

Indiana Comprehensive Wildlife Strategy

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Developed for:
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I. Foreword

Wildlife and natural resources play an important role in the quality of life for all people. The Indiana Department of Natural Resources (DNR) takes very seriously its responsibility to care for this natural legacy for future generations of Hoosiers.

Because the vast majority of Indiana's land and water resources are in private ownership, DNR recognizes that wildlife conservation in Indiana must be a joint effort between public agencies and private land managers.

Congress also has recognized the importance of partnerships and integrated conservation efforts, and has charged each state and territory in the country with developing a comprehensive wildlife conservation strategy by October 2005.

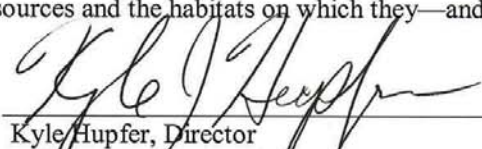
The DNR has taken advantage of this opportunity to identify and begin to integrate the broad range of existing efforts that conserve Indiana wildlife and the habitats upon which they depend. This strategy documents an ongoing process to increase collaboration within the DNR and among the many organizations across the state that work for conservation. The DNR is committed to seeking ways to knit our various programs more closely together to ensure they are efficiently focused on enhanced resource conservation.

Conservation doesn't just happen. It requires effort and resources, including technical training and financial incentives. With federal assistance through the Federal Aid in Fish and Wildlife Restoration Programs (hunter and angler money), DNR has had great success in managing game species and providing hunting and fishing opportunities for Hoosiers. To achieve similar conservation success for wildlife species that are not hunted or fished, a permanent, stable funding base will be required, both from federal sources and state matching funds. This strategy is a necessary step toward that goal. As a member of the International Association of Fish and Wildlife Agencies, DNR will work with other states and our partners to establish and maintain the level of support required to implement this groundbreaking strategy.

Hoosiers work together to build the future, whether in manufacturing or agriculture or wildlife conservation. Remembering that a wise tinkerer keeps all the parts, we intend to conserve all our natural resources to sustain economic development and contribute to quality of life for our citizens and visitors.

We have engaged hundreds of technical experts and partner organizations in establishing this compendium of baseline information on wildlife and habitat management at an unprecedented scale. We are grateful to all who have helped us create this foundation. Now, we invite all Hoosiers who care about conservation to help us continue the construction process. Join us as we use this strategy to guide development of action plans that will conserve all wildlife for generations to come.

We believe in Hoosier ingenuity and look forward to working with all our partners in this historic effort to ensure the future of our critical wildlife resources and the habitats on which they—and we—depend.



Kyle Hupfer, Director
Indiana Department of Natural Resources

II. Executive Summary

The Indiana Department of Natural Resources, Division of Fish and Wildlife (DFW) working with conservation partners across the state, developed a Comprehensive Wildlife Strategy (CWS) to protect and conserve habitats and associated wildlife at a landscape scale.

Taking advantage of Congressional guidance and nationwide synergy

Congress recognized the importance of partnerships and integrated conservation efforts, and charged each state and territory across the country to develop similar strategies. To facilitate future comparisons and cross-boundary cooperation, Congress required all 50 states and 6 U.S. territories to simultaneously address eight specific elements. Congress also directed that the strategies must identify and be focused on the “species in greatest need of conservation,” yet address the “full array of wildlife” and wildlife-related issues. Throughout the process, federal agencies and national organizations facilitated a fruitful ongoing discussion about how states across the country were addressing wildlife conservation.

States were given latitude to develop strategies to best meet their particular needs. Congress gave each state the option of organizing its strategy by using a species-by-species approach or a habitat-based approach. Recognizing that very little is known about direct management of many rare species in Indiana, the DFW selected the habitat-based approach. This approach recognizes the interconnections between species in a community, provides for the needs of a variety of game and nongame species and provides a balanced approach that supports the conservation of Indiana’s biological diversity.

Creating a baseline and mechanism for describing current conservation needs

The Indiana Comprehensive Wildlife Strategy (CWS) provides a comprehensive overview of conservation in Indiana and identifies needs and opportunities for helping prevent species from becoming threatened or endangered in the future. It identifies conservation needs, organizations working in those arenas and areas where interests overlap (potential partnerships).

Species of greatest conservation need (SGCN) were identified utilizing the most current published list of federally endangered, threatened or candidate species and Indiana’s list of endangered species and species of special concern. The Indiana CWS was developed using an information system designed to link SGCN to all wildlife species and the habitats on which they depend. This was done by using a set of representative species as surrogates for guilds including the SGCN and which were reflective of habitat needs for all wildlife species.

More than 60 specific habitat types were identified for the state. Indiana State University (ISU) operated within a contract to research and compile data on these habitats using GIS databases. Major habitat categories included agricultural lands, aquatic systems, barren lands, developed lands, forest lands, grasslands, subterranean systems, and wetlands. Distribution maps show the changes in these habitats since presettlement times. Sophisticated mapping techniques will allow the agency to repeat the calculations of area and distribution, so that trends will be revealed during implementation of the strategy.

The DFW developed an information system designed for computer-based data entry to allow for an iterative process of generating and updating information, as well as improving the model for the future. Web-based surveys were used to collect information on species and habitats,

monitoring activities, current conservation efforts, and future conservation needs for representative species and habitats to specifically address the eight elements Congress requires in the CWS.

Technical experts, conservation organizations and the general public each provided input at relevant stages of strategy development. Working through a contractor that specializes in marketing and outreach, the DFW developed a communications plan to aid with partner identification, technical input, public involvement, and coordination with federal, state, and local agencies.

Over 80 technical experts provided input through an extensive online survey form, in accordance with the information requirements in the Congressional guidelines. Each wildlife species has specific habitat requirements for providing appropriate food, water, shelter and other resources to meet survival and reproduction needs. Therefore, conservation of wildlife must start with a focus on habitat. Habitat types such as wetlands, forests and grasslands benefit from specific incentive programs that encourage public and private acquisition and restoration. Habitat degradation and urban sprawl were the top two reported threats to habitat. Experts ranked the research and survey efforts needed for wildlife species in the major habitat types and for habitats. The highest-ranking research needs for habitats included dependence on specific site conditions in five of the eight major habitat types. In the technical expert survey, experts were asked what conservation actions were most needed in Indiana. The following results are organized by habitat type, beginning with actions needed for *wildlife* conservation, followed by actions needed for *habitat* conservation.

Monitoring progress into the future

Wildlife conservation and management is intended to provide stable, self-sustaining populations of native wildlife. Therefore, habitat and species monitoring projects contribute to two important aspects of the planning cycle: the inventory stage that tallies the state's raw materials for conservation and the evaluation stage that assesses the success of conservation efforts. The DFW has operated under a planned management system for over 20 years and has a long history of monitoring species. Based on inquiries received by DFW, the public expects the state to have some knowledge of the abundance and status of wildlife. Due to federal support for monitoring activities, inventory data has been more readily available for game and sport fish species.

Early detection and intervention are critical for implementing the array of conservation actions needed to prevent species from declining to the point of being endangered. All monitoring needs identified would benefit from standardized monitoring efforts that would make interstate or regional comparisons possible. To date, only bird and fish survey efforts seem to have achieved some measure of standardization. Monitoring efforts for amphibians, (especially salamanders), all reptiles and mussels need to be increased. Standardized protocols that allow comparison of population trends between state, regions and sample areas must be established to improve the efficiency of increased monitoring. Habitat inventory and monitoring has been even less deliberate and frequent than species monitoring. Sophisticated mapping techniques were not available 150 years ago when wholesale changes were made to habitats across the Hoosier landscape. Mapped data on the distribution and abundance of major habitat types provides essential baseline data at the beginning of this century against which changes may be documented.

Indiana wildlife and habitat biologists recognize that conservation practices will evolve and improve with future advances in research techniques and compilation of knowledge through time. Therefore, implementation of this strategy must be flexible and dynamic. To allow for adaptive management, successful survey and monitoring efforts have two necessary components: the technically proficient conduct of monitoring protocols and the effective dissemination of results. The DNR will conduct species and habitat assessment efforts as resources allow and will participate, as appropriate, in regional or national monitoring programs. Along with the results, all aspects of the inventory necessary to the responsible interpretation of the effort will be made available to the partners and other interested parties on an Internet site. Easily accessed, timely inventory information will allow conservation partners and other interested parties to track progress towards conservation goals and to apply adaptive management where appropriate. Information sharing by all partners will facilitate the application of accurate, timely information to the environmental review process.

Enhancing partnerships and collaboration

Over 570 partners received a solicitation to provide information regarding current efforts, specific interests and capacity for action among conservation organizations, professional societies, universities, federal, state and local agencies, individuals and major landholders in Indiana. The contractor team and agency staff directly solicited input through e-mail, phone calls and in-person meetings and presentations. A colorful project website facilitated further contact with a range of audiences across the state. The DFW staff and contractors hired to develop this strategy also actively participated in various mechanisms for interstate cooperation and communication that were facilitated by the International Association of Fish and Wildlife Agencies (IAFWA) and the U.S. Fish and Wildlife Service (FWS).

Many partnering agencies and organizations have established programs and funding for conservation projects in Indiana. More than 50 programs in Indiana provide funding for wildlife and habitat conservation. Over 120 partner organizations also provided their percentage of efforts spent on specific habitats in Indiana. Information provided by these organizations are compiled in a matrix within the CWS. A thorough examination of these missions, resources and tools reveals how they are complementary to each other and begins to identify gaps in conservation planning within the state. Full participation by Indiana in these programs and partnerships will require focused and stable, technical, financial and human resources for implementation of this strategy and associated actions.

Preparing to meet the natural resource needs of future generations

This is the first time in history that Indiana has strategically assessed habitats, wildlife species and conservation partners. The information gathered during the process is compiled into a database and will be used to develop operational action plans to enhance effective collaboration among agencies, organizations and individuals where the resources and conservation needs overlap. The next step in putting conservation on the ground will be guided by a communications plan that will continue to solicit active participation among relevant agencies, conservation organizations, and other public and private partners. The opportunity to fulfill the Congressional requirements provides a giant leap into the future of wildlife and habitat conservation for Indiana.

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List of Acronyms

ASTER: Advanced Space-borne Thermal Emissions Reflection Radiometer
 Bird DB: Bird Database
 CRP: Conservation Reserve Program
 CWS: Comprehensive Wildlife Strategy
 DFW: Division of Fish and Wildlife
 DNP: Division of Nature Preserves
 DNR: Department of Natural Resources
 EPA: Environmental Protection Agency
 ETM+: Enhanced Thermal Mapper plus
 FHWA: Federal Highway Administration
 FWS: Fish and Wildlife Service
 GIS: Geographic Information Systems
 HD: Heritage Database
 IAFWA: International Association of Fish and Wildlife Agencies
 IBA: Indiana Important Bird Areas Program
 IBI: Index of Biotic Integrity
 IDNR: Indiana Department of Natural Resources
 IFIC: Indiana Forest Industry Council
 IPL: Indianapolis Power and Light

ISB: Indiana Soybean Board
ISC: Indiana Smallmouth Club
ISGA: Indiana Soybean Growers Association
ISU: Indiana State University
LMEC: Lake Maxinkuckee Environmental Council
MAFWA: Midwest Association of Fish and Wildlife Agencies
MICRA: Mississippi Interstate Cooperative Resource Association
NABCI: North American Bird Conservation Initiative
NIPSCO: Northern Indiana Public Service Company
NIRPC: Northwestern Indiana Regional Planning Commission
ORSANCO: Ohio River Valley Water Sanitation Commission
Reptile DB: Reptile Database
RFP: Request For Proposal
SARE: Sustainable Agriculture Research and Education
SGCN: Species of Greatest Conservation Need
SWCD: St. Joseph County Soil & Water Conservation District
USDA: United States Department of Agriculture
USFWS: United States Fish and Wildlife Service
USGS: United States Geologic Service
WCRP: The Wildlife Conservation and Restoration Program
WRP: Wetland Reserve Program

IV. Introduction and Purpose

Because the vast majority of Indiana's land and water resources are in private ownership, wildlife conservation in Indiana must be a joint effort between public agencies and private land managers. Fish and wildlife depend on protection and conservation of a wide variety of habitats across the state. State fish and wildlife area managers, farmers, developers, land trusts, industries, and hunting, trapping, and fishing clubs are among the many stewards in Indiana who are taking steps to ensure that these resources will be around for the use and enjoyment of future generations.

Given that there are limited resources for all of these partner efforts, The Indiana Department of Natural Resources, Division of Fish and Wildlife (DFW) wants to encourage partnerships with other organizations where our interests overlap and our efforts can be mutually beneficial.

Congress also has recognized the importance of partnerships and integrated conservation efforts, and has charged each state and territory in the country with developing a comprehensive wildlife conservation strategy by October 2005.

Indiana is taking advantage of this opportunity to identify and begin to integrate the broad range of efforts that conserve wildlife and the habitats upon which they depend. This effort will prepare a framework for maximizing conservation efforts across the state.

Congressional Guidelines

Congress has given states great latitude in developing strategies that best meet state needs, but has required all states to address eight specific elements in their strategies. The locations of the sections of this document that address these requirements are noted below in parenthesis.

1. Information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife (Chapter VII, pages 25-33 and Appendix E); and,
2. Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1) (Chapter VIII, pages 34-52); and,
3. Descriptions of problems which may adversely affect species identified in (1) or their habitats, (Chapter IX, pages 53-57 and Appendix E) and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats (Chapter X, pages 58-60 and Appendix E); and,
4. Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions (Chapter XI, pages 61-76 and Appendix E); and,
5. Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4) (Chapter XII, pages 77-86), and for adapting these conservation actions to respond appropriately to new information or changing conditions (Chapter XIV, Page 88); and,
6. Descriptions of procedures to review the strategy at intervals not to exceed ten years (Chapter XV, page 89); and,
7. Plans for coordinating the development, implementation, review, and revision of the plan with Federal, State, and local agencies and Indian tribes that manage significant land and

water areas within the State or administer programs that significantly affect the conservation of identified species and habitats (Chapter XII, page 77-86).

8. Congress also affirmed through this legislation that broad public participation is an essential element of developing and implementing these plans (Chapter V, pages 18-22), the projects that are carried out while these plans are developed, and the Species in Greatest Need of Conservation that Congress has indicated such programs and projects are intended to emphasize.

Congress gave each state the option of organizing its strategy using a species-by-species approach or a habitat-based approach. The DFW selected the habitat-based approach for Indiana's strategy for the following reasons:

- Habitat loss or degradation has traditionally been considered the biggest threat to Indiana wildlife, so a habitat-based strategy was considered the most efficient way to address the needs of the widest variety of species.
- Previous DFW strategic plans have indicated the need to be working on habitats, but a "good way to get there" has never been developed.
- The species focus sometimes tends to polarize or insulate interests and resources. There was a concern that this divide could grow wider as the number of partnerships expands.
- Traditional Federal Aid funding and even Endangered Species funding tends to limit the areas and types of habitat-associated activities that qualify for grants. The Wildlife Conservation and Restoration Program (WCRP) and the State Wildlife Grants legislation (which initiated the comprehensive wildlife strategy process) make funds available for habitat work.
- When conservation efforts focus on one or a small group of species, important habitat for other species (potentially including species in greatest need of conservation) can be inadvertently impacted.

Indiana DNR staff identified more than 60 specific habitat types in Indiana (see Appendix A for complete list and definitions). All information on Indiana wildlife that is included in this strategy has been categorized by these habitat types. When results are presented by major habitat types this data is the aggregation of the results of sub-habitat information within that habitat type.

Indiana's CWS: What It Is—and What It Isn't

The Indiana Comprehensive Wildlife Strategy (CWS) provides a comprehensive overview of conservation in Indiana and identifies needs and opportunities for helping prevent species from becoming threatened or endangered in the future. The CWS includes biological aspects of wildlife and habitat conservation in the state, as well as information on the conservation organizations currently conducting on-the-ground efforts. It identifies conservation needs, organizations working in those arenas and areas where interests overlap (potential partnerships).



Figure 1. Purpose of Indiana's comprehensive wildlife conservation strategy (CWS). The Indiana CWS is an effort to identify conservation needs, existing partners and resources for addressing the needs. Where partners overlap, synergy allows greater relative benefit for a given effort. The process also identifies gaps in conservation efforts where additional time and resources should be applied.

The CWS is NOT an operational plan. It does not identify specific tasks, assignments, or schedules for achieving wildlife conservation. However, the intent of Congress and the DFW is that the CWS will guide and encourage development and/or compilation of operational plans from within the Department of Natural Resources (DNR) and from among DNR's many partners in the conservation community. Operational plans and partnerships are the next steps in the process.

CWS is a *model* for identifying habitat conservation needs

Generating information on conservation needs for all habitats and all wildlife species within the state is a daunting task, especially when little is known about many of these species. Models can be an efficient and effective way of maximizing limited knowledge by focusing on available research, enhanced by extrapolation from species that are better known, and all informed by best professional judgment. Information used to create recommendations for Indiana's CWS was generated through an information system, or tool, that was developed specifically to link species of greatest conservation need (SGCN) to all wildlife species and the habitats on which they depend. This was done by using a set of representative species as surrogates for the SGCN and for habitat needs of all wildlife species. In some cases, enough was known about certain SGCN that they were also used as representative species.

Linking the information system back to species of greatest conservation need

SGCN were identified utilizing the most current published list of federally endangered, threatened or candidate species and Indiana's list of endangered species and species of special concern (Table 1). These species were cross-referenced with the Indiana Academy of Science *Revised Checklist of the Vertebrates of Indiana* for species range, relative abundance, season and status. The state list of endangered species and species of special concern are reviewed and updated periodically, using expertise from scientists who study species within the state. Data were collected for representative species in all habitats that contained SGCN. This allows the habitat information to be used to infer conservation needs for SGCN. This will be especially significant for SGCN for which little

species-specific information is currently known. Habitat conservation efforts that benefit SGCN will also benefit all other wildlife in those habitats.

Electronic input allows for revisions to the information system

Knowledge about wildlife species and their habitats will improve over time and conditions will change. Therefore, DFW developed the information system around a computer-based data entry tool to allow for an iterative process of generating and updating information, as well as improving the model itself in the future. Web-based surveys were used to collect information on species and habitats, monitoring activities, current conservation efforts, and future conservation needs for representative species and habitats to specifically address the eight elements Congress requires in the CWS. Eighty-six professionals throughout Indiana completed more than 180 questionnaires. The resulting database and compiled narratives can be adjusted and/or repeated, as needed, to update progress in species and habitat conservation.

Finally, a landscape approach

For many years, natural resource managers and conservationists have identified the need for a comprehensive umbrella approach to conservation in Indiana and throughout the country. The DFW and some of its partners have been able to achieve some landscape-level conservation efforts, but there has not yet been a systematic attempt to compile all such efforts, along with the conservation needs of all Indiana wildlife and habitats, to identify gaps and potential partnerships and synergies. The CWS attempts to do just that.

A note on how to use the information in this strategy

Gathering the information for development of this strategy was for most states—including Indiana—a monumental and unprecedented effort. Many experts from throughout the state contributed uncounted hours to provide thoughtful input into creating this baseline for future collaborative conservation. As a result, well over a thousand pages of information has been collected and collated.

Most conservation partners will find that their detailed interest lies within a subset of this information. However, they may also wish to scan the overall status of wildlife conservation in Indiana. This document and associated information is organized to allow the reader to see a broad overview or to delve deeply into the data that were gathered during this process.

This document contains a series of tables that allow the reader to view condensed information about all habitats and species within those habitats. If the reader is interested in further information about particular habitats or major taxonomic groups, that information is found in appendices. If the reader wishes to go deeper still, the species- and habitat-specific input and responses from individual conservation organizations can be explored electronically on the Indiana CWS website.

NOTE: The outline used for this document was created from an outline recommended by the U.S. Fish and Wildlife Service (FWS). The process was modified as necessary to meet the particular needs of the State of Indiana while also satisfying guidance from the federal government.

Strategy Development Assistance

In September 2003, DFW distributed an RFP for a contractor to assist with development of the CWS. D.J. Case & Associates (DJ Case), a natural resources communications firm based in Mishawaka, Indiana was selected to provide this assistance.

V. Public Involvement and Partnership Solicitation

The DFW sought broad public and partner participation in the development of the CWS. The first step was to develop a communications plan to aid with partner identification and solicitation, public involvement and coordination with federal, state, and local agencies. The communications plan outlined specific objectives for the various target audiences, coupled with key messages and tactics for these audiences. (See Appendix B)

Based on the communications plan, and given the increased availability, access and acceptance of computer technology, DFW opted to utilize web-based techniques for species and habitat data collection and partner participation. This provided the opportunity for a larger audience to be involved than could have participated at traditional forums, because:

- Traditional techniques (workshops/meetings, focus groups, etc) often are poorly attended;
- Budget constraints would have limited the number and distribution of meetings;
- In-person meetings often create unintentional bias toward participants that have the means and/or availability to attend.

A. Technical expertise: a tool for identifying habitat conservation needs

Indiana DFW chose to use a habitat-based model for its CWS. The intent of the model is to maximize limited knowledge about wildlife species by focusing on available research, enhanced by extrapolation from species that are better known, and by including best professional judgment. SGCN were linked to all wildlife species and to the habitats on which they depend by using representative species as surrogates. The resulting information system, or tool, was developed through the following four steps.

Step 1: Assemble a guild of species for each habitat type

Using the Indiana Academy of Science *Revised Checklist of the Vertebrates of Indiana* as a guide, technical experts listed all vertebrate wildlife species with their associated habitats, forming *guilds* for more than 60 specific habitat types (See Appendix A for complete list of habitats and definitions and Appendix C for listing of guilds). Mussels also were included in the list as a placeholder for future invertebrate conservation needs. Insects and other invertebrates were not included because there is limited state statutory authority and little expertise available to directly manage these taxa. However, by protecting rare habitats, insects and other invertebrates can be indirectly protected. Three general rules were used to define guilds.

- Does the animal live in the habitat;
- How specific is the habitat association (is the animal *always* found in this habitat, versus usually or occasionally found); and
- Presence of a specific critical habitat for the survival or success of the animal.

The process was used to identify specific or critical habitat types that were not previously identified.

Species of greatest conservation need were included in appropriate guilds.

Step 2: Select a species to represent each guild

The DFW recognized that including all of the wildlife species in Indiana would create an unmanageably large strategy, which would limit its usability. Therefore, wildlife professionals

from DFW selected species to serve as representatives of each guild. The species were picked based on biological features and whether constituents would recognize them as representative of the guild. The selected species “painted a reasonable mental picture of the associated habitat type” when presented to a diverse user group including biologists, the public, legislators, grant reviewers and other partners. The focus is on habitat, not individual species. Species were selected that would automatically generate an association with the habitat-related guild and a desire to protect, enhance or somehow improve that habitat as the strategy is implemented. Representative species also were used as mental tools to focus technical expert input on particular relationships between species and their habitats, as they considered research and conservation needs for these associations.

Step 3: Collect, compile and analyze information on conservation and monitoring

Specific information on the biological components of the CWS was solicited from wildlife experts throughout the state. Members of DNR technical advisory committees and other professionals with expertise in wildlife or habitat science were asked to provide information to help describe the conservation needs and recommendations for wildlife and habitats in Indiana. A web-based survey was developed (See Appendix D) to collect information on current status and trends, threats, and opportunities facing the representative species and their associated habitats. The survey tool also collected information on monitoring activities, current conservation efforts, and future conservation needs for representative species and habitats.

The questionnaire was developed to specifically address the eight elements Congress requires to be included in the CWS. The survey was standardized across major taxonomic groups and habitats to facilitate comparison and identification of critical conservation efforts to be implemented in Indiana. Eighty-six professionals throughout Indiana completed more than 180 questionnaires (See Appendix E 1-78 for questionnaire results).

Data collected on the representative species were aggregated by habitat and sub-habitat type and descriptive statistics allowed the ranking (highest to lowest importance) of the information. This information has been compiled into narrative statements. These efforts were NOT an attempt to prioritize across habitats. Results indicate the most critical threats, species monitoring efforts and techniques, habitat inventory and assessment efforts and techniques, body of science, research needs, and current and recommended conservation practices for wildlife and for specific habitats.

The technical expert and partner communities were asked to review the results of the habitat aggregations and comment on whether the results are a reasonable representation of the conservation situation across the specific habitats and all the wildlife species in those habitats (See Appendix F 1-78 for comments on narratives). Comments were included in the draft CWS manuscript, which was made available for additional review by conservation organizations and the general public.

Step 4: Linking the results back to species of greatest conservation need

Species of greatest conservation need were included in their appropriate guilds and data were collected for species that represented those guilds and their associated habitats. The habitat information can then be used to infer conservation needs for SGCN, as well as for many taxa for which direct management strategies are not well known (e.g., insects and other invertebrates). This will be especially significant for SGCN for which little species-specific information is currently known.

B. Partnership Solicitation

The contractor hired to assist in CWS development created a communication plan to guide the partnership solicitation process. The DFW and the contractor searched for partners among conservation organizations, professional societies, universities, individuals and major landholders in Indiana. The search was conducted by referencing numerous agency databases, searching the Internet for non-traditional partners and through recommendations from other partners. The contractor followed the process below to invite 570 potential partners to participate in the development process.

Sent partners an electronic survey to collect information

An on-line survey (See Appendix G for survey instrument) was distributed to all potential partners in order to gather the following information for inclusion in the CWS:

- Partner name, mission, goals, authority, size (number of employees, members or volunteers), type (non-profit, for profit, local government, state government, federal government), and location (city, county, region or area) of the organization.
- Primary source of funding (foundation grants, state, federal, individual contributions, dues, etc.), and total annual budget.
- Types of habitats where efforts are focused.
- Estimated percent of total time spent on efforts in these habitats.
- Primary wildlife species of interest.
- Specific objectives with this/these species.
- Projects (current or proposed) that could contribute to a local, regional or statewide conservation strategy.
- Available resources or capabilities the organization could contribute to the development of the CWS.
- Developed conservation partnerships.
- Perceived need to improve existing partnerships, resources or programs focused on resource for conservation.
- Best way to communicate with the organization and the general public about the CWS and similar conservation efforts (e.g., member newsletters, email lists, meetings).
- Strategic or operational documents that could be incorporated into the CWS.

Sent customized e-mails and made calls to encourage partners to complete surveys

Partners received an e-mail with a link to an electronic survey and were encouraged to complete it. Following the initial e-mail, the contractor, on behalf of DFW, followed-up with another customized e-mail and in some cases made phone calls asking partners to complete the survey. The DFW, with help from the contractor, utilized survey responses to gauge the organizations' interest in participating in the CWS process. Survey responses also provided DFW with information about the organizations' impact on wildlife habitat and types of current conservation projects. Survey responses were automatically compiled in an electronic database and will be used in CWS implementation.

Categorized potential partners based on electronic survey responses

Based on responses to the partner survey, potential partners were placed into one of three partner levels: 1) Keystone Partners; 2) Partners; and 3) Stakeholders.

Most organizations that submitted a survey indicated interest in being involved in the development of the CWS and were categorized as “Keystone Partners.” All Keystone Partners have significant impact on wildlife habitats in Indiana and/or reach a large number of people interested in habitat conservation. A total of 126 partners (three groups combined) completed the survey (See Appendix H for complete survey results). The DFW put more effort into communicating with Keystone Partners than the other two groups because these organizations will have a significant role and impact in the implementation of the CWS.

Sent customized e-mails and made personal calls to solicit partner input

Throughout CWS development, the contractor sent e-mail messages to all partners and called Keystone Partners to encourage comments and suggestions on versions of the draft CWS. Most e-mail contacts directed partners to an on-line form, where they could submit feedback on the various sections of the CWS. Once submitted, the on-line feedback was automatically compiled into a database for inclusion in the CWS. There were three opportunities for partners to provide information or feedback for inclusion in the CWS.

Asked selected partners about internal communication mechanisms that could be used to solicit additional input on CWS

During phone calls to Keystone Partners, the contractor asked organizations if they had access to communications mechanisms that could reach members and other publics interested in wildlife. The contractor also gathered media contacts that could be used to distribute solicitations to the public for CWS feedback. Informational materials (see Appendix I for informational materials) about the CWS were placed in partners’ newsletters, on websites and distributed via e-mail. All materials directed the reader to the CWS website to learn more about CWS development and/or to provide comment on versions of the CWS.

The DFW and the contractor utilized partners’ existing communication mechanisms to reach publics that already have an interest in wildlife because these were more likely to provide feedback on the CWS and become involved in implementation.

C. Public Involvement

During the CWS development phase, DFW focused most of its resources on communicating with publics (partners and others) that had a vested interest in the strategy (see above). However, input was also solicited from the “general public.” In an effort to maximize effectiveness, the general public was further segmented into two subsets:

1. Publics predisposed to interest in wildlife.
2. “John Q. Public.”

Many partners have direct communications with publics that share an interest in conserving wildlife and habitat. Information gathered via partner interviews described above was used to solicit input from publics with existing interest in wildlife. Organizations distributed solicitations for public comment via their newsletters, websites, listservs and meetings. The DFW had a better chance of receiving input from interested publics (partner members, nature center visitors and others with existing interest in wildlife) than from publics with no active interest in wildlife.

To reach “John Q. Public” (publics with no existing active interest or predisposition to wildlife conservation issues), DFW distributed a press release through the *Wild Bulletin* soliciting public

input on the final draft version of the CWS. *Wild Bulletin* reaches more than 10,000 recipients, including most media outlets in the state.

The contractor also made a CWS presentation to the Hoosier Outdoor Writers organization at their annual meeting. This led to publication of several informational newspaper articles about the CWS around the state.

The DFW developed a database of all partners with the capability to communicate about the CWS, and will continue to utilize these communication channels, partner websites, newsletters, list-serves, etc. to involve the public in implementation and revisions of the CWS.

VI. Coordination with Federal, State and Local Agencies and Indian Tribes

Federal, state and local agencies were involved in CWS development as partners and technical experts. The DFW solicited input through e-mail, phone calls and in-person meetings/presentations.

Throughout development, DFW scheduled in-person meetings and presentations with selected agencies statewide. During the in-person meetings and presentations, DFW informed agencies about the CWS and explained how they could be involved. DFW coordinated agency feedback via electronic communications.

A. Federal Agencies

Federal agencies in Indiana were considered Keystone Partners. The DNR solicited input from the following federal agencies:

- Federal Highway Administration
- Great Lakes Commission (binational agency)
- National Park Service (Indiana Dunes National Lakeshore)
- U.S. Army Chemical Materials Agency
- U.S. Department of Agriculture
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U.S. Geological Survey
- National Resources Conservation Service

B. State Agencies

State agencies in Indiana were considered Keystone Partners. The DNR solicited input from the following state agencies:

- Internally from DNR staff
- Indiana Chamber of Commerce
- Indiana Department of Environmental Management
- Indiana Department of Transportation
- State universities in Indiana

C. Local Agencies

The DFW solicited input from local agencies including:

- Indiana Association of Cities and Towns
- Indiana Association of Soil and Water Conservation Districts
- Elkhart Public Works and Utilities
- Kankakee River Basin Commission
- Lake Lemon Conservancy District
- Merry Lea Environmental Learning Center
- Northwest Indiana Regional Planning Commission
- St. Joseph County Soil and Conservation District
- Valparaiso Chain of Lakes Watershed Group
- Wabash River Heritage Corridor Commission

D. Indian Tribes

There are no federally recognized Indian tribes in Indiana.

E. Neighboring States

The DFW staff and contractors hired to develop this strategy actively participated in various mechanisms for interstate cooperation and communication that were facilitated by the International Association of Fish and Wildlife Agencies (IAFWA) and the U.S. Fish and Wildlife Service (FWS). This included an electronic discussion forum, attendance at a meeting in Nebraska City, NE, in August 2004, and participation in CWS discussions at several other professional meetings (Midwest Fish and Wildlife Conference, International Association of Fish and Wildlife Agencies annual meeting, Association of Conservation Information annual meeting, North American Wildlife and Natural Resources Conference, etc.).

The DFW participates in regional conservation efforts that are coordinated at the national level such as Partners in Flight, North American Waterfowl Management Program (and associated All Birds Initiative), North American Amphibian Monitoring Plan, Great Lakes Fishery Commission, FWS Region 3 Endangered Species Coordinators meetings, and other similar programs. The DFW will continue to participate in these coordinating conservation efforts along with its partners.

The DFW anticipates further involvement in a project that will be sponsored by the Midwest Association of Fish and Wildlife Agencies (MAFWA) in which regional and cross-boundary issues will be identified for future development.

Effective participation in these regional efforts will be contingent upon out-of-state travel approval, staffing capacity, state matching funds, and other resources that may be required.

VII. Distribution and Abundance of Species of Greatest Conservation Need (1st Element)

The goal of the Indiana Comprehensive Wildlife Strategy is to preserve the native biological diversity of Indiana and thus contribute to the preservation of national and global biological diversity.

The Indiana Nongame and Endangered Species Conservation Act was enacted in 1973 in response to the federal Endangered Species Act. Endangered species is defined by IC 14-22-34-1 as “any species or subspecies of wildlife whose prospects of survival or recruitment within Indiana are in jeopardy or are likely within the foreseeable future to become so due to any of the following factors:

1. The destruction, drastic modification, or severe curtailment of the habitat of the wildlife.
2. The overutilization of the wildlife for scientific, commercial, or sporting purposes.
3. The effect on the wildlife of disease, pollution, or predation.
4. Other natural or manmade factors affecting the prospect of survival or recruitment within Indiana.
5. Any combination of the factors described in subdivisions (1) through (4).”

Additionally, by Indiana Statute “any species or subspecies of fish or wildlife appearing on the United States list of endangered native fish and wildlife (50 CFR 17, Appendix D)” is also considered endangered by Indiana law. The term “threatened” is not defined in Indiana statute; however, threatened is defined in Indiana Administrative Code. As there is no regulatory distinction between threatened and endangered, Indiana no longer uses the threatened category. Any species or subspecies deemed vulnerable enough to require the protection of the state Endangered Species Act is considered endangered.

Species and subspecies are added or deleted from the state endangered species list through the administrative rule process. This process provides ample opportunity for public comment. Comments may be made in writing to an administrative law judge and/or by direct testimony to the Indiana Natural Resources Commission, the legal body with authority to adopt DNR administrative rules. In practice recommendations to add or delete species or subspecies originates in a Technical Advisory Committee (TAC). The DFW established five TAC for Mammals, Birds, Reptiles and Amphibians, Fish and Mussels and Crustaceans. Each committee is composed of five to nine experts, mainly from Indiana colleges and universities, with Indiana experience relative to the animal group covered by that committee. Each TAC has one DFW staff person assigned as an ex-officio member. The TAC’s consider only resident wildlife and bird species breeding in Indiana. For a given species a listing recommendation is made by a TAC based on the consideration of several factors, including overall population size, a comparison of current distribution relative to historic distribution, threats to the species, status of closely related taxa or other species in a similar niche. The experts in each TAC use their best professional judgment, experience and applicable publications and unpublished reports to determine if the prospect for a given species’ survival in Indiana is in jeopardy. The Technical Advisory Committees tend to be conservative. When there is insufficient data upon which to make a definitive determination, the committees have recommendation protection for a species facing significant risk. This precaution provides the maximum protection of Indiana law and elevates the survey, monitoring and/or research priority of that species. Each species or

subspecies is evaluated in light of prospects for survival in Indiana relative to the species historic occurrence in the state. The status of species newly discovered in Indiana, such as the green salamander and the mole salamander, are especially problematic. Historically systematic surveys were not conducted for all taxa and the historic distribution and population status in Indiana are unknown. However, disjunct populations or populations at the edge of their range may represent distinct gene pools that warrant conservation. For these species recovery is defined by the degree to which the known population is secure from threat rather than a specific population level or distribution.

Insects and other invertebrates, other than mollusks and crustaceans, are not protected by Indiana statute. A list of endangered insects has been developed based on the recommendation of insect experts working in Indiana. Many of these insects occur in rare habitats. To date most conservation efforts for these species consist of conservation of these rare habitats. As resources allow systematic surveys for all insect orders should be conducted to provide a more holistic assessment of the status of Indiana's insect fauna.

Species of special concern have no legal protection. Species are generally placed on the special concern list because the experts suspect the species' population is declining or their distribution is shrinking. Additionally, these species may be difficult to survey. Special concern status raises the survey and monitoring priority of these species and stimulates encounter reports from the scientific community. The status of all species most in need of conservation are reviewed annually by the TACs and additions and deletions are recommended.

In order to conserve the native biological diversity of Indiana the DFW uses all the tools of a modern scientific management program, including survey and monitoring, research, population and habitat management, education, land acquisition, and regulation to conserve all species most in need of conservation. Species are removed from this list when their prospects for survival in the state are known to be secure.

Element 1 of the Congressional guidelines requires that the CWS present information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife. Therefore, Indiana's Species of Greatest Conservation Need (SGCN) were identified using the published list of federally endangered, threatened or candidate species and Indiana's list of endangered species and species of special concern. These species were cross-referenced with the Indiana Academy of Science *Revised Checklist of the Vertebrates of Indiana* for species range, relative abundance, season and status (Table 1).

The numbers of SGCN are not distributed evenly across major habitat types. There were 7 species associated with agricultural habitat, 75 in aquatic systems, 5 in barren lands, 6 in developed lands, 50 in forestlands, 28 in grasslands, 10 in subterranean habitats, and 51 in wetlands. Some of these species may use different habitat types depending upon life stage and availability. Some habitats are better studied than others or receive more attention due to economic and aesthetic values. Some habitats are naturally smaller in size, widely scattered and may have historically supported low biodiversity.

By virtue of being rare or in remotely accessible habitats, scientific information is limited for many of these species. Other species may even continue to go undetected. Taxonomy is a field of

science that changed dramatically with development of new techniques to detect genetic relationships. Therefore, these lists are subject to change as more knowledge about the species identification, distribution and abundance becomes available. The complete list of species of greatest conservation need in Indiana and their associated habitat types can be found in Appendix J. For additional information on the distribution and status of mammals, birds, amphibians, reptiles, fishes and bi-valve mussels in Indiana see references in Appendix K. In at least the last 50 years no similar reference has been developed for the insects of Indiana.

Although the DNR does not have statutory responsibility or expertise in direct conservation and management practices for most groups of invertebrate wildlife, Table 1 documents the federal or state status of insects listed as threatened or endangered in Indiana. Federally listed insects are predominantly associated with rare habitat types. Management of these species in Indiana has largely consisted of protection of those habitats. These actions are within the purview of the Indiana DNR Division of Nature Preserves, which works closely with DFW on this and other related issues.

Table 1: Species of Greatest Conservation Need - species range, relative abundance and status (Source: Indiana’s list of endangered species and species of special concern and the Indiana Academy of Science *Revised Checklist of the Vertebrates of Indiana* or from personal communication with insect experts working in Indiana.)

<p>Range (within state): Statewide (I), North (N), South (S), West (W), East (E), Central (C) and various combinations. U=Unknown</p> <p>Relative abundance (within state): Common (C): Don’t have detectably lower populations than historical or expected levels. (Species that are included on this list of greatest conservation need due to identified habitat or ecological disturbances or threats). Occasional (O): Disjunct populations who’s occurrence is sporadic yet significantly less than historic or expected levels. Rare (R): Significantly lower populations than historic or expected levels. U: Unknown</p> <p>Status (Federal) Federally Endangered (FE), Federally Threatened (FT), candidates for federal listing (FC) (State) State Endangered (SE), Special Concern in need of further study (SC)</p>

Common Name	Scientific name	Range	Relative Abundance	Status
Allegheny Woodrat	<i>Neotoma magister</i>	SC	R	SE
Alligator Snapping Turtle	<i>Macrochelys temmincki</i>	SW	R	SE
American Bittern	<i>Botaurus lentiginosus</i>	I	R	SE
Badger	<i>Taxidea taxus</i>	I	R	SC
Bald Eagle	<i>Haliaeetus leucocephalus</i>	I	R	SE, FT
Banded Pygmy Sunfish	<i>Elassoma zonatum</i>	SW	R	SC
Bantam Sunfish	<i>Lepomis symmetricus</i>	W	R	SE
Barn Owl	<i>Tyto alba</i>	I	R	SE
Bigmouth Shiner	<i>Notropis dorsalis</i>	NW	R	SC
Black Rail	<i>Laterallus jamaicensis</i>	I	R	SE
Black Tern	<i>Chlidonias niger</i>	I	O	SE
Black-And-White Warbler	<i>Mniotilta varia</i>	I	O	SC

Common Name	Scientific name	Range	Relative Abundance	Status
Black-Crowned Night-Heron	<i>Nycticorax nycticorax</i>	I	R	SE
Blanding's Turtle	<i>Emydoidea blandingii</i>	N	O	SE
Blue-Spotted Salamander	<i>Ambystoma laterale</i>	N	O	SC
Bobcat	<i>Lynx rufus</i>	I	R	SC
Broad-Winged Hawk	<i>Buteo platypterus</i>	I	O	SC
Butler's Garter Snake	<i>Thamnophis butleri</i>	NE, C	R	SE
Cerulean Warbler	<i>Dendroica cerulea</i>	I	O	SC
Channel Darter	<i>Percina copelandi</i>	C	R	SE
Cisco	<i>Coregonus artedi</i>	NW	R	SC
Clubshell	<i>Pleurobema clava</i>	NC, NE	R	SE, FE
Common Moorhen	<i>Gallinula chloropus</i>	I	R	SE
Common Mudpuppy	<i>Necturus maculosus</i>	I	O	SC
Common Nighthawk	<i>Chordeiles minor</i>	I	O	SC
Copperbelly Water Snake	<i>Nerodia erythrogaster neglecta</i>	SW, NE, SC	O	SE, FC
Cottonmouth	<i>Agkistrodon piscivorus</i>	S	R	SE
Crawfish Frog	<i>Rana areolata</i>	W	O	SE
Cypress Darter	<i>Etheostoma proeliare</i>	SW	R	SC
Eastern Fanshell	<i>Cyprogenia stegaria</i>	NC, SW, SC	R	SE, FE
Eastern Mud Turtle	<i>Kinosternon subrubrum</i>	NW, SW	R	SE
Eastern Pipistrelle	<i>Pipistrellus subflavus</i>	S	C	SC
Eastern Red Bat	<i>Lasiurus borealis</i>	I	A	SC
Eastern Spadefoot Toad	<i>Scaphiopus holbrookii</i>	S	O	SC
Ellipse	<i>Venustaconcha ellipsiformis</i>	N	C	SC
Evening Bat	<i>Nycticeius humeralis</i>	SC	O	SE
Fat Pocketbook	<i>Potamilus capax</i>	SW	O	SE, FE
Four-Toed Salamander	<i>Hemidactylium scutatum</i>	N, C	R	SE
Franklin's Ground Squirrel	<i>Spermophilus franklinii</i>	NW	R	SE
Gilt Darter	<i>Percina evides</i>	C	O	SE
Golden-Winged Warbler	<i>Vermivora chrysoptera</i>	I	R	SE
Gray Myotis	<i>Myotis grisescens</i>	SC	R	SE, FE
Great Egret	<i>Ardea alba</i>	I	O	SC
Greater Redhorse	<i>Moxostoma valenciennesi</i>	N	R	SE
Green Salamander	<i>Aneides aeneus</i>	SE	R	SE
Hellbender	<i>Cryptobranchus alleganiensis</i>	S	R	SE
Henslow's Sparrow	<i>Ammodramus henslowii</i>	I	R	SE
Hieroglyphic River Cooter	<i>Pseudemys concinna</i>	SW	R	SE
Hoary Bat	<i>Lasiurus cinereus</i>	I	O	SC
Hooded Warbler	<i>Wilsonia citrina</i>	I	R	SC
Indiana Myotis	<i>Myotis sodalists</i>	I	O	SE, FE
Kidneyshell	<i>Ptychobranchus fasciolaris</i>	NE, C, SE	O	SC
King Rail	<i>Rallus elegans</i>	I	R	SE
Kirtland's Warbler	<i>Dendroica kirtlandii</i>	I	R	SE, FE
Kirtland's Snake	<i>Clonophis kirtlandii</i>	N, C, SE	O	SE
Lake Sturgeon	<i>Acipenser fulvescens</i>	W, S	R	SE
Lake Whitefish	<i>Coregonus clupeaformis</i>	NW	C	SC
Least Bittern	<i>Ixobrychus exilis</i>	I	R	SE
Least Tern	<i>Sterna antillarum</i>	I	R	SE, FE

Common Name	Scientific name	Range	Relative Abundance	Status
Least Weasel	<i>Mustela nivalis</i>	N	R	SC
Little Brown Myotis	<i>Myotis lucifugus</i>	I	C	SC
Little Spectaclecase	<i>Villosa lienosa</i>	C, S	O	SC
Loggerhead Shrike	<i>Lanius ludovicianus</i>	I	R	SE
Longnose Dace	<i>Rhinichthys cataractae</i>	N	O	SC
Longnose Sucker	<i>Catostomus catostomus</i>	NW	R	SC
Longsolid	<i>Fusconaia subrotunda</i>	C	R	SE
Marsh Wren	<i>Cistothorus palustris</i>	I	R	SE
Massasauga	<i>Sistrurus catenatus</i>	N	R	SE
Mississippi Kite	<i>Ictinia mississippiensis</i>	I	R	SC
Northern Brook Lamprey	<i>Ichthyomyzon fossor</i>	NE	R	SE
Northern Cavefish	<i>Amblyopsis spelaea</i>	S	R	SE
Northern Harrier	<i>Circus cyaneus</i>	I	O	SE
Northern Leopard Frog	<i>Rana pipiens</i>	N, E	C	SC
Northern Madtom	<i>Noturus stigmus</i>	W, C	R	SC
Northern Myotis	<i>Myotis septentrionalis</i>	I	C	SC
Northern Riffleshell	<i>Epioblasma torulosa rangiana</i>	NC	R	SE, FE
Ohio Pigtoe	<i>Pleurobema cordatum</i>	C, S	O	SC
Ohio River Muskellunge	<i>Esox masquinongy ohioensis</i>	S	R	SC
Orangefoot Pimpleback	<i>Plethobasus cooperianus</i>	S	R	SE, FE
Ornate Box Turtle	<i>Terrapene ornata</i>	NW, SW	O	SE
Osprey	<i>Pandion haliaetus</i>	I	R	SE
Pallid Shiner	<i>Hybopsis amnis</i>	W	R	SE
Peregrine Falcon	<i>Falco peregrinus</i>	I	R	SE
Pink Mucket	<i>Lampsilis abrupta</i>	S	R	SE, FE
Piping Plover	<i>Charadrius melodus</i>	I	R	SE, FE
Plains Leopard Frog	<i>Rana blairi</i>	W	R	SC
Plains Pocket Gopher	<i>Geomys bursarius</i>	NW	C	SC
Pointed Campeloma	<i>Campeloma decisum</i>	U	U	SC
Pugnose Shiner	<i>Notropis anogenus</i>	NE	R	SC
Purple Lilliput	<i>Toxolasma lividus</i>	NC, C	R	SC
Pygmy Shrew	<i>Sorex hoyi</i>	SC	O	SC
Pyramid Pigtoe	<i>Pleurobema rubrum</i>	C	R	SE
Rabbitsfoot	<i>Quadrula cylindrica cylindrica</i>	NC	R	SE
Rafinesque's Big-Eared Bat	<i>Corynorhinus rafinesquii</i>	SC	R	SC
Rayed Bean	<i>Villosa fabalis</i>	NC	R	SC, FC
Red Salamander	<i>Pseudotriton ruber</i>	SC	R	SE
Red-Shouldered Hawk	<i>Buteo lineatus</i>	I	O	SC
Redside Dace	<i>Clinostomus elongatus</i>	E	R	SE
River Otter	<i>Lontra canadensis</i>	I	R	SC
Rough Green Snake	<i>Opheodrys aestivus</i>	S	O	SC
Rough Pigtoe	<i>Pleurobema plenum</i>	C	R	SE, FE
Round Hickorynut	<i>Obovaria subrotunda</i>	NC, WC	R	SC
Salamander Mussel	<i>Simpsonaias ambigua</i>	SE, SC, WC	R	SC
Sandhill Crane	<i>Grus canadensis</i>	I	O	SC
Scarlet Snake	<i>Cemophora coccinea</i>	S	R	SE
Sedge Wren	<i>Cistothorus platensis</i>	I	R	SE

Common Name	Scientific name	Range	Relative Abundance	Status
Sharp-Shinned Hawk	<i>Accipiter striatus</i>	I	O	SC
Sheepnose	<i>Plethobasus cyphus</i>	NC, S	R	SE, FC
Short-Eared Owl	<i>Asio flammeus</i>	I	R	SE
Silver-Haired Bat	<i>Lasiorycteris noctivagans</i>	I	O	SC
Slimy Sculpin	<i>Cottus cognatus</i>	NW	R	SC
Smoky Shrew	<i>Sorex fumeus</i>	SC	O	SC
Smooth Green Snake	<i>Liochlorophis vernalis</i>	NW	R	SE
Snuffbox	<i>Epioblasma triquetra</i>	C	R	SE
Southeastern Crowned Snake	<i>Tantilla coronata</i>	S	R	SE
Southeastern Myotis	<i>Myotis austroriparius</i>	SC	R	SE
Spotted Darter	<i>Etheostoma maculatum</i>	C	R	SC
Spotted Turtle	<i>Clemmys guttata</i>	N	O	SE
Star-Nosed Mole	<i>Condylura cristata</i>	NE	R	SC
Swamp Lymnaea	<i>Lymnaea stagnalis</i>	U	U	SC
Swamp Rabbit	<i>Sylvilagus aquaticus</i>	SW	R	SE
Timber Rattlesnake	<i>Crotalus horridus</i>	S	R	SE
Tippecanoe Darter	<i>Etheostoma tippecanoe</i>	C	R	SC
Trout-Perch	<i>Percopsis omiscomaycus</i>	NW, S	R	SC
Trumpeter Swan	<i>Cygnus buccinator</i>	I	R	SE
Tubercled Blossom	<i>Epioblasma torulosa torulosa</i>	U	Likely Extinct	SE, FE
Upland Sandpiper	<i>Bartramia longicauda</i>	I	R	SE
Variegated Darter	<i>Etheostoma variatum</i>	SE	R	SE
Virginia Rail	<i>Rallus limicola</i>	I	R	SE
Wavey-rayed Lampmussel	<i>Lampsilis fasciola</i>	NC, C	C	SC
Western Meadowlark	<i>Sturnella neglecta</i>	N	R	SC
Western Mud Snake	<i>Farancia abacura</i>	SW	R	SE
Western Ribbon Snake	<i>Thamnophis proximus</i>	NW, SW	O	SC
Western Sand Darter	<i>Ammocrypta clara</i>	NW, S	O	SC
Whip-Poor-Will	<i>Caprimulgus vociferus</i>	I	C	SC
White Catfish	<i>Epioblasma obliquata perobliqua</i>	NE	R	SE, FE
White Wartyback	<i>Plethobasus cicatricosus</i>	S	R	SE, FE
Whooping Crane	<i>Grus americana</i>	N	R	SE, FE
Worm-Eating Warbler	<i>Helmitheros vermivorum</i>	I	R	SC
Yellow-Crowned Night-Heron	<i>Nyctanassa violacea</i>	SW	R	SE
Yellow-Headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	W, S	R	SE
Invertebrates in Indiana not protected by IC-14-22-34				
A Caddisfly	<i>Setodes oligius</i>	U	U	SE
A Flatheaded Mayfly	<i>Raptoheptagenia cruentata</i>	U	U	SE
A Homoplectran Caddisfly	<i>Homoplectra doringa</i>	U	U	SE
A Longhorned Casemaker Caddisfly	<i>Nectopsyche pavidata</i>	U	U	SC
A Lytrosis Moth	<i>Lytrosis permagnaria</i>	U	U	SE
A Mayfly	<i>Epeorus namatus</i>	U	U	SE
A Mayfly	<i>Pseudiron centralis</i>	U	U	SE
A Mayfly	<i>Tortopus primus</i>	U	U	SE
A Millipede	<i>Conotyia bollmani</i>	U	U	SC

Common Name	Scientific name	Range	Relative Abundance	Status
A Millipede	<i>Pseudopolydesmus collinus</i>	U	U	SE
A Moth	<i>Dasychira cinnamomea</i>	U	U	SC
A Moth	<i>Lesmone detrahens</i>	U	U	SC
A Moth	<i>Leucania inermis</i>	U	U	SC
A Moth	<i>Macrochilo absorptalis</i>	U	U	SC
A Moth	<i>Pagara simplex</i>	U	U	SC
A Noctuid Moth	<i>Bellura densa</i>	U	U	SC
A Noctuid Moth	<i>Capis curvata</i>	U	U	SC
A Noctuid Moth	<i>Iodopepla u-album</i>	U	U	SC
A Noctuid Moth	<i>Macrochilo hypocriticalis</i>	U	U	SC
A Noctuid Moth	<i>Oligia bridghami</i>	U	U	SE
A Northern Casemaker Caddisfly	<i>Goera stylata</i>	U	U	SE
A Northern Casemaker Caddisfly	<i>Pycnopsyche rossi</i>	U	U	SE
A Pentagenian Burrowing Mayfly	<i>Pentagenia vittigera</i>	U	U	SE
A Pseudoscorpion	<i>Chthonius virginicus</i>	U	U	SE
A Rove Beetle	<i>Lissobiops serpentinae</i>	U	U	SE
A Sand Minnow Mayfly	<i>Siphloplecton basale</i>	U	U	SE
A Sand-filtering Mayfly	<i>Homoeoneuria ammophila</i>	U	U	SE
A Small Minnow Mayfly	<i>Paracloeodes minutus</i>	U	U	SC
A Sponge-feeding Caddisfly	<i>Ceraclea sp. 1</i>	U	U	SE
A Spongilla Fly	<i>Climacia sp. 1</i>	U	U	SE
Angular Spittlebug	<i>Lepyronia angulifera</i>	U	U	SE
Annointed Sallow Moth	<i>Pyreferra ceromatica</i>	U	U	SC
Appalachia Appalachian Eyed Brown	<i>Satyrodes appalachia</i>	U	U	SE
Appalachian Cave Spider	<i>Porhomma cavernicola</i>	U	U	SE
Argo Ephemerellid Mayfly	<i>Ephemerella argo</i>	U	U	SE
Barrens Metarranthid Moth	<i>Metarranthis apiciaria</i>	U	U	SC
Big Broad-winged Skipper Sedge	<i>Poanes viator viator</i>	U	U	SC
Bunchgrass Skipper	<i>Problema byssus</i>	U	U	SC
Catocaline Dart	<i>Cryptocala acadensis</i>	U	U	SC
Cave Beetle	<i>Batrisodes krekeri</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus barri</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus chthonius</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus emersoni</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus eremite</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus jeanneli</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus leonae</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus shilohensis</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus shilohensis boonensis</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus shilohensis mayfieldensis</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus tenuis</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus tenuis blatchleyi</i>	U	U	SE

Common Name	Scientific name	Range	Relative Abundance	Status
Cave Beetle	<i>Pseudanophthalmus tenuis morrisoni</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus youngi</i>	U	U	SE
Cave Beetle	<i>Pseudanophthalmus youngi donaldsoni</i>	U	U	SE
Cave Millipede	<i>Pseudotremia nefanda</i>	U	U	SE
Cave Pseudoscorpion	<i>Apochthonius indianensis</i>	U	U	SE
Chandler's Cave Flatworm	<i>Sphalloplana chandleri</i>	U	U	SE
Cobblestone Tiger Beetle	<i>Cicindela marginipennis</i>	U	U	SE
Cobweb Skipper	<i>Hesperia metea</i>	U	U	SE
Columbine Borer	<i>Papaipema leucostigma</i>	U	U	SC
Common Roadside-skipper	<i>Amblyscirtes vialis</i>	U	U	SC
Donaldsons Cave Copepod	<i>Megacyclops donaldsoni</i>	U	U	SE
Douglas Stenelmis Riffle Beetle	<i>Stenelmis douglasensis</i>	U	U	SC
Dusted Skipper	<i>Atrytonopsis hianna</i>	U	U	SE
Earwig Scorpionfly	<i>Merope tuber</i>	U	U	SE
Eastern Veined White	<i>Pieris oleracea</i>	U	U	SE
Frosted Elfin	<i>Callophrys irus</i>	U	U	SC
Gemmed Satyr	<i>Cyllopsis gemma</i>	U	U	SC
Gold-banded Skipper	<i>Autochton cellus</i>	U	U	SC
Great Copper	<i>Lycaena xanthoides</i>	U	U	SC
Great Spreadwing	<i>Archilestes grandis</i>	U	U	SC
Groundwater Isopod	<i>Caecidotea teresae</i>	U	U	SE
Harris's Checkerspot	<i>Chlosyne harrisii</i>	U	U	SC
Helianthus Leafhopper	<i>Mesamia stramineus</i>	U	U	SC
Hidden Springs Snail	<i>Fontigens cryptica</i>	U	U	SE
Hine's Emerald (Ohio Emerald?)	<i>Somatochlora hineana</i>	U	U	SE, FE
Ice Thorn	<i>Carychium exile</i>	U	U	SE
Indiana Crayfish	<i>Orconectes indianensis</i>	U	U	SC
Indiana Ochthebius Minute Moss Bee	<i>Ochthebius putnamensis</i>	U	U	SC
Indiana Spongilla Fly	<i>Sisyra sp. 1</i>	U	U	SE
Jeannel's Cave Copepod	<i>Diacyclops jeanneli</i>	U	U	SE
Jeannel's Cave Ostracod	<i>Pseudocandona jeanneli</i>	U	U	SE
Jordan Cave Isopod	<i>Caecidotea jordani</i>	U	U	SE
Karner Blue	<i>Lycaeides melissa samuelis</i>	U	U	SE, FE
Leadplant Flower Moth	<i>Schinia lucens</i>	U	U	SE
Leonard's Skipper	<i>Hesperia leonardus</i>	U	U	SC
Marengo Cave Ostracod	<i>Pseudocandona Marengoensis</i>	U	U	SE
Mitchell's Satyr	<i>Neonympha mitchellii mitchellii</i>	U	U	SE, FE
Morrison's Cave Copepod	<i>Bryocamptus morrisoni morrisoni</i>	U	U	SE
Mottled Duskywing	<i>Erynnis martialis</i>	U	U	SE
Nevada Buck Moth	<i>Hemileuca nevadensis</i>	U	U	SC
Northeastern Cave Isopod	<i>Caecidotea rotunda</i>	U	U	SE
Northern Cloudywing	<i>Thorybes pylades</i>	U	U	SC
Northern Hairstreak	<i>Fixsenia favonius</i>	U	U	SC
Northern Metalmark	<i>Calephelis borealis</i>	U	U	SC
Olympia Marble	<i>Euchloe olympia</i>	U	U	SE
Packard's Cave Amphipod	<i>Crangonyx packardi</i>	U	U	SC

Common Name	Scientific name	Range	Relative Abundance	Status
Persius Duskywing	<i>Erynnis persius persius</i>	U	U	SE
Phlox Moth	<i>Schinia indiana</i>	U	U	SE
Pinkpatched Looper Moth	<i>Eosphoropteryx thyatyroides</i>	U	U	SE
Pointed Campeloma	<i>Campeloma decisum</i>	U	U	SC
Salt-and-pepper Skipper	<i>Amblyscirtes hegon</i>	U	U	SC
Scarce Swamp Skipper	<i>Euphyes dukesi</i>	U	U	SC
Sedge Skipper	<i>Euphyes dion</i>	U	U	SC
Shaggy Cave Snail	<i>Antroselatus spiralis</i>	U	U	SE
Sharp Wedge	<i>Xolotrema obstrictum</i>	U	U	SE
Six-banded Longhorn Beetle	<i>Dryobius sexnotatus</i>	U	U	SE
Sooty Azure	<i>Celastrina nigra</i>	U	U	SC
Southwestern Virginia Cave Amphipod	<i>Stygobromus mackini</i>	U	U	SE
Spring Amphipod	<i>Gammarus bousfieldi</i>	U	U	SE
Springtail	<i>Arrhopalites bimus</i>	U	U	SE
Springtail	<i>Sinella alata</i>	U	U	SE
Swamp Lymnaea	<i>Lymnaea stagnalis</i>	U	U	SC
Swamp Metalmark	<i>Calephelis muticum</i>	U	U	SC
The Glorious Blazing Star Flower Moth	<i>Schinia gloriosa</i>	U	U	SC
The Hoary Edge Skipper	<i>Achalarus lyciades</i>	U	U	SC
The Included Cordgrass Borer	<i>Spartiniphaga includens</i>	U	U	SE
The Kansas Prairie Leafhopper	<i>Prairiana kansana</i>	U	U	SE
The Leadplant Underwing Moth	<i>Catocala amestris</i>	U	U	SE
The Pitcher Plant Borer Moth	<i>Papaipema appassionate</i>	U	U	SE
The Royal Fern Borer Moth	<i>Papaipema speciosissima</i>	U	U	SE
The Shadowy Arches	<i>Melanchra assimilis</i>	U	U	SE
The Southern Purple Mint Moth	<i>Pyrausta laticlavata</i>	U	U	SC
Troglobitic Crayfish	<i>Orconectes inermis testii</i>	U	U	SE
Two-spotted Skipper	<i>Euphyes bimacula</i>	U	U	SC
Undescribed Amphipod	<i>Stygobromus sp. 2</i>	U	U	SE
Undescribed Cave Amphipod	<i>Crangonyx sp. 1</i>	U	U	SC
Unicorn Beetle	<i>Dynastes tityus</i>	U	U	SC
Wallace's Deepwater Mayfly	<i>Spinadis wallacei</i>	U	U	SE
Weingartner's Cave Flatworm	<i>Sphalloplana weingartneri</i>	U	U	SE
West Virginia White	<i>Artogeia virginensis</i>	U	U	SC
	<i>Herpetogramma thestealis</i>	U	U	SC
	<i>Panthea furcilla</i>	U	U	SC

VIII. Key Habitats and Communities for Species of Greatest Conservation Need (2nd Element)

Element 2 of the Congressional guidelines requires that the CWS describe locations and relative condition of key habitats and community types essential to conservation of SGCN. Recognizing that states varied in the amount of information they had about direct management of SGCN, the FWS reviewers provided states with an option to focus their efforts primarily on the species themselves or to address those species through conservation of their habitats.

The Indiana CWS is a habitat-based model. The intent of the model is to maximize limited knowledge about wildlife species by focusing on available research, enhanced by extrapolation from species that are better known, and all informed by best professional judgment. The model was developed to link species of greatest conservation need (SGCN) to all wildlife species and to the habitats on which they depend by using representative species as mental surrogates for the guilds and habitat needs (see Section V above for a description of model development).

Habitat can be classified in many ways and the classification scheme chosen often depends upon the intended purpose of the classification and the resources available for classification. Conservation organizations and conservation initiatives often result in habitat classifications relative to a particular species of interest for example bird habitat is often classified by flyways, Bird Conservation Regions, and Important Bird Areas. Other conservation organizations such as The Nature Conservancy take an ecoregion approach and identify natural community types representative of the ecoregion. Still other organizations classify lands based on land-use such as the USDA Forest Service Forest Inventory and Analysis (FIA). None of these classification schemes is holistic, measuring both traditional habitat types and human-impacted lands such as developed lands. In order to track habitat changers, that is conversion from one habitat type to another, and the degree of habitat fragmentation a baseline measure of all habitat types is needed. Current technology makes this type of habitat analysis possible and repeatable for future comparisons.

Statewide habitat assessments based on spectral analysis of space-borne thematic or reflection radiometer photographs is now available. Land-use/Land-cover can be tracked by replication of the spectral analysis at reasonable time intervals. However, habitat measures derived from different methodologies may not be directly comparable. Forest cover from spectral analysis is greater than forest cover as measured by the FIA. Unlike the spectral analysis, the FIA does not include forest cover as part of developed lands (i.e. parks and stream corridors through cities, etc.). However, the database resulting from spectral analysis allows multiple parameters to be considered. Additional investigation can further refine habitat identification based on habitat associations. For example, the value of urban forest for wildlife species A may be a function of forest block size and connecting forest cover. Based on species A's refined habitat requirements the urban forest in every city can be analyzed for its value to that species. For the purposes of the Indiana CWS, the additional analysis possible with a comprehensive spectrally derived habitat database is desirable.

More than 60 specific habitat types were identified in Indiana, and Indiana State University (ISU) was contracted to research and compile data on these habitats using GIS databases. Specifically, by June 2006 ISU will have compiled quantitative or index information on the total acreage,

geographic distribution, patch size, native vs. non-native, vegetation diversity and relative abundance, ownership, and relative condition of the habitats (Table 2). Additionally, ISU will also compile historical trends in wildlife species occurrences for each of the habitat types in 1800, 1900 and 2000.

This CWS effort is the first comprehensive effort by the state to acquire statewide habitat data. A team of specialists, led by four scientists at Indiana State University, is to provide either a quantitative measure or an index of over 80 habitat features. Measures for major habitat features will be based on analysis of Landsat 7 Enhanced Thermal Mapper plus (ETM+) or Terra's Advanced Space-borne Thermal Emissions Reflection Radiometer (ASTER) digital data projects for Indiana. Additionally, ISU is to provide a historic overview of the changes in the eight major habitat categories in Indiana from pre-European settlement to present, in hundred-year intervals, with associated changes in fauna. The current habitat analysis and the historic overview are to be presented in a format suitable for publication as a reference book. This effort will be completed in the spring of 2006. The habitat analysis effort will be adequately documented so that the process maybe replicated in the future to allow for fully comparable sequential analyses. Thus, a habitat baseline will be established for Indiana at the beginning of this century against which changes may be documented.

Subterranean habitats cannot be measured by these methods but are vitally important for supporting rare and unique Indiana wildlife associated with caves and underground waters. To give a sense for the location of these habitats, a map of the karst regions of Indiana from the state GIS Atlas is provided in Figure 8, including layers for karst springs, density of cave entrances, karst area dye points, karst area dye lines, and sinkhole area or sinking-streams.

Table 2: Habitat parameters from Indiana State University.

Habitat Features								
Q=Quantitative								
I=Indices								
Habitat Type	Total Acres	Geographic Distribution	Patch Size	Native vs. Non-Native	Vegetation		Ownership Public/Private	Relative Condition
					Diversity	Relative Abundance		
AGRICULTURE	Q	Q	Q					I
Row crop by type	I	Q	I					
Cereal grains	I							
Vineyards	I							
Feedlots	I							
Residue management	I							
Confined operations	I							
Orchards	I							
AQUATIC SYSTEMS	Q	Q	Q	I				I
Lake Michigan	Q	Q	Q				I	
Rivers and streames by order and	Q/I	Q	Q				I	

Habitat Features Q=Quantitative I=Indices								
Habitat Type	Total Acres	Geographic Distribution	Patch Size	Native vs. Non-Native	Vegetation		Ownership Public/Private	Relative Condition
					Diversity	Relative Abundance		
Herbaceous/Marsh	Q	Q	Q	I	I	Q	I	
Native								
Restored								
Created								
Historic wetlands types and distribution	I	I	I	I	I	I	I	
Potholes								
Farmed	I	I	I	I	I	I	I	
Drained	Q	Q	Q		Q	Q	Q	
Ditched								
Mudflats	Q	Q	Q		Q	Q		
Wetlands created or restored for mitigation	Q	Q	Q		Q	Q	Q	

For the CWS, the following major habitats and sub-habitats were used. The major habitat based discussions in this manuscript are based on the aggregated data from all sub-habitats. The results of specific sub-habitats are available in Appendix E and F. For a complete list of sub-habitats and definitions see Appendix A.

Agriculture: Lands devoted to commodity production, including intensively managed row crops (Figure 2).

Aquatic Systems include the following sub-habitats: Dunes and Shorelines, Impoundments, Kettle Lakes, Lake Michigan, Natural Lakes, Oxbows/Backwaters/Sloughs/Embayments, Rivers and Streams, Great Lakes Drainage Great River, Great Lakes Drainage Headwater, Great Lakes Drainage Wadeable/ Large River, Rivers and Streams Kankakee River (Illinois River) Drainage Headwater, Kankakee River (Illinois River) Drainage Wadeable/ Large River, Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater, Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Wadeable/Large River, Rivers and Streams Ohio River Drainage Great River, Ohio River Drainage Interior River Lowland Headwater, Ohio River Drainage Interior River Lowland Wadeable/Large River (Figure 3).

Barren Lands include the following sub-habitats: Active Quarries, Bare Dunes, Cliffs, and Rock Outcrops (Figure 4).

Developed Lands includes the following sub-habitats: Golf Courses, Industrial Lands, and Roads/Rails/Bridges (Figure 5).

Forests include the following sub-habitats: Deciduous, Early Forest Stage, Evergreen, Floodplain Forests, Forested Wetlands, Mature or High Canopy Stage, Old Forest Stage, Pole Stage, Pre-Forest Stage, Riparian Wooded Corridors/Streams, Shrub/Scrub, Suburban, Upland, and Urban (Figure 6).

Grasslands include the following sub-habitats: Early Successional Areas, Farm Bill Programs, Fescue, Haylands, Pasture, Prairies, Reclaimed Minelands, Savannah, and Vegetated Dunes and Swales (Figure 7).

Subterranean Systems include both Caves and Cave Entrances. (Figure 8).

Wetlands include the following sub-habitats: Emergent, Ephemeral, Forested Wetlands, Herbaceous Marsh, Mudflats, Permanent Wetlands and Shrub/ Scrub Wetlands (Figure 9).

A. Location within the State

Scientists at ISU will calculate statewide areal coverage of each land use or vegetation type (Table 2). These results are very specific to the classification scheme used by ISU in spectral identification and mapping of the cover types. Therefore, results of this analysis may vary somewhat from other land cover calculations. For example, some old fields may be classified as either grasslands or young forest, depending on the appearance of vegetation, rather than being classified as agriculture. Some species of wildlife may be able to respond favorably to pasture lands that in other classification schemes would have been described as agricultural land use but were herein described as grasslands. In addition to reflecting the potential for use by wildlife, the methodology employed by ISU was selected so that it could be repeated using existing technology, resulting in a long-term trend analysis.

Less than 6 percent of Indiana is in public ownership. Additionally, a review of Table 3 and Figures 2-9 demonstrate that Indiana's habitat is fragmented and dominated by two land uses, Agriculture and Forest. Indiana's land ownership/use pattern determines the viability of potential conservation measures. Technical and financial assistance programs for private landowners are important conservation tools in Indiana. The distribution and size of Indiana's habitat fragments require efforts to retain, restore, and connect native wetlands, grasslands, aquatic-systems, barren lands and forests wherever land owners are willing to participate.

Five of the state's 92 counties have more than 90 percent of their land area in farm uses (Adams, Benton, Carroll, Clinton and Tipton counties in Northern Indiana).

Only six counties have less than one-third of their areas in farms. The presence of public parks and forest lands puts Brown, Monroe, Floyd and Crawford counties among those with the lowest percentage of land in farms. Marion County (Indianapolis) has just 11.4 percent of its land in farms, but most other urban counties still have extensive farm usage. Martin County (with the NSWC-Crane military facility) has less than one-third of its land in farms.

Figure 2: Agriculture Lands - Over half of Indiana's land area is classified as agriculture. Agriculture is dotted throughout the state.

Indiana State Agriculture Mapping

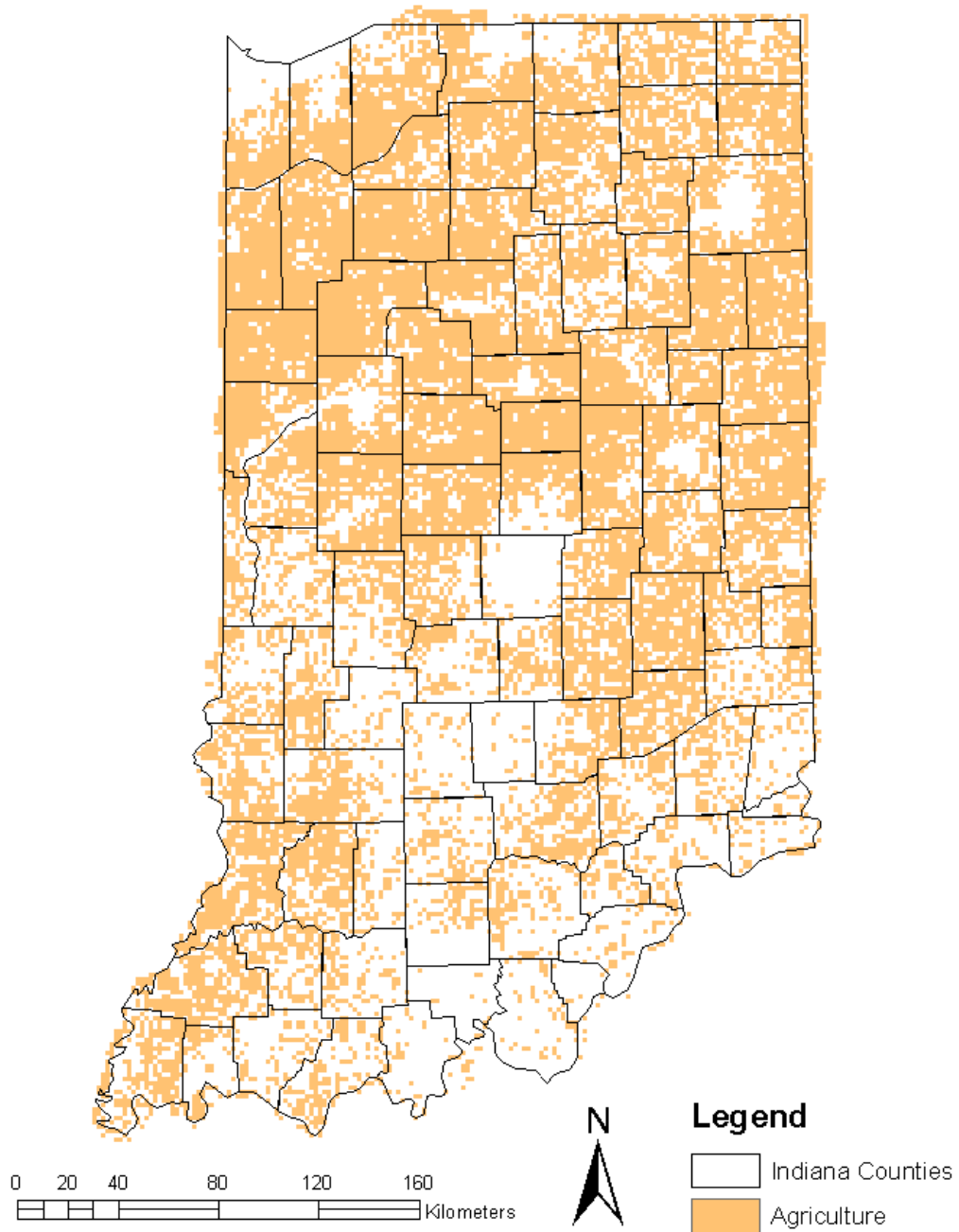


Figure 3: Aquatic Systems - Indiana's stationary and free flowing aquatics habitats are spread throughout the state, covering 2.36 percent of Indiana or 898.67 square miles (575,150.87 acres). Aquatic systems include lakes and reservoirs, streams and rivers, and parts of Lake Michigan.

Indiana State Aquatic System Mapping

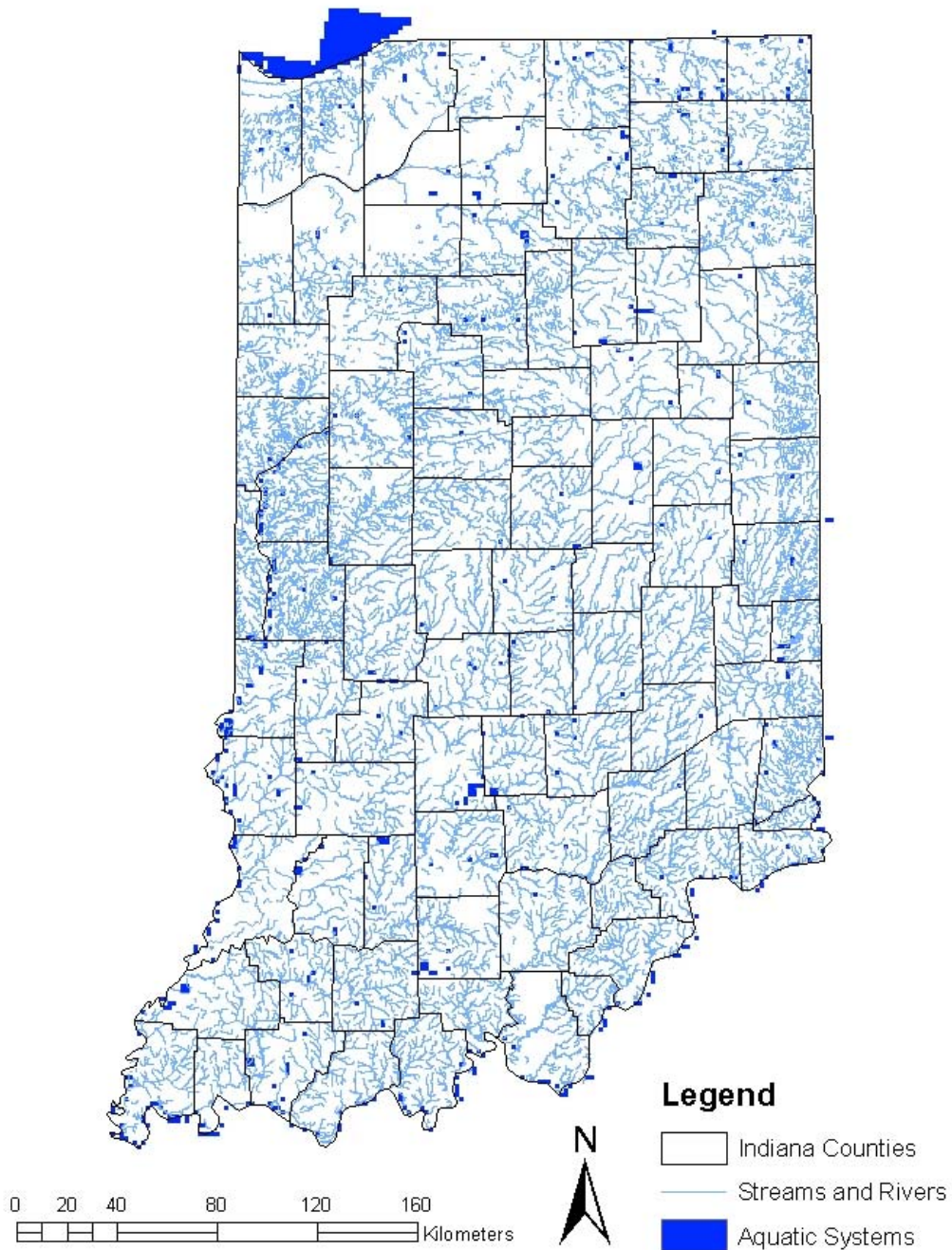


Figure 4: Barren Lands - Indiana's barren lands comprise 0.19 percent of Indiana. These lands dominated by exposed rock or minerals with sparse vegetation cover 72 square miles or 46,191 acres.

Indiana State Barren Lands Mapping

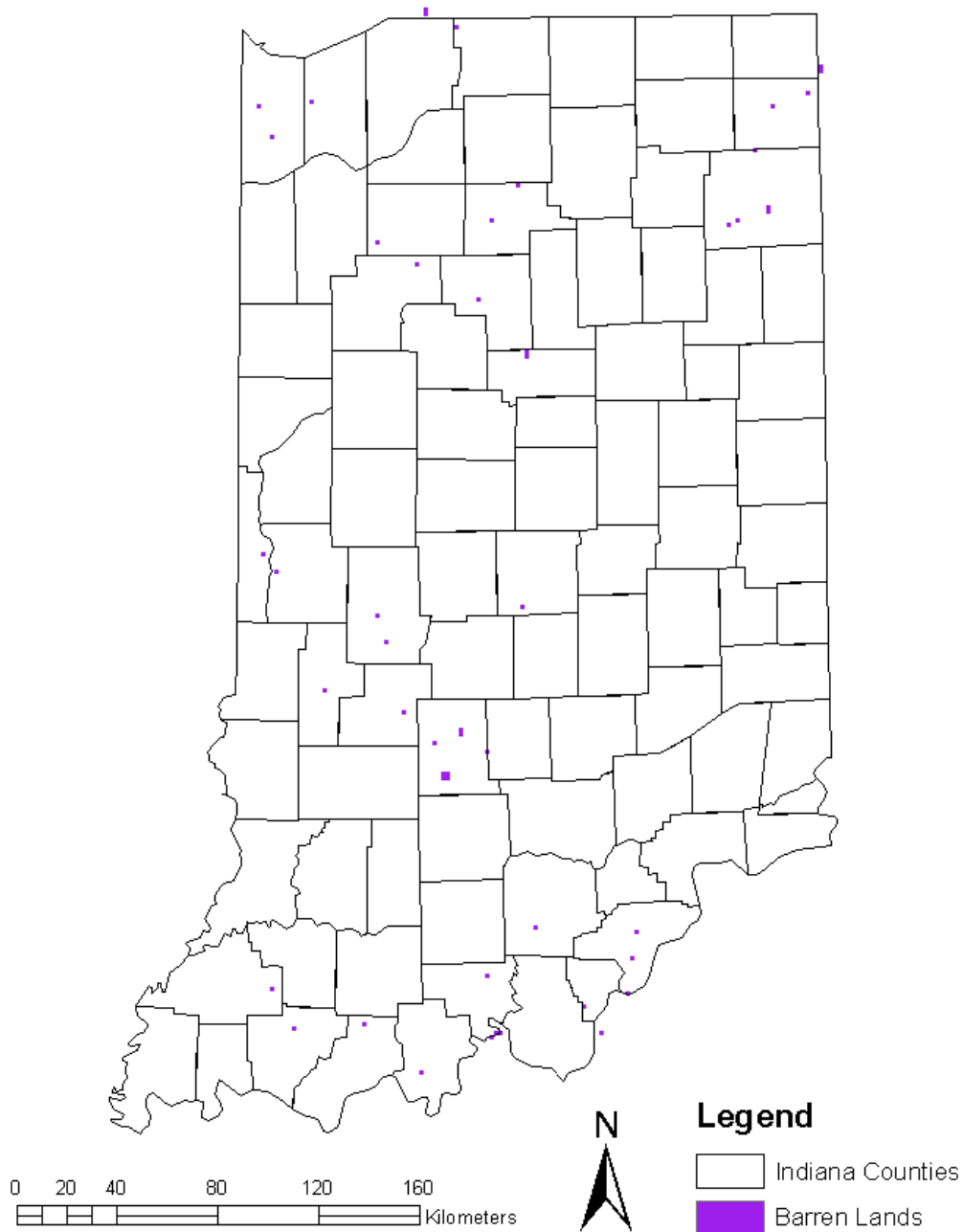


Figure 5: Developed Lands - Indiana’s developed lands constitute 3.69 percent of Indiana, or 1,404.18 square miles (898,673.81 acres). While developed lands are sprinkled liberally throughout the state, particularly above I-70, they are concentrated in areas that include Gary, South Bend, Fort Wayne, Indianapolis, Evansville, and Louisville, Kentucky. There are fewer developed lands in South Central Indiana.

Indiana State Developed Lands Mapping

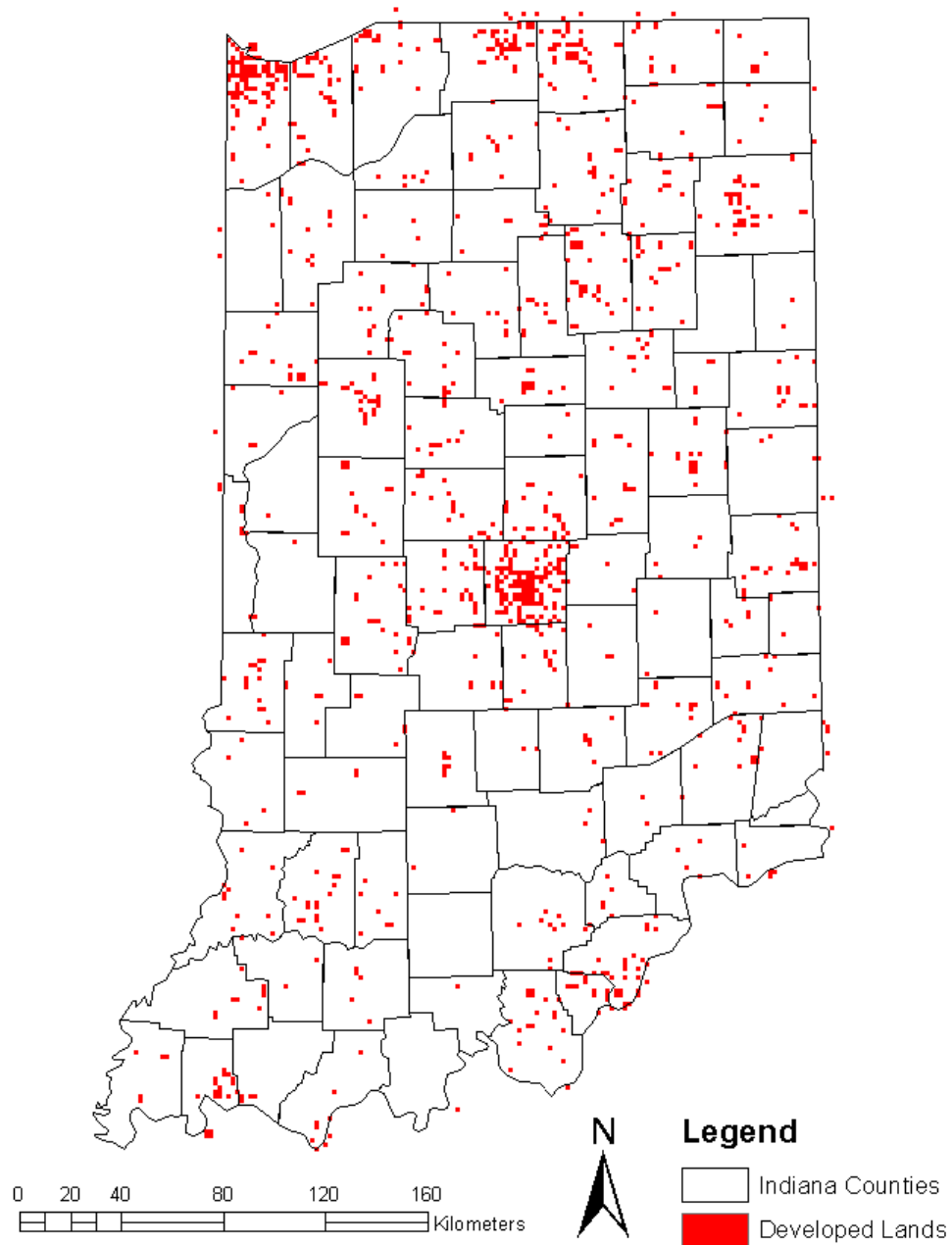


Figure 6: Forest Lands - Almost 23 percent of Indiana is forested, comprising 8,686.32 square miles (more than 5.5 million acres). While forest lands dot the landscape in Northern Indiana (24 percent), heavier concentrations of woodlands follow the hillier geography of West Central (21 percent woodlands), South Central (46 percent woodlands) and Southeastern Indiana (9 percent woodlands).

Indiana State Forest Lands Mapping

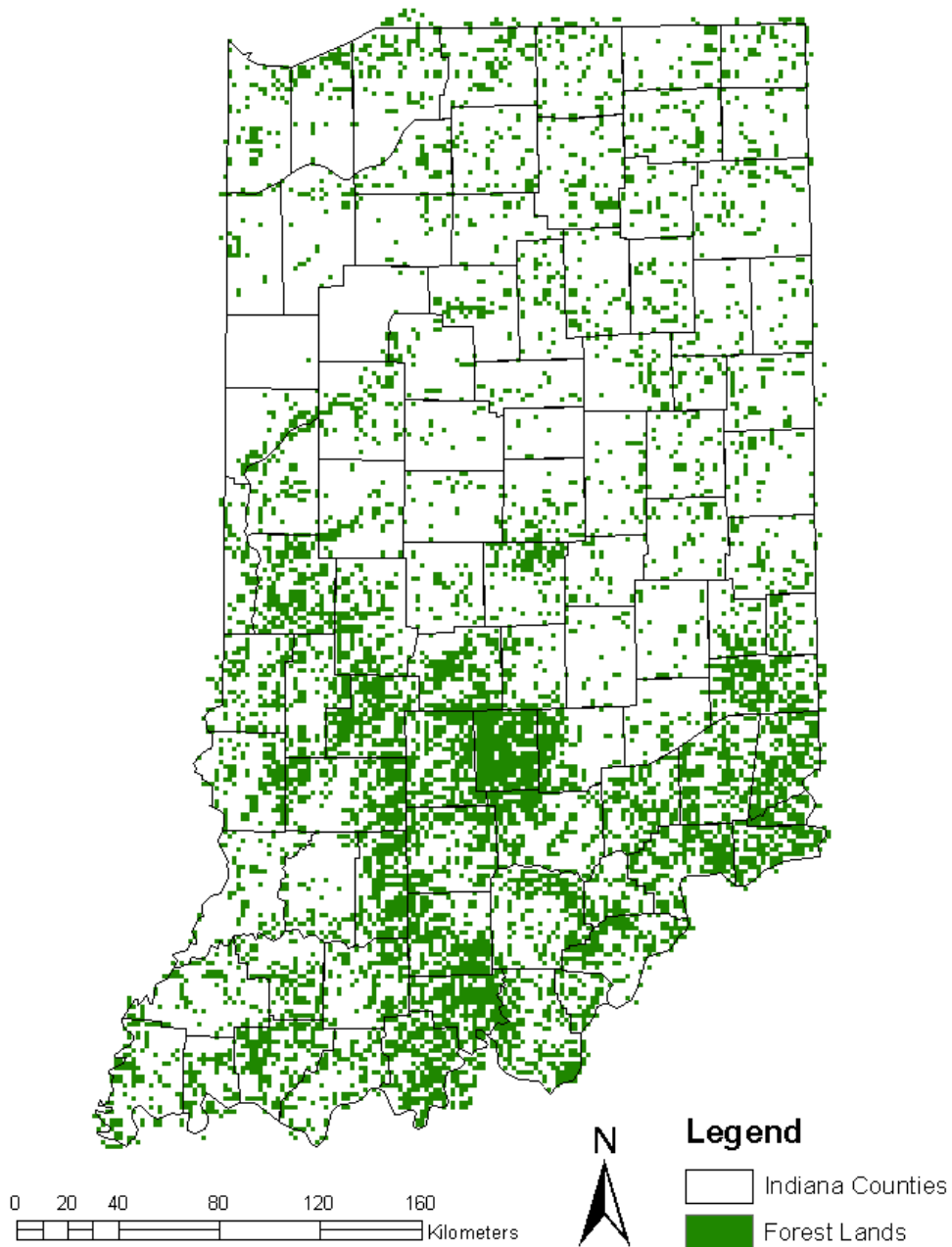


Figure 7: Grasslands - Over 15 percent of Indiana is in grasslands, constituting prairies and reclaimed mine lands. Those areas are primarily in southern, central and extreme northern parts of the state. Grasslands comprise more than 5,800 square miles or 3.7 million acres.

Indiana State Grasslands Mapping

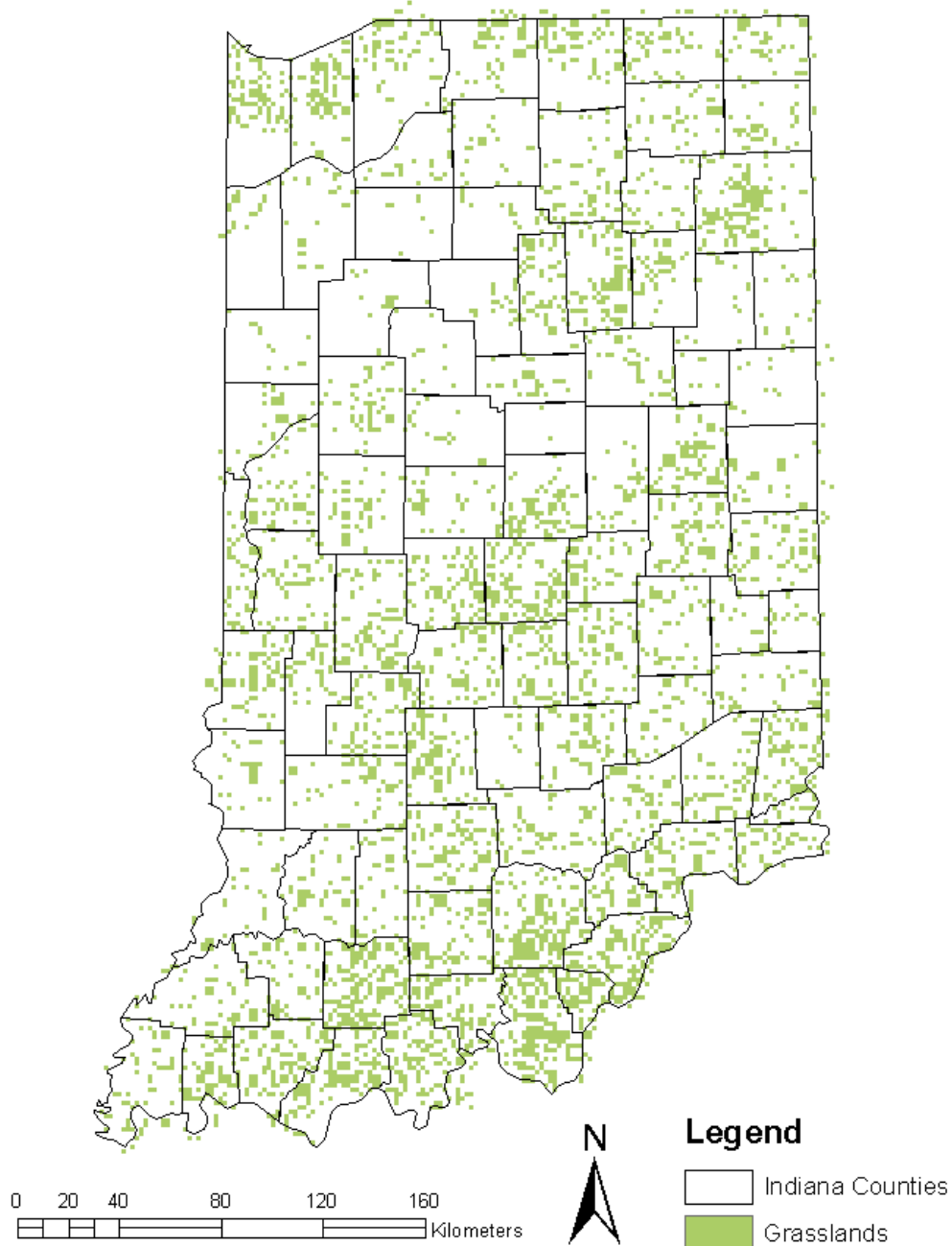


Figure 8: Subterranean Systems - the karst region of Indiana is predominantly located in the south central part of the state.

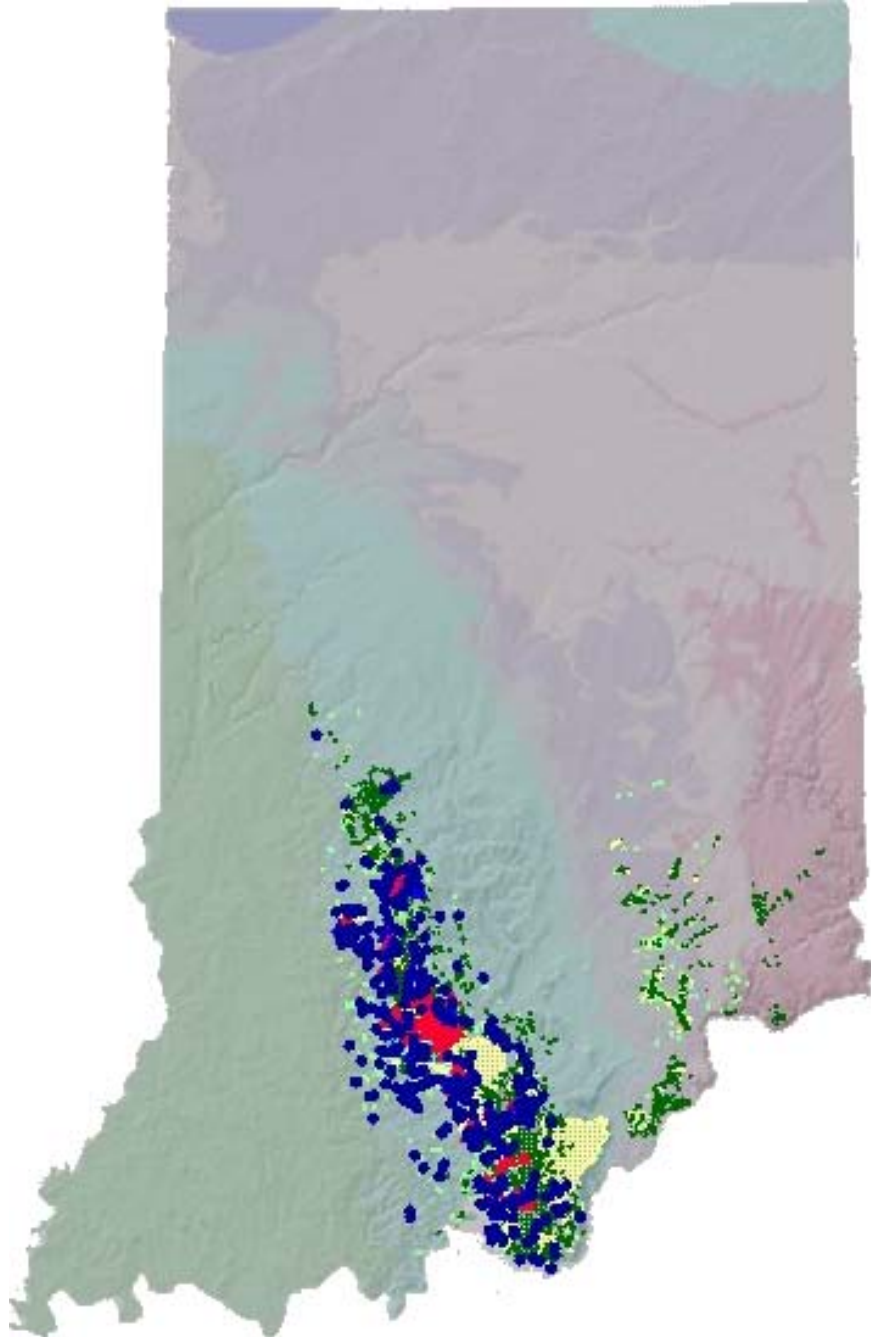


Figure 9: Wetlands - Less than 1 percent of Indiana remains in wetlands. Indiana’s wetlands comprise 222,549.98 or 347.74 square miles. Today, wetlands are dotted throughout South Central, West Central, and Northeastern Indiana.

Indiana State Wetlands Mapping

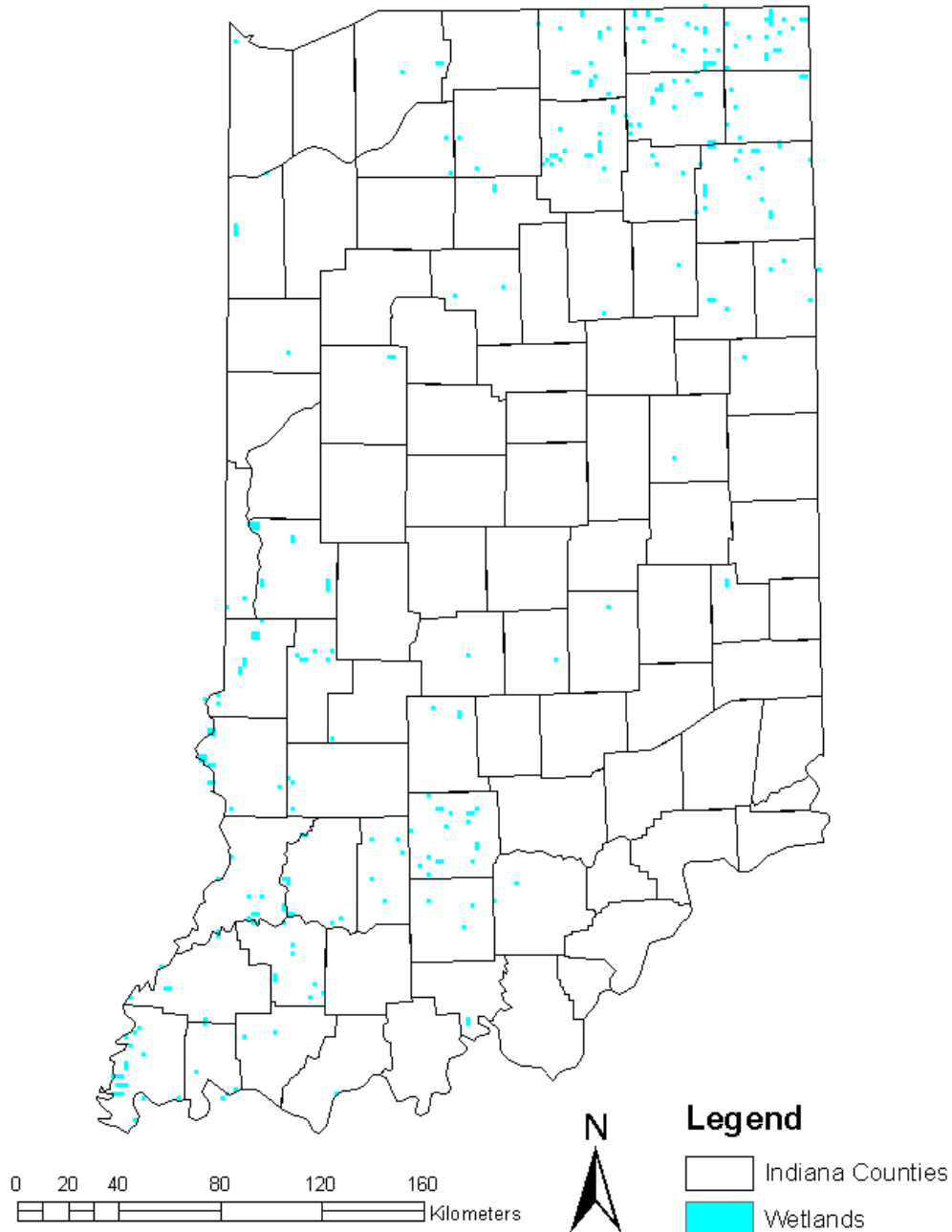


Table 3. Area and its percentage of each habitat type for Indiana in Year 2000

Habitat type	Area		Area percentage in 2000	Area of High Quality* habitat	Percent of High Quality* Habitat
	(Acres)	(Square miles)	(%)	(Acres)	(%)
Agriculture	13,296,995.43	20,776.56	54.58	NA	NA
Aquatic System	575,150.87	898.67	2.36	708	0.12
Barren Lands	46,191.57	72.17	0.19	988	2.1
Developed Lands	898,673.81	1,404.18	3.69	NA	NA
Forest Lands	5,559,244.40	8,686.32	22.82	33409	0.60
Grasslands	3,762,818.27	5,879.41	15.45	5256	0.14
Wetlands	222,549.98	347.74	0.91	10551	4.74

* Derived from the Indiana Heritage Database and represents the highest quality remaining examples of Indiana's natural communities (a minority of these communities may be degraded, but no higher quality examples remain).

B. Relative Condition

This effort is the first attempt to describe the affects of habitat distribution and abundance on wildlife diversity at a statewide scale. Information provided above provides a reasonable baseline for location and distribution of habitat types across Indiana. Scientific information on habitat *condition* is even scarcer.

There are several specialized protocols used to measure relative habitat condition for particular conservation purposes. The Heritage Database, The Nature Conservancy, and other land trusts have developed systems for identifying the location of high quality habitats in order to consider them for acquisition and protection. The Indiana Natural Heritage Data Center, set up in 1978, represents a comprehensive attempt to determine the state's most significant natural areas through an intensive statewide inventory. The Indiana Natural Heritage Data Center is part of the Natural Heritage Network, a worldwide system of Heritage Programs. This program is designed to provide information about Indiana's diversity of natural ecosystems, species, landscape features, and outdoor amenities, and to assure adequate methods for evaluating this information and setting sound land protection priorities. The inventory is a continuous process, becoming an increasingly valuable tool for decision makers and scientists as it progresses. The Indiana Biodiversity Initiative designed a computerized system to map areas within Indiana's natural regions that may be valuable for biodiversity conservation.

Other systems have been explored to measure the quality of a limited number of particular habitat types—mostly aquatic systems. Since the mid-1990s, various scientists have been working together to establish standardized methods for measuring the function and quality of wetlands. These systems are based on classification of wetland plants according to their sensitivity to habitat degradation. Due to the complexity of these systems, no commonly accepted method is currently available, although research continues to that end. The Qualitative Habitat Evaluation Index (QHEI) is a standardized system designed by the Ohio EPA and modified for Indiana to evaluate the physical and chemical characteristics of river and stream habitats. Various programs within the

Indiana Department of Environmental Management (IDEM) and DNR use this protocol to evaluate the effects of habitat quality on stream fish and invertebrate communities. The U.S. Environmental Protection Agency (EPA) has developed a similar system for natural lakes, which is being tested in Indiana.

Section 303(d) of the Clean Water Act requires states to identify waters that do not or are not expected to meet applicable water quality standards with federal technology based standards alone. States are also required to develop a priority ranking for these waters taking into account the severity of the pollution and the designated uses of the waters.

A comprehensive assessment of 99.3 percent of Indiana stream miles was completed by the IDEM and included in USEPA's Total Waters File for support of aquatic life use (USEPA 1993; IDEM 2002). Sampling has been conducted on a five-year rotating basin cycle since 1998. Therefore, the first complete report was available in 2002. Supporting data for the 2004 update and information on all Indiana streams and lakes that have been assessed and reported since 1998 is available from IDEM and ISDH.

Based on the first complete statewide assessment cycle, a statewide picture indicates that around half of all water bodies are unsatisfactory for aquatic life and full body contact uses. Nearly 42 percent of the lake and reservoir surface acreage supports aquatic life uses. Approximately 64.5 percent of the stream miles fully support aquatic life use. Of the stream miles assessed, 58.6 percent support full body contact recreational use. Indiana's Lake Michigan shoreline outside the Indiana Harbor supports aquatic life use, but does not fully support full body contact recreational use. Causes of stream pollution affecting over 2,000 miles of stream each are: pathogens for recreational use, mercury and polychlorinated biphenyl for fish consumption. Over 2,000 stream miles also have biological communities with measurable adverse response to pollutants.

Fish tissue and surficial sediment were monitored for the presence of toxic pollutants. The Indiana Fish Consumption Advisory identifies fish species that contain toxicants at levels of concern for human consumption. The Great Lakes sport fish risk based approach was used to evaluate PCB contamination (Anderson 1993). As fish tissue and sediments from additional watersheds are analyzed for contaminants, it is expected that the miles of impaired streams and acres of impaired lakes and reservoirs due to fish consumption advisories will increase for the near term. Based on this information, the Indiana State Department of Health annually issues fish consumption advisories for many Indiana streams, the Indiana portion of Lake Michigan, and some inland lakes. A general carp fish consumption advisory has also been issued for all Indiana rivers and streams only (ISDH 2001).

Other habitat types have received no attention regarding development of similar methods to measure condition at a large scale. Therefore, data is not currently available at a scale that could inform the development of this iteration of the CWS.

What is known is that habitat types that once covered extensive areas of the state are now found as fragments scattered across the landscape. Lindsey and others presented a map in 1965 that showed the soil relations and distribution of the vegetation in presettlement Indiana (Figure 10), which later became a foundation for the seminal publication *Natural Areas in Indiana and their Preservation* (Lindsey, et al., 1970). Whereas most of the state was covered in forest and wetlands over 150 years ago, the state is now predominantly used to grow agricultural crops, as

well as for mining, urban development, and other industries. As opposed to the dirt paths that once existed, roads and highways are now major barriers to plant and animal dispersal throughout the state. Conversely, highways and associated ditches may also facilitate dispersal of exotic and invasive plant species, such as purple loosestrife and common reed (*Phragmites*). Some sources state that 87 percent of Indiana was once forested. In addition, the state has lost more than 85 percent of its original wetlands. While 150 years seems like a long time, it represents the passing of less than five human generations.

In contrast, some types of habitat, such as barren lands and grasslands, were never very abundant. However, these areas may now be adjacent to or surrounded by land uses that are not amenable to thriving populations of SGCN. Quality of the plant community in these areas may also be affected by factors such as a lack of seed sources or air, water and land-based pollution.

Habitat types such as wetlands, forests and grasslands benefit from specific incentive programs that encourage public and private acquisition and restoration. While the science of restoring these habitats has progressed extensively over the past few decades, it is still difficult or impossible to completely recreate the successional stages and composition of plants that would mimic natural development of the systems. Site conditions are critically important to the adequate restoration of these systems. For example, soil types and topography are crucial for the development of plants and water regime necessary to support stable, functioning wetlands. In any case, these restoration projects are taking place in a very different landscape than that in which the original systems evolved. Never-the-less, in light of the considerable challenges in protecting the remaining fragments of high quality natural areas in Indiana, habitat restoration remains a major tool in the conservation of species most in need of conservation.

Some habitat types simply can't be recreated. Lakes formed by glaciers, erosion of rock outcroppings and dunes, and karst regions slowly dissolving over geologic timescales cannot be destroyed and reconstructed in another location. Forces that drive evolution, such as fire, wind storms, flooding, earthquakes, glaciers, and climate change cannot be engineered. At the same time, some of these factors, such as fire, are being artificially controlled or suppressed. As a result, protection of these habitats may be the only way to effectively save the species and communities that depend on them.

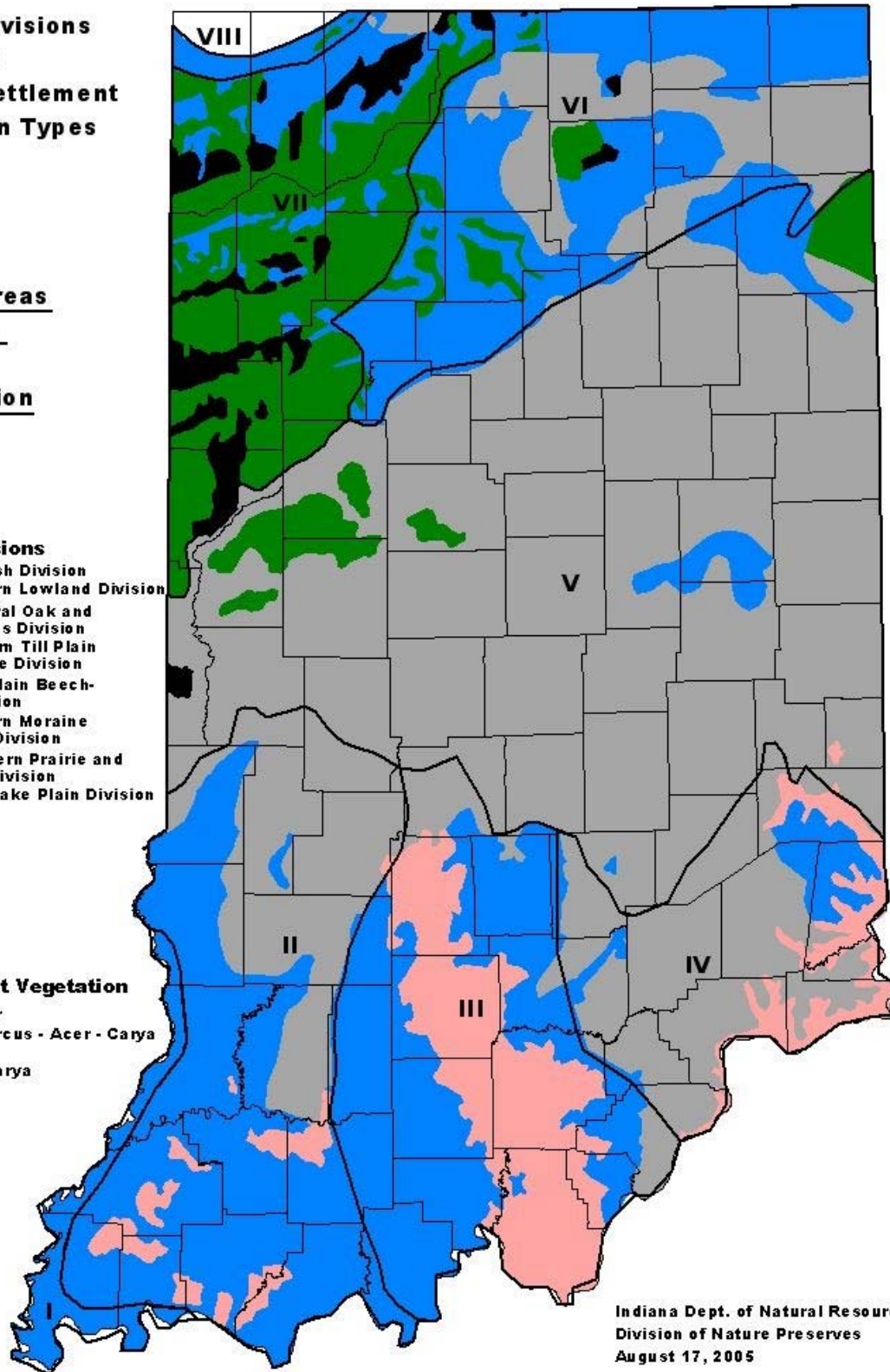
Figure 10: Presettlement vegetative condition in Indiana (Source: Lindsey et al 1965)

Natural Divisions of Indiana with Presettlement Vegetation Types

from **Lindsey, Natural Areas in Indiana and Their Preservation**

- Natural Divisions**
 I. Lower Wabash Division
 II. Southwestern Lowland Division
 III. South-central Oak and Mixed Woods Division
 IV. Southeastern Till Plain Beech-Maple Division
 V. Tipton Till Plain Beech-Maple Division
 VI. Northeastern Moraine and Kettle Division
 VII. Northwestern Prairie and Wetlands Division
 VIII. Calumet Lake Plain Division

- Presettlement Vegetation**
 ■ Fagus - Acer
 ■ Fagus - Quercus - Acer - Carya
 ■ Prairie
 ■ Quercus - Carya
 ■ Wetlands



Indiana Dept. of Natural Resources
 Division of Nature Preserves
 August 17, 2005

IX. Problems Affecting the Species and Habitats Identified (3rd Element-partial)

In part, Element 3 of the Congressional guidelines requires that the CWS describe problems that may adversely affect species identified as SGCN or their habitats. To fulfill this information need, technical experts identified threats to wildlife species within habitats, and then threats to the habitats as a whole through an online survey. Respondents ranked the top threats in Indiana, as well as providing further detail on specific threats to either the species or the habitat. The results of sub-habitat data were aggregated by major habitat type and are presented below. Technical experts and conservation organizations reviewed the compiled results and were asked if these were a reasonable representation of the threats to wildlife and these habitats.

The survey provided an extensive list of potential threats to habitats. Individual results were compiled and mathematically ranked for responses to this prepared list. See Appendix E 1-78 for all sub-habitat expert questionnaire results. As a summary of these data, average rankings only are presented within the text below. Additional comments from the surveys are provided to illustrate specific concerns. All comments were captured and are presented in Appendix F 1-78.

A. Threats to Species

Each wildlife species has specific habitat requirements for providing appropriate food, water, shelter and other resources to meet survival and reproduction needs. Therefore, conservation of wildlife must necessarily start with a focus on habitat. Even in pre-European settlement Indiana, the amount and distribution of habitat in each of our eight habitat classifications was not evenly distributed. Currently, the amount, distribution and patch size of certain habitats is changing at an unprecedented rate.

Despite the different characteristics of these habitats, their varying histories, and susceptibility to change, wildlife in all of these habitat types face similar problems. Technical experts identified loss of habitat as the main problem facing wildlife in all habitats, with loss of breeding habitat considered to be slightly more of a problem than loss of feeding and foraging habitat (Table 4). The third-ranked problem facing wildlife in all habitats was degradation of movement/migration routes. This reflects the increased fragmentation of habitats in Indiana. Indeed, fragmentation that impedes movement was identified as the number one problem facing species inhabiting developed lands, and these species tend to be generalists and tolerant of disturbance (Table 4).

For specific habitats, habitat loss ranked high as a problem for wildlife in most habitats, but barren lands and developed lands deviated from this pattern. This likely reflects the distinctly different evolutionary pressures shaping the species that occur in these habitats. Experts identified the greatest threats to wildlife in barren lands to be variable population size and disease. Small, isolated populations are more vulnerable to negative stochastic events than more robust populations in contiguous or connected habitat patches. Wildlife dependent upon small, widely dispersed habitats would be more threatened by variable population size and disease than wildlife species in more common contiguous habitats. Wildlife species that continue to survive in developed lands tend to be more tolerant of disturbance and sufficiently capable of movement to locate their requirements. Therefore, habitat loss would not be considered a primary problem for these species. Rather, degradation of movement/migration routes would be a major threat to the survival of both terrestrial and aquatic wildlife in developed areas.

Degradation of movement/migration routes and variable reproduction population size also ranked high and the experts identified this as the number one problem facing forest habitat in Indiana.

Some threats to species are more prevalent than others. Overall, the first five threats identified for all wildlife species in all habitats relate to habitat loss, connectivity and quality (see Table 4). Addressing these shared threats, related to loss of quality habitat, provides fertile ground for efficient, effective conservation partnerships. Some habitats are naturally in short supply. Species in these habitats face unique stressors that need to be specifically addressed to conserve overall biodiversity.

B. Threats to Habitats

The top ranking threats of habitat degradation, commercial or residential development (sprawl), agricultural or forestry practices, habitat fragmentation, and counterproductive financial incentives or regulations are all inter-related and affected by land use policies (Table 5). As Indiana has developed over the past three centuries, the amount of habitat classified as developed land and agricultural land has increased as all other habitat types have decreased.

Today's forest differs from the forest of the 1800s in block size, stem size, and species composition due to changing land use and management practices. Economic forces driving timber production and agriculture have resulted in large-scale habitat cycles in southern Indiana. In the late 1800s, deforestation was rapid and Indiana's forested lands reached their point of lowest abundance in the early 1900s. Since the Great Depression, Indiana's forests have been increasing, especially in the southern part of the state; however current timber stand management practices may also be driving a conversion from oak-hickory dominance to more maples (Miller, 2005). Respondents to the technical survey stated that oak-hickory forest cover type is not regenerating itself due to the lack of disturbance (fire, even-aged silviculture) that provides suitable conditions for the growth of the shade-intolerant mast-producing oak species. Therefore, wildlife species dependent on the oak-hickory cover type will have a difficult time maintaining current populations over the long term; fire suppression favors growth of fire intolerant species such as sugar maple and American beech.

Water and streamside habitat are vital for the survival of both aquatic species and terrestrial species, particularly in developed lands where stream systems often provide the only habitat and travel corridors. Stream channelization was identified as the number one threat in aquatic systems and the number two threat in developed lands. Stream channelization certainly degrades the habitat quality and quantity. When streams are straightened, the linear distance of available habitat decreases significantly. Depending upon methods used to construct and maintain the channel, riparian habitat can be severely degraded (especially due to removal of trees along the bank and fallen logs in the stream), erosion and sedimentation may increase and flows will be altered. Therefore, stream channelization was expected to be a highly ranked threat to aquatic systems.

Although drainage practices (stormwater runoff) and flow regulation were ranked somewhat lower, it is closely related to channelization in both urban and rural areas. As examples of indirect impacts to species, scientists offered that changes in drainage patterns due to development could affect Kirtland's snakes, which also can be adversely affected by moving or clearing debris. Artificial manipulation of water levels in wetlands is also likely to increase

mortality of over wintering snakes. Snakes hibernate underground at the groundwater interface. Raising water levels in the winter could drown snakes and lowering water table could expose them to extreme cold temperatures.

Practices exclusively designed to reduce one kind of threat to habitats may inadvertently degrade other habitat characteristics. Point source (from pipes), nonpoint source (from runoff), and residual contamination were also identified as habitat threats, particularly in developed lands and subterranean systems. When grasses along streambanks replace tree cover, overland soil erosion may be controlled, but the grasses provide no instream habitat for fish and other aquatic animals. Removal of streamside trees and instream log jams results in overheated water (which affects animal physiology, water chemistry and oxygen levels), loss of food resources from falling leaves and insects, instability of streambanks and reduction of structures that provide cover from predators, nurseries, and egg-laying substrate. Around sinkholes, the use of grassed buffers may be possible without negative side effects on habitat.

Similarly, intentional use of invasive non-native plant species to control erosion has resulted in damages when those species took over native communities. Invasive species concerns were rated especially high for barren lands and wetlands, but can be a problem in any habitat type. The impact of invasive species on all ecosystems is so disruptive that the USFWS and the USGS state that invasive species rank second only habitat loss as a cause of endangerment to native species. Once introduced, it may be difficult or impossible to contain invasive species. Therefore, design of conservation practices must take into account effects on the entire range of habitat characteristics.

Some threats are specific to more local or limited habitats. Mining/acidification was considered to be a significant threat in agricultural lands and subterranean systems. Although this threat is not likely to be widespread in either habitat type, the acidification associated with mining can be locally very detrimental to the entire wildlife community and must be addressed to promote good conservation

In general, technical experts were satisfied that results from the questionnaire adequately addressed the threats to the eight habitat categories. One expert commented on a habitat type or sub-type—early/mid successional habitat—which was not specifically included in this survey. DNR staff involved in the development of the habitat classification system were also frustrated by this omission. However, they were unable to resolve how to define and detect this habitat type because in a mapping exercise, the habitat can either be an aging grassland or early successional-stage forest, an agricultural field or roadside border. The inability to detect and clearly classify these systems may be problematic for conservation, considering that the number two threat to grasslands was management of successional change. This refinement may be addressed in future versions of the CWS, as sensing and mapping techniques improve. Other comments identified additional threats relative to the following categories: public knowledge and conflicts, short-term climate events, insufficient data, lack of natural and anthropogenic disturbance in certain habitats (such as fire and silviculture), and rapid changes in habitat features such as drainage.

Table 4. Problems affecting Wildlife in each major habitat type

Ranked threats to wildlife by major habitat type in Indiana. (See Appendix E-1 to E-78 for responses to sub-habitat expert questionnaires).

Habitat	All habitats combined	Agricultural	Aquatic systems	Barren lands	Developed lands	Forested lands	Grasslands	Subterranean Systems	Wetlands
Habitat loss (breeding range)	1	1	1	4 (tie)	8 (tie)	1 (tie)	1	1	1
Habitat loss (feeding etc.)	2	3	2	3	9 (tie)	1 (tie)	2	2	2
Degradation of movement /migration routes	3		4	6	1	2	6	5	5
Dependence on irregular resources	4	2	5	5 (tie)	8 (tie)	10	5	8	3
High sensitivity to pollution	5	7 (tie)	3		3	12	11	4 (tie)	10
Predators (native and domesticated)	6	4 (tie)	9	5 (tie)	9 (tie)	4	4	9	7
Bioaccumulation of contaminants	7	5	7		5	11 (tie)	7	4 (tie)	6
Viable reproductive population size	8		8	1	11	3	9	10	8
Invasive/non-native species	9	4 (tie)	6	7	7	8	3	13	11
Diseases/Parasites	10		10	2	2	5	12	12	13
Specialized reproductive behavior	11		6 (tie)	8 (tie)	12 (tie)	7	13	3	9
Unintentional take	12	8 (tie)	11	8 (tie)	9 (tie)	6	8	6	12
Small native range (high endemism)	13	6 (tie)	14	5 (tie)	14	9	10	7	14
Near limits of natural geographic range	14	6 (tie)	15	4 (tie)	13 (tie)	13	15	11	4
Species overpopulation	15		17		4	14			17
Dependence on other species	16	7 (tie)	12		10 (tie)	18	16		19
Genetic pollution (hybridization)	17	8 (tie)	16		6	16			15
Large home range requirements	18		19	10	13 (tie)	11 (tie)	14	15	16
Unregulated take	19		18	9	10 (tie)	15	18	14	18
Regulated hunting/fishing pressure (too much)	20		13		12 (tie)	17	17		20

Table 5. Problems Affecting Habitats:

Ranked threats to each major habitat type in Indiana. (See Appendix E-1 to E-78 for responses to sub-habitat expert questionnaires).

Habitat	All habitats combined	Agriculture	Aquatic systems	Barren lands	Developed lands	Forested lands	Grasslands	Subterranean systems	Wetlands
Habitat degradation	1	2	2	1	2 (tie)	3	1	1	1
Commercial or residential development (sprawl)	2	3	5	4	1	1	4	2	4
Agricultural/Forestry practices	3	4	4	5	7	4	3	4	3
Habitat fragmentation	4	1	8	2 (tie)	8	2	5	6	2
Counterproductive financial incentives or regulations	5	7 (tie)	13	2 (tie)	4 (tie)	7	6	13	6 (tie)
Point source pollution (continuing)	6	7 (tie)	6	7 (tie)	5	12	10	5 (tie)	6 (tie)
Invasive/non-native species	7	6 (tie)	11	3	10 (tie)	6	7	11	8
Nonpoint source pollution	8	8 (tie)	3	7 (tie)	9	11 (tie)	12	7	5
Successional change	9	5	14	6	12	5	2	12	6 (tie)
Stream channelization	10		1		2 (tie)	10	15	10 (tie)	10
Residual contamination (persistent toxins)	11	8 (tie)	10	8	3	13	8	5 (tie)	12
Drainage practices (stormwater runoff)	12	6 (tie)	7	7 (tie)	6	14	13	9	7
Mining/acidification	13	6 (tie)	12		13	9	9	8	11
Impoundment of water/Flow regulation	14		9		4 (tie)	11 (tie)	16	10 (tie)	9
Climate change	15		15		11		11	3	13
Diseases (of plants that create habitat)	16		16		10 (tie)	8	14		14

X. Additional Research and Survey Efforts Needed (3rd Element-partial)

Part of Element 3 of the Congressional guidelines requires that the CWS identify priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats. A section of the online survey solicited input from technical experts to outline research and survey efforts needed for wildlife species within the major habitat types, and then specifically for the habitats themselves.

Respondents were asked to describe how complete the current body of research is. Technical experts and conservation organizations reviewed these results and were asked if the output was a reasonable representation of the current body of science.

Respondents ranked research needs for wildlife in the major habitats in Indiana, as well as providing more detail on specific research needs. Technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the research needs for wildlife in specific habitats. Additional comments from the surveys are provided to illustrate specific recommendations. All comments were captured and are presented in the appendix.

A. Additional Research and Survey Efforts Needed for *Wildlife Species*

The greatest need identified for wildlife species within their habitats was to conduct research and survey efforts on threats, including interactions and effects of predators, competitors, and contaminants (Table 6). The next greatest research need was to identify limiting factors, such as food, shelter, water and breeding sites. In developed lands, more research is needed on distribution and abundance of wildlife species. In barren lands, research on dependence of wildlife species in relationship to their habitats was a significant need. As an example of a research need, Indiana bat habitat has been protected through erection of metal grates at cave entrances, but still the species is not thriving. Additional efforts to address factors that may be limiting recovery of the species, such as contaminants and populations dynamics, would be critical in assisting species that have low reproductive potential. Burrowing crayfish research provides an example of the interrelationship between threats and various species within a habitat. A number of threatened and endangered species, including the copper belly water snake, massasauga rattlesnake, and crayfish frog, are dependent upon crayfish burrows for habitat. A \$500,000 research project, funded by a State Wildlife Grant, is currently underway to conduct extensive research on burrowing crayfish to improve the understanding of how habitat and threats to crayfish can be limiting for a number of other species.

Table 6. Research needs for Indiana species

Ranked research and survey efforts needed for wildlife in each by major habitat types. (See Appendix E-1 to E-78 for responses to sub-habitat expert questionnaires).

Habitat	All Habitats Combined	Agriculture	Aquatic Systems	Barren lands	Developed Lands	Forest lands	Grasslands	Subterranean systems	Wetlands
Threats (predators/competition, contaminants)	1	1		1 (tie)	5	1	2	1	2
Limiting factors (food, shelter, water, breeding sites)	2	3 (tie)	1	1 (tie)	2	5	1	2	1
Relationship and dependence on specific habitats	3	3 (tie)	3	1 (tie)	3	2	3	3	3
Population health (genetic and physical)	4	2	5 (tie)	2	4	4	4	4	4
Distribution and abundance	5	4	4	4 (tie)	1	3	5	5	5
Life Cycle	6	5	5 (tie)	4 (tie)	6	6	6	6	6

B. Additional Research and Survey Efforts needed for *Habitats*:

The highest-ranking research needs for habitats included dependence on specific site conditions in five of the eight major habitat types (Table 7). This information will be especially critical for restoration projects and for protection of migrating species. For example, when wetlands are restored, they may not provide all of the wildlife needs because of the location relative to soil types, nearby sources of seed for re-establishment of diverse plant species and damage due to invasion of adjacent nuisance species. Different age classes of the endangered Blandings' turtle are dependent upon a range of water depths throughout their life cycle. If the necessary combination of water depths is not available within the restored wetland, the habitat may not be suitable to this species. Respondents indicated a need for additional information on metapopulation dynamics and migration distances to and from ephemeral wetlands, habitat distribution within the landscape, and buffer size and vegetation composition around ephemeral wetlands.

Threats such as land use change, competition, contamination, and global warming were significant—most notably in aquatic habitats. Lakes, streams, wetlands and other waterways are highly susceptible to the impacts of changing environment due to watershed dynamics and flow through the systems. These aquatic systems cannot be isolated from the surrounding landscape. Distribution and abundance (fragmentation) was significant for barren lands and forested areas. As the landscape of Indiana changes through highway construction, farming and urban development in rural areas, forests become separated from each other, creating barriers to migration and genetic health of species that are dependent upon these areas. Successional changes were significant in agricultural areas and in forests, where the combination of species may be dependent on the mix of plants that grows and changes over time in an abandoned field or in a forested area affected by fire or wind storms. One technical expert noted that forest health

is compromised by the “lack of periodic vegetative disturbance (man-made or natural every five to 10 years) that adequately opens the forest canopy and is well distributed throughout predominately forested environments, especially in large contiguous forested areas in public ownership.”

All of these factors also can be interrelated. Land use changes (categorized as a “threat” in the table) can affect the distribution, abundance and fragmentation of habitats. Research on each factor in isolation must be combined with an understanding of the synergy between these factors.

Table 7. Research needs for Indiana habitats.

Ranked research and survey efforts needed by each major habitat type. (See Appendix E-1 to E-78 for responses to sub-habitat expert questionnaires).

Habitat	All habitats combined	Agriculture	Aquatic Systems	Barren lands	Developed Lands	Forest lands	Grasslands	Subterranean systems	Wetlands
Relationship/dependence on specific site conditions	1	1 (tie)	2	1 (tie)	1	4	1	1	3
Threats (land use change/competition, contamination/global warming)	2	1 (tie)	1	3	3	2	2	2	1
Distribution and abundance (fragmentation)	3	3	3	1 (tie)	2	1	3	3	2
Growth and development of individual components of habitat	4	4	4	2	4	5	4	4	4
Successional changes	5	2	5	4	5	3	5	5	5

XI. Conservation Actions Needed (4th Element)

Element 4 of the Congressional guidelines requires that the CWS describe the conservation actions determined to be necessary to conserve the identified species and habitats, as well as priorities for implementing such actions. In the technical expert survey, experts were asked what conservation actions were most needed in Indiana for both species within habitats, as well as for the habitats themselves.

A. Tables of Ranked Actions

The following results are organized by habitat type, beginning with actions needed for *wildlife* conservation (Table 8), followed by actions needed for *habitat* conservation (Table 9). Technical experts were asked to respond to each of the following information needs:

1. Rank a list of conservation efforts by how well they address threats.
2. Describe other current conservation practices for species and habitats in Indiana.
3. Provide more detailed recommendations for more effective conservation actions (not ranked).

Then, technical experts and conservation organizations reviewed the above results and were asked if these were a reasonable representation of the conservation actions needed. Following are tables that list the ranked actions needed for wildlife and for habitats in Indiana, along with reviewer comments. Additional comments from the surveys are provided to illustrate specific actions needed for conservation. All comments were captured and are presented in the appendix.

1. Species Conservation Actions

Overall, population management and protection of migration routes ranked the highest as recommended conservation actions for *species within habitats* (Table 8). Population management may be particularly effective in habitats where interactions with common species can detrimentally affect rare species.

Generalists that thrive on human disturbance may negatively affect a number of other species, depending on land use and resource management practices. For example, overpopulation of raccoons can result on unsustainable loss of turtle eggs, resulting in reproductive failure. Overabundant browsing deer have denuded plant communities—even in locations where the habitat is otherwise protected such as state parks or nature preserve. Woodrats may also have to cross non-forested areas to reach preferred feeding areas (e.g., hard mast crops, berries). While doing so, they may become exposed to ubiquitous predators (great-horned owls, raccoons). Game species can also transmit diseases and parasites to populations that may already be at unsustainably low levels. Raccoon densities may be higher in non-forested settings (such as farmed areas on top of cliffs) and could expose woodrats to higher levels of raccoon roundworm.

When game species become overabundant, population management through hunting and trapping can be a major tool for controlling negative impacts on rare plant and animal communities. This method was rated highly for all habitats except the rarer barren lands and inaccessible subterranean areas.

The highest ranking conservation action in agricultural landscapes, barren lands, forest lands, and subterranean habitats was direct habitat protection. These areas are either naturally rare

(subterranean and barren lands) or are directly affected by use of conservation practices in commercial harvest and production of natural resources (agriculture and forestry). Several community types occur in Indiana at or near the edge of their range, making these groups particularly susceptible to changes in climate or other factors. Populations on the outskirts of their natural distribution may be particularly useful for genetic study or to determine conditions that limit restoration and protection. The green salamander is one of these species. They are only found at two sites in Indiana, are at the edge of the geographic range and are vulnerable as habitat specialists in barren lands.

Reintroduction and stocking may be more commonly used in wetlands and Aquatic systems than for species in other habitat types. Wetland restoration has become a growing and developing area of science, propelled by incentive-based programs and regulatory mitigation. Otters and osprey are examples of species that benefit from successful reintroduction programs. While there is some potential for turtle reintroduction, requisite knowledge about behavior and life histories may not support its use. Furthermore, reintroduction can be financially costly and resource-intensive. Protection of habitats, including nesting and rearing sites, may be a far more cost-effective means of providing for these species. Direct reintroduction and stocking are less commonly employed in upland or more terrestrial habitats.

Protection of migration routes was recommended for species in developed lands, forest lands and barren lands. This need is related to fragmentation of these habitats, which was indicated as a major habitat threat. Wildlife must be able to survive dispersal between habitats, which may be affected by barriers such as roads, dams and other developed areas. So, establishment and protection of corridors becomes critical for survival within healthy habitats that are scattered across the landscape.

Direct population management by hunting or trapping was rated particularly high in grasslands, where many species are associated in guilds with game birds. In contrast, regulation of collecting was significant in subterranean systems where populations are so small and reproductive capacity is so low that these species cannot withstand the pressure of collection and removal by humans. Related to population management is the need in some cases to take direct action to control or remove invasive species, contaminants and predators that may be interfering with population recovery. One respondent noted that invasive species control (e.g., buckthorn, autumn olive, *Phragmites*) was necessary to maintain open herbaceous habitat suitable for massasauga rattlesnake protection. Translocation to a new geographic range is a specialized tool for direct manipulation of populations. An example would be establishing a population of prairie chickens in grasslands that have been developed in former strip-mined areas in southern Indiana. Neither the species nor the habitat would have existed naturally in this area in historic times.

Particularly in some habitats, direct population management may be virtually impossible. Another respondent illustrated why lack of knowledge about invertebrates and the difficulty of working in underground habitats deal a double blow that could seriously impede survival of rare species. He described how a non-native carnivorous millipede (*Oxidus gracilis*) is invading caves in the east and has now been found in several Indiana caves. This species preys on the food base for cave salamanders. Further east, reports of greatly decreased insect diversity in caves invaded by this millipede have been reported. Potential impacts are unknown, but could be significant. Once underground systems have been infested with exotic invaders, there are no known means of restoring the biotic integrity of these habitats.

While some of these conservation actions are dependent on decisions made through state or local public policy, individuals on private lands can implement other actions. In either case, public education to reduce human disturbance is intimately connected to the ability to implement all of these actions. Respondents especially noted the necessity of public information regarding rare or less noticeable habitats, such as barren lands, grasslands and subterranean (cave) systems.

2. Habitats Conservation Actions

Conservation action needs for habitats highlighted the importance of habitat protection and restoration on public lands (Table 9). Land trusts and public funds are the primary mechanisms to prioritize and protect significant habitats. Large blocks of habitat are required by some species with large home ranges and to protect species diversity and interactions that are dependent on large undisturbed areas. Additional tools are available for private lands management, including financial incentives for habitat protection and restoration (the Classified Wildlife Habitat Program) and cooperative land management agreements (conservation easements).

The first step to engage private landholders in conservation is to appeal to an ethic of long-term land stewardship. Once landowners understand the impacts of land use practices and are presented with viable alternatives, they will often take advantage of wildlife and habitat conservation programs. Like public education regarding wildlife species conservation, technical assistance is inextricably related to establishment of protected areas and habitat management through the use of public funds or private lands incentives. Delivery of technical assistance is seriously affected by changing patterns in land ownership. For example, private ownership patterns of forest land have changed significantly in the past three decades. While the number of forestland acres in Indiana remained relatively the same between 1978-1994, the average parcel size of private forest acres declined from 77 acres to 25 acres while the number of private forestland owners tripled; by 1994, sixty percent of the 151,300 forest landowners owned less than 9 acres (Broussard, 2005). Reaching the increased number of small landholders with adequate and timely information on land and water management practices can be difficult. Not reaching them can be even more costly, as these fragmented resources are even more vulnerable than they were as larger tracts of forest.

Partnerships between public land managers and private landholders can stretch coverage for critical habitats. Patoka River NWR manages agricultural habitat through cooperative farming agreements on refuge lands and restores prior converted wetlands to palustrine forested habitat on acquired refuge lands. The refuge also partners with the NRCS in reviewing lands nominated by farmers for inclusion in the WRP easement program. The refuge facilitates restoration of wetland and forested habitat on private agricultural lands through the Fish and Wildlife Services Private Lands Program.

Land use planning, corridor development, successional control, and regulation are all interrelated as tools for larger-scale management of habitats across space and time. Effective development and use of these tools also relates back to species and habitat research needs, such as factors that affect migration, dependence on site specific conditions, land use change, competition, contamination, and global warming.

Table 8. Conservation action needed for species in each of the habitats

Ranked conservation efforts needed for wildlife by each major habitat type. (See Appendix E-1 to E-78 for responses to sub-habitat expert questionnaires).

Conservation Action	All habitats combined	Agricultural	Aquatic systems	Barren lands	Developed lands	Forest lands	Grasslands	Subterranean systems	Wetlands
Population management (hunting, trapping)	1		2		3 (tie)	2	1		2 (tie)
Protection of migration routes	2		4	2 (tie)	1	1 (tie)	4		3
Habitat protection	3	1	5	1	3 (tie)	1 (tie)	6	1 (tie)	5
Reintroduction (restoration)	4		1	2 (tie)	6 (tie)				1 (tie)
Stocking	5		6		6 (tie)				1 (tie)
Food plots	6		9 (tie)		3 (tie)	3	5		2 (tie)
Regulation of collecting	7		11 (tie)	2 (tie)	2	4	7 (tie)	1 (tie)	6
Translocation to new geographic range	8		3	2 (tie)	6 (tie)				9 (tie)
Public education to reduce human disturbance	9		11 (tie)	2 (tie)	4	6 (tie)	2	3	9 (tie)
Threats reduction	10		8	3	6 (tie)	5		2	8
Exotic/invasive species control	11	2	12 (tie)	2 (tie)	6 (tie)	6 (tie)	3		7
Population enhancement (captive breeding and release)	12		10	2 (tie)	6 (tie)				
Limiting contact with pollutants/contaminants	13		11 (tie)	2 (tie)	5	6 (tie)	7 (tie)	4	9 (tie)
Native predator control	14		9 (tie)	2 (tie)	6 (tie)	6 (tie)	7 (tie)		9 (tie)
Culling/selective removal	15		7		6 (tie)	6 (tie)			9 (tie)
Disease and parasite management	16		12 (tie)		6 (tie)	6 (tie)			4

Table 9. Conservation actions needs for habitats.

Ranked conservation efforts needed for each major habitat type. (See Appendix E-1 to E-78 for responses to sub-habitat expert questionnaires).

Conservation Action	All habitats combined	Agriculture	Aquatic systems	Barren lands	Developed lands	Forested lands	Grasslands	Subterranean systems	Wetlands
Habitat protection on public lands	1	1 (tie)	5	2	3 (tie)	3	2	5	1
Cooperative land management agreements (conservation easements)	2		4	3 (tie)	3 (tie)	8	3	2	3
Habitat restoration on public lands	3	1 (tie)	3	3 (tie)	2	4	4	7 (tie)	4
Habitat restoration incentives (financial)	4	2 (tie)	1	3 (tie)	1 (tie)	7 (tie)	1	7 (tie)	9 (tie)
Land use planning	5		9 (tie)	3 (tie)	1 (tie)	2	7	4	6 (tie)
Habitat protection incentives (financial)	6	1 (tie)	6	3 (tie)	1 (tie)	5 (tie)	10	7 (tie)	7 (tie)
Corridor development/protection	7		8	3 (tie)	3 (tie)	5 (tie)	6	7 (tie)	5
Succession control (fire mowing)	8		10	3 (tie)	1 (tie)	5 (tie)	12		2
Habitat restoration through regulation	9	2 (tie)	9 (tie)	3 (tie)	3 (tie)	6	9 (tie)	7 (tie)	8
Restrict public access and distribution	10		7 (tie)	1	5 (tie)	7 (tie)	8	3	11
Protection of adjacent buffer zone	11		2	3 (tie)	4 (tie)	9 (tie)	13 (tie)	7 (tie)	6 (tie)
Artificial habitat creation (artificial reefs, nesting platforms)	12	2 (tie)	11		1 (tie)		13 (tie)	7 (tie)	7 (tie)
Habitat protection through regulation	13	1 (tie)	12		5 (tie)	7 (tie)	11	6	10
Technical assistance	14		13	3 (tie)	5 (tie)	9 (tie)	9 (tie)	1	12
Selective use of functionally equivalent exotic species in place of extirpated natives	15		14		7	1	5		13
Managing water regimes	16		7 (tie)		4 (tie)	9 (tie)	13 (tie)	7 (tie)	9 (tie)
Pollution reduction	17		7 (tie)	3 (tie)	6	9 (tie)	13 (tie)	7 (tie)	14

B. Partnering Agencies and Organizations

In association with Element 4, guidelines called for the CWS to describe specific projects and programs, in addition to partnering agencies and organizations, who will likely be involved in implementing these conservation actions. A major characteristic of Indiana's CWS approach is that it provides a statewide umbrella strategy for conservation of all known habitats and all fish and wildlife species that depend on those habitats. This approach can be compared to several other decision-making tools and matched with existing conservation programs that have been developed by organizations at the state, regional or national level. By examining each of these tools, programs and organizational resources, it is possible to describe how the collection of programs and their associated decision-making tools are complementary to the CWS and identify where there may be gaps in conservation planning within the state.

1. Programs for conservation

An inventory of programs that provide resources and tools that may be useful to implement wildlife and habitat conservation actions is provided in Table 10. Additional detail on conservation programs is given in Appendix L. To facilitate implementation, these organizations are categorized by the major habitats they address, recognizing that there may be overlaps in some cases.

For each program, the following information is provided, if applicable:

Program Title:	name of the organization or program
Administered:	agency that administers the organization or program
Primary Taxa:	wildlife species or groups that are the primary focus for the program
Relationship to CWS:	how actions or interests could be aligned with CWS conservation needs
Implementation constraints:	barriers to implementation, including financial or technical resource constraints
Eligibility:	who may apply for funding
How Much:	how much funding is typically available
Application Deadline:	deadline for submitting an application
Web Pages/Links:	sources of specific online information

Based on this summary, conservationists in Indiana have access to more than 50 programs that could provide technical or financial assistance for wildlife and habitat conservation in the state.

For state agencies and private organizations, thousands of dollars are available each year from federal and non-profit funds for states to purchase, manage or improve habitats. Other programs allow the state or private organizations to provide dollars to partners to carry out conservation work on public and private lands. In addition, several coalitions encourage agencies to band with stakeholders to share resources and achieve larger goals than an agency could achieve alone.

Despite these opportunities, internal constraints often prevent state agencies from using these resources to their fullest potential. Restrictions on out-of-state-travel can constrain participation, as does a lack of state staff to participate in or develop these efforts. Funding that requires state

matches often can't be realized because matching funds are inadequate or non-existent. Many of the federal programs require state matching funds in excess of 25-50% of the total project amount. When federal funds operate by reimbursing state expenditures, the state must have to total project amount available as a cash outlay at the outset of the project. Federal tax dollars dedicated to habitat conservation programs such as the Conservation Reserve Enhancement Program (CREP) within the Farm Bill programs have gone unused for years due to the lack of state matching funds. Reversion of federal funds to the federal Sport Fish Restoration and Wallop-Breaux programs have also loomed as possibilities in years when state funding came up short.

For state agencies to realize and reap the benefits of programs and partnerships, agency leaders need to look for ways to better tap funding, resources and partnerships heralded through the CWS. A major component of implementation for CWS will be to continue identifying appropriate programs, determining how barriers can be overcome, and linking these programs with conservation needs. As program scope, capacity and resources change, this information will have to be continually updated. For these reasons, Table 10 and Appendix L are not necessarily comprehensive or complete and remain a work in progress.

Table 10: Conservation Programs and Resources

Programs currently available for wildlife conservation in Indiana and barriers to effective implementation of conservation actions. (See Appendix L for additional information)

Program	Funds available	Implementation Constraints				
		Out of state travel	State match	Lack staff	Funding issues or limits	Other
Programs for All Habitats						
2002 IPL Golden Eagle Environment Grant	Yes	--	--	--	--	--
Classified Wildlife Habitat Program	Yes	--	--	--	X	--
Ecoregional planning (TNC)	Yes	--	--	--	--	X
Game Bird Habitat Program	Yes	--	--	--	X	--
General Challenge Grant	Yes	--	X	?	?	?
Indiana Biodiversity Initiative	Yes	--	--	--	X	--
Indiana Heritage Trust	Yes	--	--	--	--	--
Land trusts in Indiana	Yes	--	?	?	?	?
Nongame Tax Check-off	Yes	--	X		X	--
North American Bird Conservation Initiative (NABCI)	No	X	--	X	--	--
Partners In Flight	No	--	--	--	--	--
State wildlife agency management strategic plans	Yes	--	--	--	X	--
Tipmont REMC Envirowatts Trust	Yes	--	?	?	X	X
Wildlife Habitat Cost Share Program	Yes	--	--	--	X	--
Programs for Agricultural Habitats						
Conservation Reserve Enhancement Program	Yes	--	X	--	--	X
Conservation Reserve Program	Yes	--	--	--	--	X
Core 4 Alliance Grants	Yes	--	--	--	--	X
Game Bird Habitat Program	Yes	--	--	--	X	--
Indiana Environmental Quality Incentives Program	Yes	--	--	--	--	X
Sustainable Agriculture Research and Education (SARE) Producer Grant Program	Yes	--	--	--	--	X
Wetland Reserve Program	Yes	--	--	--	X	--
Wildlife Habitat Cost Share Program	Yes	--	--	--	X	--
Wildlife Habitat Incentives Program	Yes	--	?	?	?	X
Programs for Aquatic Habitats						
Aquatic Ecosystems Restoration	Yes	--	X	--	--	--
Bring Back the Natives	Yes	?	?	?	?	?
Clean Water Act Nonpoint Source Grants (Section 319)	Yes	--	X	--	X	X
Clean Water Act Planning Grants (Section 205(j))	Yes	--	--	--	--	--
Clean Water Act Stormwater Grants (Section 104(b) (3))	Yes	--	X	--	X	X

Program	Funds available	Implementation Constraints				
		Out of state travel	State match	Lack staff	Funding issues or limits	Other
Great Lakes Aquatic Habitat Network & Fund	Yes	?	?	?	X	?
Great Lakes Basin Program for Soil Erosion and Sediment Control	Yes	?	?	?	X	?
Great Lakes Regional Collaboration	Unknown	X	--	--	--	--
Hoosier Riverwatch Water Quality Monitoring	Yes	--	--	--	--	X
Lake and River Enhancement Program	Yes	--	--	--	X	X
Lake Michigan Coastal Program	Yes	--	?	?	?	X
Mississippi Interstate Cooperative Resource Association (MICRA)	No	X	--	--	--	--
National Fish Habitat Initiative	TBD	TBD	TBD	TBD	TBD	TBD
Ohio River Valley Water Sanitation Commission (ORSANCO)	No	X	--	--	--	--
Partners for Fish and Wildlife	Yes	?	?	?	X	?
Project Modifications for Improvement of the Environment (Section 1135 (b))	Yes	--	X	--	--	--
Re-Grants	Yes	?	?	?	X	?
Research grants	Yes	--	?	?	?	?
Science Program	Yes	X	--	--	--	--
State Revolving Fund Program	Yes	--	--	--	X	--
Watershed assistance grants	Yes	?	?	?	X	?
Programs for Developed Lands Habitats						
Brownfields Cleanup Revolving Loan Fund	Yes	--	--	--	--	X
Clean Water Act Stormwater Grants (Section 104(b) (3))	Yes	--	X	--	X	X
Hometown Indiana Grant Program	Yes	--	--	--	X	X
State Revolving Fund Program	Yes	--	--	--	X	--
Urban Forest Conservation Grants	Yes	?	?	?	X	?
Programs for Forest Lands Habitat						
Classified Forest Program	Yes	?	?	?	X	?
Forest Legacy Program	Yes	?	?	?	X	?
Hometown Indiana Grant Program	Yes	--	--	--	X	X
National forest planning rules	No	--	--	--	--	X
Urban Forest Conservation Grants	Yes	?	?	?	X	?
Wildlife Habitat Cost Share Program	Yes	--	--	--	X	--
Programs for Subterranean Systems Habitats						
Conservation Fund	Yes	?	?	?	?	?
Conservation grants	Yes	?	?	?	X	?
Fellowship	Yes	?	?	?	X	?
Indiana Environmental Quality Incentives Program	Yes	--	--	--	--	X
Programs for Wetlands Habitats						
Conservation Reserve Enhancement Program	Yes	--	X	--	--	X

Program	Funds available	Implementation Constraints				
		Out of state travel	State match	Lack staff	Funding issues or limits	Other
Conservation Reserve Program	Yes	--	--	--	--	X
Lake and River Enhancement Program	Yes	--	--	--	X	X
North American Wetlands Conservation Act Grants	Yes	?	X	?	?	?
Wetland Reserve Program	No	--	--	--	X	--
Wetlands Protection Development Grants Program	Yes	?	?	?	?	?
Wildlife Habitat Incentives Program	Yes	--	?	?	?	X
More Funding Sources						
Catalog of Federal Funding Sources for Watershed Protection	Yes	TBD	TBD	TBD	TBD	TBD
GrantsWeb	Yes	TBD	TBD	TBD	TBD	TBD
The Foundation Center	Yes	TBD	TBD	TBD	TBD	TBD

2. Partners for conservation

Appendix H contains listings of conservation organizations, what types of habitat they focus, what types of work they do, and what percent of their time they spend on that work and detailed descriptions of each organization's activities if the respondent provided this requested information. A matrix of conservation partners contains the responses from the CWS Partner Survey (Table 11). Organizations were asked "On which of the following types of habitats does your organization focus its efforts?" and "Percent of your total time spent on efforts in this habitat." Fields with an "X" indicate that the organization responded that they have activities in this habitat but did not include a percentage. All other responses are as completed by the individual completing the form.

Information submitted by potential conservation partners suggests some trends in the amount and kind of attention various habitats and species are currently receiving. The largest number of partners spends at least some time addressing wetlands (84), aquatic systems (83), forest lands (74), and grasslands (60) with the lowest number of partners available to do work in barren lands (21) and subterranean habitats (21). Likewise the largest average percentage of time that partners reported was for aquatic systems (18%), forest lands (17%) and wetlands (15%). The smallest percentage of time spent was reported for barren lands (0.8%), subterranean systems (2%), grasslands (7%) and developed lands (7%).

For the most part, efforts seem to be correlated with the prevalence of some habitat types in presettlement Indiana, such as grasslands, forest lands and wetlands. Grasslands (pasture, hay and abandoned fields) and forest lands are associated with agriculture and timber production. These systems benefit from stable, well-funded nationwide incentive programs such as the Farm Bill and funding for management of game species. Techniques for restoring these habitats may be better developed due to the long-term stable funding and research associated with production systems.

Program and partner attention also reveals a predisposition for working in water-related systems. State and national surveys have repeatedly shown the importance of clean water in the minds of the public. In relation to this interest, wetland conservation and regulation have received a tremendous amount of attention relative to other habitat types. While wetlands may comprise a small land area, their contribution to water quality and quantity is disproportionately significant. Wildlife-related recreation such as waterfowl hunting, fishing and bird-watching also propel an interest and investment in aquatic systems and wetlands that is out of proportion to the land area that they cover. These systems directly benefit from funding provided for the support of game species and fisheries management.

Habitats that are difficult to access, such as cliffs or dunes (barren lands) and below ground (subterranean) habitats, also received relatively little attention. Working in these systems is highly specialized and may include hazardous conditions (e.g., caves and sinking streams). These habitats are also extremely fragile and may not be able to withstand the attention of a very large number of researchers and practitioners. Collecting was identified as one of the serious threats to species in some of these highly sensitive habitats.

Table 11. Matrix of conservation partners

Responses from the Indiana Comprehensive Wildlife Strategy (CWS) Partner Survey to indicate what approximate percentage of their efforts are spent in which habitats.

	Agricultural	Aquatic systems	Barren lands	Developed lands	Forest lands	Grasslands	Subterranean systems	Wetlands
Conservation Partner	Efforts by habitat type							
ACRES, Inc.	15	30	5	0	30	5	0	30
American Consulting, Inc.	5	15		45	5			35
American Society of Landscape Architects, Indiana Chapter	X	X		X	X	X		X
Amos W Butler Audubon Society		X						X
Aquatic Weed Control		100						
Arrow Head Country Resource Conservation & Development Area, Inc.	10	30		10	30			10
Bartholomew County Conservation Council, Inc.								2
Big Oaks National Wildlife Refuge, USFWS	5	5		0	30	30	10	20
Blue Heron Ministries, Inc.		5		5	10	40		40
Center For Urban Policy and The Environment								
Central Hardwoods Joint Venture/American Bird Conservancy		X			X	X		X
Central Indiana Land Trust					90	5		5
Central Indiana Trout Unlimited		100						
Cinergy Corp.	5	20	5	30	10	15	0	15
Clark's Valley Land Trust	50	10			30			10
Cordry Sweetwater Conservancy District		50		45				
Crooked Creek Conservation & Gun Club, Inc.						X		
Division of Fish and Wildlife	28	28	1	2.5	6	6	0.5	28
DNR Division of Nature Preserves		10	10		30	30	10	X
Ducks Unlimited, Inc.		10			10	15		65
Dunes-Calumet Audubon Chapter					20	30		50
Earth Source, Inc.		10		20	10	10		50
Enviroscience Incorporated		40		20	5			20
Federal Highway Administration (FHWA)	?	?		?	?	?	?	?
Fish Lake Conservancy District	5	90						5
Four Rivers Resource Conservation & Development Area		50	10					5
Fur Takers of America	X	X	X	X	X	X	X	X
Fur Takers of America Chapter 7-E North West In.	?	?		?	?	n/a		?
Great Lakes Commission	NA	NA		NA				NA

	Agricultural	Aquatic systems	Barren lands	Developed lands	Forest lands	Grasslands	Subterranean systems	Wetlands
Conservation Partner	Efforts by habitat type							
Hamilton Lake Conservancy District		100						
Hoosier Conservation Alliance					15			
Hoosier Environmental Council	10	40			25	5	10	10
Hoosier Heartland Resource Conservation and Education Council	10	20		35	35			
IDNR- Division of Forestry- Cooperative Forest Management Section (Private Lands)	15	5	2		70	5	2	15
IN DNR, Division of State Parks & Reservoirs, Interpretive Services	~5	~5		~4-5	~75-80		~2-3	X
Indiana Academy of Science								
Indiana Association of Cities and Towns		10		10				5
Indiana Association of Soil and Water Conservation Districts	30	10	10	20	10	10	0	10
Indiana Bass Chapter Federation		80						20
Indiana Beaglers Alliance	10							
Indiana Beef Cattle Association	X					X		
Indiana Biodiversity Initiative Indian University - School of Public and Environmental Affairs								
Indiana Chamber of Commerce	15	45	10	20				10
Indiana Deer Hunters Association		10		0	25	10		10
Indiana Department of Natural Resources Division of Forestry, Properties Section (State Forests)	1	3	1	60	31	1	2	1
Indiana Department of Natural Resources, Division of Outdoor Recreation								
Indiana Department of Transportation								
Indiana Division of The Izaak Walton League of America	1	20	1	2	5	3	1	30
Indiana Dunes National Lakeshore		5			45	20		30
Indiana Environmental Institute	10	30		5				10
Indiana Forest Industry Council (IFIC)					100			
Indiana Forestry and Woodland Owners Association					100			
Indiana Forestry Educational Foundation					100			
Indiana Grand Kankakee Marsh Restoration Project						30		70
Indiana Hunter Education Association								
Indiana Karst Conservancy							100	
Indiana Land Resources Council	X			X	X			
Indiana Michigan Power and Affiliate of American Electric Power; Land Management Department		X	X					
Indiana Native Plant and Wildflower Society				10	30	30	0	30

	Agricultural	Aquatic systems	Barren lands	Developed lands	Forest lands	Grasslands	Subterranean systems	Wetlands
Conservation Partner	Efforts by habitat type							
Northeastern Indiana Trout Association		80		5				
Northern Indiana Public Service Company (NIPSCO) a Subsidiary of NiSource					10	25		10
Northwestern Indiana Regional Planning Commission (NIRPC)		25		25		10		10
Patoka River National Wildlife Refuge & Management Area		20			20	20		40
Pheasants Forever Inc.	40	15				25		20
Potawatomi Audubon Society								
Quail Forever								
Red-Tail Conservancy, Inc.					33	33		33
Robert Cooper Audubon Society	5	28	1	5	28	5	3	25
Sassafras Audubon Society		25			25	25		25
Save The Dunes Conservation Fund		35			10	10		25
Sierra Club Hoosier Chapter	15	40		15	5	5		20
South Bend-Elkhart Audubon Society		10-20?				10-15?		10-20?
St. Joseph County Soil & Water Conservation District (SWCD)	70	3		15	3	4		5
St. Joseph River Watershed Initiative	35	36	1	7	7	7		7
Steelheaders of Northwest Indiana (Northwest Indiana Steelheaders)		70		20				10
Summit Lake State Park		10		20	10	20		
Sycamore Land Trust	10				30	10		10
The Indiana Audubon Society					90	10		
The Nature Conservancy	10	10	5		20	20	10	25
Tiptecanoe Audubon Society					40			
Trillium Land Conservancy, Inc.		25			25	25		25
U.S. Army Corps of Engineers Regulatory Branch, Louisville District (Please Note This Is Only a Part of The Larger Organization and While The Greater Organization May Be Involved In Areas Not Noted Below, Our Answers Are Specific To The Regulatory Program		X						X
U.S. Department of Agriculture, Forest Service Hoosier National Forest		5	5	5	65	10	5	5
U.S. Fish and Wildlife Service - Indiana Private Lands Office					10	30		60
US Fish and Wildlife Service Ecological Services (Does Not Include National Wildlife Refuges)	10	25	5	15	10	5	5	25
USDA Natural Resources Conservation Service	X	X			X	X	X	X

	Agricultural	Aquatic systems	Barren lands	Developed lands	Forest lands	Grasslands	Subterranean systems	Wetlands
Conservation Partner	Efforts by habitat type							
Valparaiso Lakes Area Conservancy District		25		10				5
Valparasio Chain of Lakes Watershed Group, Inc.		30		10	10			50
Veolia Water Indianapolis, LLC	10	45		25	5	5	5	5
Wabash River Heritage Corridor Commission	10	40		25	5			20
Wawasee Area Conservancy Foundation, Inc.		10			10	10		70
Whitewater Valley Land Trust, Inc.	15	10		0	60	5	0	10
Total number of partners	50	83	21	48	74	60	21	84
Average time spent (%)	8	18	0.8	7	17	7	2	15
Land coverage (%)	55	2	0	4	23	15	N/A	1

XII. Proposed Plans for monitoring with Time Lines or Schedules Indicated

Wildlife conservation and management is intended to provide stable, self-sustaining populations of native wildlife. Therefore, habitat and species monitoring projects contribute to two important aspects of the planning cycle: the inventory stage that tallies the state's raw materials for conservation and the evaluation stage that assesses the success of conservation efforts.

A. Species Monitoring

The DFW has operated under a planned management system for over 20 years and has a long history of monitoring species (Table 12). Based on inquiries received by DFW, the public expects the state to have some knowledge of the abundance and status of wildlife. Due to federal support for survey/monitoring activities, inventory data have been more readily available for game and sport fish species. Readily observable bird species have benefited from longstanding bird survey protocols that provide population trend data. Survey protocols for other nongame species have increased in Indiana in the last two decades but are often limited in geographic coverage and of short duration. Individual records of SGCN are entered into the Heritage Database, maintained by the Division of Nature Preserves. These records are seldom the result of statewide or regional survey efforts; rather more limited studies or accidental encounters. However, the Heritage Database represents the most enduring and complete repository of general SGCN occurrence data available. Additional survey and monitoring and data sharing efforts are needed.

Element 5 of the CWS Congressional guidelines requires that species monitoring needs be identified. Review of current monitoring efforts was an important component in identification of additional monitoring needs. Through the expert survey we attempted to determine awareness of species monitoring efforts conducted by the state and other entities. Table 13, derived from the Technical Expert Survey, is an account of the awareness of species survey and monitoring efforts conducted in Indiana by the state or other organizations. In all species groups, except amphibians, species monitoring by the state exceeded species monitoring by all other organizations. All amphibian monitoring conducted by others (other than the state) were local or regional efforts. Additionally, the expert respondents recognized that state monitoring efforts were conducted more often, on a more regular schedule, and tended to be extensive state or range-wide efforts. Monitoring by other organizations tended to be less frequent and more regional or local in scope (Appendix E 1-78).

State monitoring efforts are used to determine species status, set harvest regulations, and prioritize conservation efforts. Historically, the majority of these surveys have been aimed at game or commercially valuable species. In addition to species status information, collectively, these surveys have provided insight into habitat and environmental health changes in Indiana. More recently, other monitoring efforts, mainly conducted or supported by the Nongame and Endangered Wildlife Program (currently the Wildlife Diversity Section), have provided population status information for a limited number of species with greatest conservation need. Implementing conservation actions needed to prevent species from declining to the point of being endangered requires early detection and intervention. Therefore, four distinct levels of species monitoring are essential for comprehensive conservation:

1. Monitoring of game, commercial, or common species.
2. Monitoring of indicator species in declining or at-risk habitats.
3. Monitoring of suspected at-risk species.

4. Monitoring of known species of greatest conservation need.

As long as appropriate, the Division of Fish and Wildlife will continue the monitoring efforts in Table 12. Monitoring efforts in categories two through four above are the purview of this CWS and are directly related to the detection (determine the conservation status of a species) or monitoring of SGCN.

The DFW does not have statutory authority for insects. As a result, insects were not included in habitat guilds. Indiana has developed a list of rare insects based largely on the serendipitous results of various insect taxa experts conducting fieldwork in Indiana (Table 1). As a general trend, rare insects occur in rare habitats. Correspondingly, staff to address the needs of federally endangered insects in Indiana has come from the Division of Nature Preserves (DNP). In Indiana, the DNP has responsibility for rare plants and plant communities. The DFW works with the DNP to protect and manage rare habitats and the species, including insects that depend upon them. As resources (funds, expertise, etc.) permit, a more comprehensive insect inventory should be pursued.

Pursuant to Element 5 of the CWS Congressional guidelines, DFW sought to identify gaps in species monitoring coverage. This included consideration of monitoring technique development. At this time, reptiles (and to lesser extent mussels) are under-monitored species groups by both the state and non-state agency groups (Table 13). Most of these identified needs would benefit from standardized monitoring efforts that would make inter-state or regional comparisons possible. To date, only bird and fish survey efforts seem to have achieved some measure of standardization. Bird monitoring efforts likely benefit from the unifying influence of federal control under the Migratory Bird Treaty Act. Fish monitoring efforts are often related to game fish management needs or environmental monitoring. Considerable effort has been expended to establish standardized fish sampling and analysis protocols relative to water and environmental quality monitoring. Undoubtedly, the use of fish in environmental monitoring has contributed to a better understanding of fish abundance and distribution. Monitoring efforts for amphibians, (especially salamanders), all reptiles and mussels need to be increased. However, to improve the efficiency of increased monitoring, standardized protocols that allow comparison of population trends between state, regions and sample areas is desirable. It is likely that similar monitoring needs and the need to standardize protocols were identified nationally in most state strategies. Indiana intends to participate in national or regional efforts to develop effective, efficient and standardized protocols for species or species groups identified in Table 13, especially amphibians, mussels and reptiles. If these multi-jurisdictional efforts at protocol standardization are not forthcoming, then IDNR will facilitate an intra-state effort to develop suitable protocols.

New monitoring techniques may be needed for specific SGCN, especially cryptic or fragile species. In general, the expert comments on the questionnaire called for increased efforts using established survey procedures (Appendix F 1-78). There were species-specific exceptions. New techniques will have to be developed for some sensitive species or species using specialized habitats, such as burrows in bogs. The Indiana CWS supports the development of new survey/monitoring techniques and the standardization of survey protocols that facilitate comparison.

Table 14 provides a list of anticipated survey/monitoring needs, derived from expert comments provided on the questionnaire and from DNR biologists. Additional information is located in Appendix M. Element 5 of the Congressional guidelines required this list. The degree to which

these survey and monitoring efforts are implemented and the schedule (plan) for implementation depend upon a variety of factors, including funding and available expertise. In response to new information, regional or national priorities, or efficient inventory opportunities, this list may be amended to provide for efficient, effective conservation. Given the magnitude of the inventory needs, use of properly trained citizen volunteers is an attractive option for certain species. Efforts should be applied to determination techniques and protocols that can be successfully conducted by volunteers provided only limited training. Method of data verification and volunteer recruitment and retention also need to be explored. A successful volunteer program is expected to require the full-time attention of one or more volunteer coordinators, provided either by the state or a conservation partner.

Table 12. Current species monitoring efforts conducted by the State (DFW).

Species Group	Survey Name	Schedule	Area
Game	Archers Index – beaver, bobwhite, coyote, deer, fox squirrel, gray fox, gray squirrel, ruffed grouse, feral; cat, muskrat, opossum, rabbit, raccoon, red fox, skunk, and turkey	Annual	Statewide
	Dove	Annual	Statewide
	Duck - breeding	Annual	Statewide
	Goose-breeding survey	Annual	Statewide
	Goose - neck collar	Annual	Statewide
	Grouse - driving drumming counts	Annual	Southern Indiana Forest
	Grouse – drumming counts	Annual	Maumee study area
	Landowner survey – similar to the small game license survey below but for the ‘unlicensed’ sportsperson	Annual	Statewide
	Quail	Annual	Statewide
	Pheasant	Annual	Statewide
	Pheasant broods	Annual	Northern Indiana
	Raccoon –road-killed	Annual	Statewide

	Small game license holder survey - bobwhite quail, cottontail rabbits, fox squirrels, gray squirrel, mourning dove, pheasant, woodcock	Annual	Statewide
	Turkey	Annual	Northern Indiana
	Turkey – occurrence	As reported	Recent transplant areas
	Woodcock	Annual ¹	Statewide
	Wood duck - banding	Annual ¹	Statewide
	Wood duck - brood	Annually	Statewide
	Wood duck – nest box survey	Annual	On selected state properties
Sport Fish	Game and commercially valuable fish	Annually	Statewide in selected streams, lakes and reservoirs on a rotating schedule.
Amphibians	Anurans - calling frogs and toads *	Annual ¹	Statewide
	Crawfish frog *	Periodic (< 5 yr interval)	Southern Indiana
	Green tree frog *	Periodic (< 5 yr interval)	Southern Indiana (as range expands)
	General salamander *	Periodic (< 5 yr interval)	Fish and Wildlife Areas
	Hellbender *	Annually	Southern Indiana
	Mole Salamander *	Periodic (< 5 yr interval)	Southeastern Indiana
	Spadefoot toad *	Periodic (< 5 yr interval)	Southern Indiana
Birds	Bald eagle – nesting *	Annually	Statewide
	Bald eagle – wintering *	Annually	Statewide

	Barn owl *	Periodic	Statewide, some nest sites each year
	Breeding birds – atlas *	20 year cycle	Statewide
	Breeding birds – summer counts *	Annually with volunteers	Statewide
	Breeding birds – survey *	Annually ¹	Statewide (random routes)
	Colonial waterbird survey *	Periodic (< 5 years)	Statewide
	Least tern *	Annually	Southwest Indiana
	Osprey *	Annually	Statewide
	Peregrine Falcon	Annually	Statewide
Mammals	Allegheny woodrats	Periodic (< 4years)	Extreme southern Indiana
	Archer Index – bobcat, badger, river otter *	Annually	Statewide
	Bobcats – occurrences *	Annually – as reported	Statewide
	Badgers – occurrences *	Annually – as reported	Statewide
	Franklin Ground Squirrels *	Periodic (≤ 10 year intervals)	Northwestern Indiana
	Indiana bats- winter hibernacula census *	Biennially	Caves in southern Indiana
	River otter – bridge /stream survey *	Annual	Statewide
	River otters – occurrences *	Annual – as reported	Statewide
	Swamp rabbits *	Periodic (≤ 10 year intervals)	Southwestern Indiana
Mussels	Mussel (focus on former commercial species) *	10-12 year interval	Big rivers in central and southern Indiana
Fish	Lake sturgeon *	Annual	Big rivers in southern Indiana
	Nongame Fish *	Continuous	Statewide

Reptiles	Box turtle *	Annually	Statewide with emphasis on South-central Indiana
	Kirtland Snake *	Annually	Statewide
	Timber rattlesnake *	Periodic (< 5 yr interval)	South central Indiana
	Mud turtle *	Periodic (< 5 yr interval)	Southeastern Indiana
	Snapping turtle *	Periodic (< 5 yr interval)	South central Indiana
	Wall lizard *	Periodic as reported	Potentially statewide

* Efforts include Species of Greatest Conservation Need

¹. Conducted under a national or regional protocol.

Table 13: Percentage of respondents aware of various monitoring efforts by state agencies and other organizations for species groups in all habitats.

Species group	State efforts	Other Organization Efforts
Amphibians	12.5	15.6
Birds	28.3	22.2
Fish	30.2	10.1
Mammals	18.5	7.4
Mussels	15.0	12.5
Reptiles	12.5	4.9

Table 14. Suggested survey, monitoring, survey technique, survey protocol, and database needs for wildlife species in Indiana.

Species Group	Species	Schedule	Area	Associated database needs
Amphibians	Salamanders	Annual	Statewide	Yes
Birds	Migratory stopover sites	Annual	Selected migratory stopover sites	Yes
	Nesting habitat searches	Annually	Selected habitats	Yes – part of Statewide Bird DB
	Owls and Nightjars	Annually	Statewide in suitable habitat	Yes – part of Statewide Bird DB
	Rails, bitterns, and shorebirds	Annually	Statewide in appropriate wetlands habitat on a regular cycle	Yes – part of Statewide Bird DB
Cave Invertebrates	Cave invertebrates	Continuous	Selected cave systems on a regular cycle	Yes

Species Group	Species	Schedule	Area	Associated database needs
Fish and Mussels	Freshwater mussels	Annually	A subset of Indiana's small streams on a 5-10 year rotation	Yes
Insects	General insect survey	Continuous	Selected rare habitats on a regular cycle	Yes
Mammals	Bats (summer)	Annual	Portions of the state on a regular cycle	Yes
	Bats (winter)	Annual	Known or suspected bat caves on a schedule. (except <i>Myotis sodalists</i> caves)	Yes
	Small mammals (shrews, mice and voles)	Annual -	Statewide - representative habitats, by county on a regular cycle	Yes
	Trapper survey (otter, bobcat, and badger)	Annual	Statewide	Yes
Reptiles	Lizards	Annual	Statewide or by county on a regular cycle	Yes – part of statewide reptile DB
	Snakes	Annual	Statewide or by county on a regular cycle	Yes – part of statewide reptile DB
	Turtles	Annual	Statewide or by county on a regular cycle	Yes – part of statewide reptile DB
General surveys	Surveys of species most in need of conservation, especially in certain habitats.	Annually	Statewide in appropriate habitats on a regular cycle	Yes – part of the Heritage Database (HD)
	General prey inventories,- insect, small mammals, amphibians, etc.	As needed	Specific study sites	No – include in study report
State Land Surveys	General Nongame survey - All nongame wildlife and insects	Annually	DNR properties	Yes – could be part of each area's database and the HD
Additional Database needs	Bird sighting database	Continuous	Statewide	Yes – could be part of a statewide bird database
	(Pit tag database			Yes
	Bat Band Database			Yes
	Road kill database (all vertebrate species)	Annually	Statewide (selected roadways on an established cycle)	Yes
	Wildlife disease	Continuous	Statewide	Yes
	Wildlife rehabilitation	Annual	Statewide	Yes
	Window, cell tower and windmill bird and bat kill database	Annual	Statewide	Yes – could be part of a statewide bird database

B. Habitat Monitoring

Habitat inventory and monitoring has been less deliberate and frequent than species monitoring. In the past, the DNR and the public have depended upon a disjunct collection of separate inventories (e.g., the 10-year USDA Forest Service Forest Inventory and Analysis, National Wetland Inventory, rare community entries in the Heritage Database and others), and specific habitat measures collected in association with specific species inventory surveys. More recently, in aquatic systems, collection of corresponding habitat data has been an important component of sampling protocols aimed at aquatic community assessment such as the Index of Biotic Integrity (IBI), which classifies species in part by their habitat requirements, and the Qualitative Habitat Evaluation Index (QHEI) which directly describes habitat characteristics. However, most of these efforts collect data on a limited number of indicator parameters, in selected portions of streams, lakes, or reservoirs. Even the systematic efforts of the EPA and USGS in Indiana fail to provide a complete picture of aquatic system habitat in Indiana.

Monitoring plans for habitats required by species with greatest conservation need as required by Element 3 of the Congressional guidelines has been hampered by an inability to precisely define the habitat type or component upon which the species depends. Monitoring distribution and abundance of major habitat types to provide baseline data for future comparisons provides a critical foundation.

This CWS effort is the first comprehensive effort by the state to acquire statewide habitat data. A team of specialists, led by four scientists at Indiana State University, will provide either a quantitative measure or an index of over 80 habitat features. Measures for major habitat features will be based on analysis of Landsat 7 Enhanced Thermal Mapper plus (ETM+) or Terra's Advanced Space-borne Thermal Emissions Reflection Radiometer (ASTER) digital data projects for Indiana. Additionally, ISU is to provide a historic overview of the changes in the eight major habitat categories in Indiana from pre-European settlement to present, in hundred-year intervals, with associated changes in fauna. The current habitat analysis and the historic overview are to be presented in a format suitable for publication as a reference book. This effort will be completed in the spring of 2006. The habitat analysis effort will be adequately documented so that the process maybe replicated in the future to allow for fully comparable sequential analyses.

Thus, a habitat baseline will be established for Indiana at the beginning of this century against which changes may be documented. Every major revision of the CWS (likely 10-year intervals) will include a replication of the habitat analysis. However, factors affecting habitats and our understanding of species/habitat interactions change. As an understanding of these factors develops, so does the need to measure specific habitat characteristics. DNR biologists, species experts and conservation partners identified additional habitat survey and monitoring needs. Table 15 and Appendix N provides a list of additional habitat monitoring needs as required by Element 5 of the CWS Congressional guidelines. The degree to which these monitoring efforts are implemented and the implementation schedule (plan) depends upon a variety factors including funding and available technology and expertise. In response to new information, regional or national priorities, or availability of inventory opportunities, this list may be amended to provide for efficient, effective conservation. To accommodate adaptive management, additional habitat characteristics may need to be inventoried.

Table 15. Habitat monitoring needs and associated database.

Habitat Type	Habitat Feature	Schedule	Area	Associated database needed
All Habitats	Quantitative or index information on the total acreage, geographic distribution, patch size, native vs. non-native, vegetation diversity and relative abundance, ownership, and relative condition of the habitats.	Once per decade	Statewide	Yes
All Habitats	Invasive animals and plants	Continuous	Statewide	Yes – including treatment information and results
All Habitats	Soil maps	Continuous	Statewide	Yes
All Habitats	Land cover/land use	As available	Statewide	Yes
Agricultural	Agricultural statistics	Annual	Statewide	Yes
Aquatic Systems	Aquatic systems - bottom substrate and contour	Continuous	Statewide	
Aquatic Systems	Environmental contaminants in waterways	Some streams should be monitored annually others on a rotating schedule	Statewide	Yes
Barren lands	Rock outcrops	Continuous	Statewide	Yes
Forest lands	Forest statistics	As available, large public landholding should be monitored annually	Statewide	Yes
Subterranean systems	Cave locations, cave recharge areas, and general karst feature inventory	Continuous	Southern Indiana	Yes
Wetlands	Restored Wetlands	Continuous	Statewide	Yes

C. The Effectiveness of the Conservation Actions Taken

Conservation actions should be based on the best available science. Element 5 of the CWS Congressional guidelines addresses the need for adapting conservation actions in response to new information or changing conditions. To allow for adaptive management, successful survey and monitoring efforts have two necessary components: the technically proficient conduct of survey/monitoring protocols and the effective dissemination of results. Both steps are necessary to direct and evaluate the effectiveness of the conservations actions undertaken. The survey/monitoring efforts proposed by the CWS relate to the identification of SGCN (especially early identification), identification of threats to these species and their habitats, monitoring known SGCN, and evaluation of conservation actions. The purpose of survey/monitoring activities is to detect population or habitat change. All partners, including the DFW, are expected to respond appropriately to detected change and adapt their conservation activities. Therefore, all partners involved in the implementation of the CWS have the same responsibility—to conduct well-designed inventory protocols in a technically proficient manner and to make the results of the survey/monitoring efforts available to other partners and interested

parties. The DNR will conduct species and habitat survey/monitoring efforts as resources allow (including, but not necessarily limited to those identified in Tables 12, 14, & 15) and to participate, as appropriate, in regional or national monitoring programs. Along with the results, all aspects of the inventory necessary to the responsible interpretation of the effort will be made available to the partners and other interested parties on an Internet site. Partners are urged to provide their survey/monitoring efforts in a similar manner. Additionally, the DFW will continue to provide relevant data to the Indiana Heritage Database. Easily accessed, timely inventory information will allow conservation partners and other interested parties to track progress towards conservation goals and to apply adaptive management where appropriate. Information sharing by all partners will facilitate the application of accurate, timely information to the environmental review process.

Individual conservation goals set by partners may have specific timelines. The success of these efforts may be evaluated by the available monitoring efforts as appropriate to their specific timeline. The effectiveness of the entire 2005 CWS will be evaluated and addressed in subsequent reviews of this document (not to exceed 10 years as delineated in required item 6)

XIII. Coordination of Conservation Actions Among Relevant Federal, State, Local Agencies, and Other Public and Private Partners

Following the guidance provided in Element 7 of the Congressional Guidelines, the development of the 2005 Indiana CWS was coordinated from its inception with input from federal, state and local conservation agencies that manage significant land and water areas within Indiana or administer programs that significantly affect the conservation of identified species and habitats. Input was solicited from scientists associated with the major land holding and land managing federal and state agencies in Indiana and local and national land trusts operating in the state (See Chapter VI). There are no recognized Indian tribes in Indiana. Presentations were made to DFW staff and DNR executives to ensure that internal audiences were cognizant of this effort. Federal agency staff, NGO staff and university-based experts were contacted by phone and briefed on the CWS mandate and Indiana's approach. Additionally, over 570 potential partners, including federal, state and local agencies, were contacted and e-mailed an electronic survey to determine the nature of their capacity to partner on conservation actions and their area of wildlife or habitat interest (see page 19 for survey methods and survey instrument description). As the CWS developed, additional opportunities were provided for input and review through online reviews, telephone interviews, as well as through face-to-face meetings with significant land and water management agencies and organizations. Where appropriate the CWS was revised based on comments received during draft CWS review and comments received are included in Appendix F 1-78.

XIV. Use of New Information to Adapt Conservation Actions During Implementation

Following the guidance provided in part of Element 5 of the Congressional Guidelines (page 13) conservation actions will be adapted by responding appropriately to new information or changing conditions. The Indiana CWS process and associated electronic tools have been designed from the outset to provide a mechanism for gathering baseline information in a format that can be updated as needed. The system has established an extensive database of contact information that reflects the current knowledge base in the state of Indiana, both in regard to technical expertise and conservation partnership opportunities. It truly lays the groundwork for more expansive collaboration and information sharing as new knowledge, tools, and concepts are developed in the future.

The congressional requirement for the development of Conservation Wildlife Strategies in coordination with all levels of potential conservation partners has firmly established an unprecedented level of responsibility for all conservation partners to share information and to work efficiently toward common goals. This is the first time in history the Indiana has strategically assessed habitats, wildlife species and conservation partners. The sheer magnitude of the conservation needs identified herein underscores the need to coordinated conservation actions based on the best available science.

Implementation of the 2005 CWS will be guided by an action plan to be developed with partner input in early 2006 with the potential for each partner to design coordinated work plans in accordance with the directions set in the state action plan. Conservation minded entities will no longer have the luxury—or limitations—of working in isolation. While they may be exposed to increased scrutiny from conservation colleagues, they will also receive more credit for efforts that may currently go unnoticed.

The DFW is committed to the promotion of communication and information sharing, using the best available communications technology, and urges all our conservation partners to engage in this dialogue. Through web based sharing of habitat and species monitoring efforts, participation in professional organizations, and enactment of the implementation action plan, the DFW will strive to ensure the development of the scientific foundation of adaptive management. Communication between partners, as the implementation of the action plan proceed, will ensure that conservation actions respond appropriately to new information or changes in condition.

XV. Future Strategy Revision and Update

A. Coordination with relevant individual federal, state, and local agencies and Indiana Tribes

Element 6 of the Congressional Guidance (page 13) directs that Strategies be reviewed at intervals not to exceed 10 years. Element 7 provides direction to ensure that Strategies provide effective dynamic guidance by requiring ongoing coordination with partners in the review, revision and implementation of the strategy. Indiana has identified a large number of potential conservation partners to implement this strategy. Indiana's CWS was specifically designed to facilitate the formation of conservation partnerships during the implementation of the strategy.

The matrix of conservation partners, Table 11, provides information to allow partners to locate other conservation groups with similar habitat or wildlife species focus. Partner survey responses provide detailed information the resources and capacity of these organizations to implement conservation actions, including preferred methods of communication and contact information. The state has never before had such a complete database of conservation organizations, providing an enhanced conduit for continued interaction as implementation proceeds.

The magnitude of the conservation needs identified in the CWS is such that the logical next step is to provide more focus for implementation. This focus can be accomplished by the development of an action plan in coordination with conservation partners and in consideration of available implementation resources. In early 2006, all partners (including relevant individual federal, state and local agencies and other conservation partners) will be invited to develop an operational plan (action plan) for implementation of the 2005 CWS. These partners will be encouraged to participate to the greatest extent possible and to assist in the dissemination of information relative to the implementation of the CWS. Information gathered via the electronic partnership survey (page 19) and presented in Appendix H will allow partners to recognize where organizations and resources can come together to address conservation needs.

All active partners are expected to claim conservation actions appropriate to their goals and objectives and to provide performance measures for their efforts. Review and revision of Indiana's 2005 CWS based on the partner's self-determined performance measures is expected to be an ongoing activity. A great deal of insight is expected to result from the ongoing iterative process of the action plan that includes implementation of conservation actions, evaluation, strategy revision, and adaptation. These insights will be applied to the next major revision of the Indiana CWS.

The next major revision of the CWS is scheduled for completion before 2015 and is expected to build on the 2005 effort and to benefit from over 8 years of experience gained from the implementation of this CWS. The 2005 Indiana CWS was developed to establish baseline information on the distribution and abundance of wildlife in Indiana, including species of greatest conservation need, the habitats upon which the species depend and the threats to the species and their habitats, and research and monitoring needs. The online surveys used to gather information on these elements can be updated and used to replicate this study at regular intervals to track the progress of Indiana's conservation efforts. Comparison of the 2005 and 2015 results will provide the best long-term evaluation of the conservation efforts guided and supported by this congressionally mandated and funded strategic process.

B. Obtaining Public Input and Partner Involvement

A web site was created and maintained throughout the development of the CWS to facilitate public participation and information sharing about all aspects of this process as required by Element 8 of the Congressional Guidance. News releases, public presentations at professional meetings and web links were used to direct the public to the CWS web site. The public was invited to provide comment on the draft plan in September 2005 and those comments are included in Appendix O. The draft Indiana Comprehensive Wildlife Strategy was made available for public comment between July 24th and September 21st 2005. The following partners utilized press kit materials to generate awareness and solicit public comment on the DRAFT Indiana Comprehensive Wildlife Strategy. The partner either posted an article on its website with a link to the draft strategy, put an article in its newsletter directing readers to the CWS website to review the strategy, wrote an article for a daily newspaper referencing the press kit or provided information about the strategy at its facility for the public to take home.

- Muncie Star
- Dunes-Calumet Audubon Chapter
- Merry Lea Environmental Learning Center of Goshen College
- Indiana Wildlife Federation
- Indiana Academy of Science
- Robert Cooper Audubon Society
- Indiana Forestry and Woodland Owners Association
- Central Indiana Land Trust

Numerous other partners presented the materials to members during monthly meetings and encouraged members to visit the website to provide comment on the DRAFT strategy. According to Webtrends, the website tracking service, the Draft Indiana Comprehensive Wildlife Strategy was downloaded over 2,800 times during this time period.

Partner organizations communicate with their members and the public in various ways, such as newsletters, member letters, e-mail or website updates. All partners will be encouraged to report to their respective audiences on their activities and the progress of the 2005 CWS implementation. The contractors DFW hired to assist with the development of the CWS will also facilitate the development of the 2005 CWS action plan and provide guidance to the partners on how to communicate their activities to the public. Conservation partners that responded to the electronic partner survey were re-contacted regarding their methods of member and supporter communications. Partner groups will be provided with factual information regarding their potential involvement in implementing the CWS for expanded dissemination to their members and supporters. For broad public consumption, the DFW is committed to providing an Internet site with progress reports on the implementation of the 2005 strategy. Members of the public wishing to participate in the implementation of the CWS will be directed to contact the DFW or relevant partners.

XVI. Glossary

Abundance - The number of individuals of a particular species.

Acidification - To make or become acidic. For example, mine waste can cause acidification of streams by lowering the pH of the water below 7.0.

Aggregated - A totaling of all data received relative to a designated factor.

Agriculture - Lands devoted to commodity production, including intensively managed nonnative grasses, row crops, fruit and nut-bearing trees.

Aquatic Systems - All water habitats (both flowing and stationary) in Indiana, including lakes, reservoirs, rivers, streams and other waterways, but excluding wetlands.

Barren Lands - Lands dominated by exposed rock or minerals with sparse vegetation.

Bioaccumulation - The accumulation of a substance, such as a toxic chemical, in various tissues of a living organism.

Biodiversity - The number and variety of organisms found within a specified geographic region. The variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.

Bogs - An area having a wet, spongy, acidic substrate composed chiefly of sphagnum moss and peat in which characteristic shrubs and herbs and sometimes trees usually grow. Bogs are usually acid areas, frequently surrounding a body of open water. Bogs receive water exclusively from rainfall.

Breeding range - The geographic region or area in which a species reproduces.

Buffer zone - An area maintained in a land use that provides a transition zone between two types of habitat. In conservation, buffer zones are neutral areas between wildlife habitat and areas that have been highly disturbed by humans. An area planted with a variety of grasses may be a buffer zone between a wetland and an urban development.

Candidate species - A species of plants or animals classified as a candidate for possible listing as endangered or threatened by a government agency.

Channelization - Straightening of a stream or dredging of a new channel to which the stream is diverted, resulting in the removal of its sinuosity (bends).

Community types - A group of populations or species that interrelate directly with each other and their specific environment. Characteristics used for identifying community types include factors such as water regimes, soils, substrate type, topographic position (elevation), plant species composition, and animal associations. Sixty-one community types have been identified within Indiana. Information on community types is maintained by the Indiana DNR Division of Nature Preserves.

Conservation - The protection, preservation, management, or restoration of wildlife and of natural resources such as forests, soil, and water.

Conservation easements - A voluntary binding agreement that permanently limits a particular property to conservation-compatible uses.

Conservation practices - Specific actions taken to protect, preserve, manage or restore wildlife and natural resources. Examples include establishing wind breaks, streambank stabilization, and tree planting. Incentive programs may list the particular kinds of conservation practices for which cost-share funding is available.

Contaminant - A toxin, hazardous substance, or pollutant introduced into the environment through human activity, either directly or as a byproduct.

Culling - Selective removal of particular individuals from a population to achieve an overall improvement in the health of the population. Can be done to reduce overall population size or to remove only individuals with certain undesirable characteristics, such as those that are diseased or of a certain age or size class.

Degradation - A decline in conditions or characteristics of wildlife species or habitat to a lower condition, quality or level.

Developed Lands - Highly impacted lands, intensively modified to support human habitation, transportation, commerce and recreation.

Distribution - The geographic area over which a species occurs.

Ecoregional planning initiative - A collaborative initiative launched by The Nature Conservancy (TNC) in the mid-1990s to identify high priority biodiversity conservation sites across North America.

Endangered Species - (federal classification) Any species that is in danger of extinction throughout all or a significant portion of its range.

Endangered Species - (state classification) Any animal species whose prospects for survival or recruitment within the state are in immediate jeopardy and are in danger of disappearing from the state. This includes all species classified as endangered by the federal government that occur in Indiana.

Endemism - A native plant or animal by virtue of originating or occurring naturally in a particular place.

Extirpated - (state classification) Any animal species that has been absent from Indiana as a naturally occurring breeding population for more than 15 years.

Extrapolation - To infer or estimate by extending or projecting from known information by assuming that the estimated value or condition follows logically from known values.

Fens - A type of wetland ecosystem characterized by peaty soil, dominated by grasslike plants, grasses, sedges, and reeds. Fens are alkaline rather than acid areas, receiving water mostly from surface and groundwater sources.

Foraging areas - An area where animals look for food.

Forest lands - Lands characterized by a plant community extending over a large area and dominated by trees, the crowns of which form an unbroken covering layer or canopy.

Fragmentation - Scattered or patchy distribution of a particular habitat type in an area that once was continuous habitat.

Genetic pollution - The dispersal of genes to natural organisms, especially by cross-pollination or introduction of closely related exotic species or genetically engineered organisms. Resulting progeny may be less well adapted to the local environment.

GIS - (Geographical Information System) A computer system for capturing, storing, checking, integrating, manipulating, analyzing, and displaying map-based data related to positions on the Earth's surface.

Grant reviewer - An individual or group that evaluates a grant proposal.

Grasslands - Open areas dominated by grass species (e.g., prairies or reclaimed mine lands).

Guild - The group of wildlife species associated with a particular habitat type.

Habitat - The type of environment in which an organism or group normally lives or occurs.

Hybridization - Interbreeding of different species or varieties of animals or plants, producing a genetic cross. In some cases, hybrids are sterile or produce offspring that are less well adapted to the environment.

Impoundment - A body of water, such as a reservoir, made by damming flowing waters.

Indiana Heritage Trust (IHT) - Established in 1992 to ensure that Indiana's rich natural heritage would be preserved and enhanced for present and succeeding generations. The purpose of the IHT is to acquire state interests in real property that are examples of outstanding natural resources and habitats or have historical or archaeological significance or provide areas for conservation, recreation, protection or restoration of native biological diversity within the state of Indiana. The use of the power of eminent domain to carry out its purposes is expressly prohibited. Property will be acquired only from willing sellers.

Invasive or non-native species - A species that is 1) non-native (alien or exotic) to the ecosystem under consideration *and* 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Iterative - Characterized by or involving repetition, recurrence, reiteration, or repetitiousness.

John Q. Public - Used as a name to designate a typical member of the general public.

Keystone partners - Organizations or agencies that identified themselves when they completed the conservation partner survey by indicating they wanted to be involved in the development of the CWS and that their organization had a large reach or significant impact on wildlife in Indiana.

Land trusts - A trust created to effectuate a real estate ownership arrangement in which the trustee holds legal title to the property that is significant for wildlife or habitat conservation.

Landholders - One that owns land.

Landscape-level conservation - Conservation of areas large enough to contain functioning ecosystems in which crucial natural processes take place. Processes like fire, flooding, and wildlife migration are essential to the health, biological diversity, and long-term sustainability of an ecosystem.

Mental surrogates - A species that provides a mental picture for the needs of a guild within a particular habitat.

Migration routes - The geographic route along which birds, fish or other species customarily migrate.

Monitoring - To keep track of systematically through collection of information.

Nonpoint source pollution - Pollution that comes from many diffuse sources, caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even underground sources of drinking water.

Objectives - Something worked toward or striven for; a goal

Operational documents - Plans that specify particular actions, generally including the timing, cost, and responsible party for the action.

Partners - One that is united or associated with another or others in an activity or a sphere of common interest; organizations or individuals capable of supporting conservation actions.

Point source pollution - Pollution that generally comes from wastewater discharged from the pipes into rivers, streams, lakes, and the ocean. Examples include industrial facilities and municipal sewage treatment plants.

Press kit - A packaged set of promotional materials, such as photographs and background information, for distribution to the press, as at a news conference or before the release of a new product.

Professional societies - A nonprofit, cooperative, voluntary organization of persons joined by their interest and background in a professional, technical, or managerial field of work.

PSA - An announcement for which no charge is made and which promotes programs, activities, or services Federal, State, and Local Governments or the programs, activities or services of non-profit organizations and other announcements regarded as serving community interests.

Range - The geographic region in which a plant or animal normally lives or grows.

Regimes - Trends in the characteristics of a system, such as the typical changes in seasonal water flow or level.

Reintroduction - Restoring a wildlife species to a habitat type or area where the species was known to have existing in the past, but from which it had disappeared.

Relative abundance - The number of individuals of a particular species as a percentage of the total number of individuals in a given area or community.

Representative species - A wildlife species selected from a guild to “paint a reasonable mental picture of the associated habitat type” when presented to a diverse user group including biologists, the public, legislators, grant reviewers and other partners. The selected species would automatically generate an association with the habitat-related guild and a desire to protect, enhance or somehow improve that habitat as the strategy is implemented. Representative species also were used as mental tools to focus technical expert input on particular relationships between species and their habitats, as they considered research and conservation needs for these associations.

Restoration - Conservation actions taken to return a degraded habitat to a normal or healthy condition.

Savannas - Upland communities of scattered trees, typically oaks, above a ground layer of prairie grasses and forbs. Fire and periodic grazing naturally maintained most of the savannas of the Midwest. Black-oak savannah is the most endangered habitat type in Indiana.

Special concern - (state classification) Any animal species about which some problems of limited abundance or distribution in Indiana are known or suspected and should be closely monitored.

Species - A classification of related organisms that can freely interbreed.

Species of greatest conservation need - Animal species whose populations are rare, declining, or vulnerable.

Sprawl - Haphazard growth or extension outward, especially that resulting from real estate development on the outskirts of a city:

Staging sites - Particular geographic areas used by migrating species to stop as a group for resting along a migration route. Specific staging sites may be consistently used year after year by

the same species. For example, Jasper-Pulaski State Park is a staging site for the migration of sandhill cranes.

Subterranean systems - Surface openings of underground features and connected rooms and passages beyond natural light penetration, such as caves and “disappearing” rivers.

Stakeholders - One who has a share or an interest in the outcome of a planning or strategic process.

State Wildlife Grants (SWG) - A grant that provides funding to every state and territory to support cost effective conservation aimed at keeping wildlife from becoming endangered.

Stewards - An individual that practices the careful management of land usage to ensure natural systems are maintained or enhanced for future generations.

Stocking - To hatch, grow or transfer a group of individuals for release into a habitat for the purposes of establishing or augmenting a wildlife population.

Strategy - A documented process to systematically identify and begin to integrate the broad range of efforts that conserve wildlife and the habitats upon which they depend. A framework for maximizing conservation efforts across the state that fulfills eight elements required for funding through the federal State Wildlife Grant program. Not an operational plan, in that it does not identify specific tasks, assignments, or schedules for achieving wildlife conservation. .

Successional change - The gradual and orderly process of ecosystem development brought about by changes in community composition and the production of a climax characteristic of a particular geographic region.

Synergy - Interaction among qualities in the environment that produce an enhanced combined effect, such as a combination of reproductive and habitat factors affecting species survival and distribution.

Systematic - Carried on using step-by-step procedures.

Talus slopes - A sloping mass of rock debris at the base of a cliff.

Taxa - A taxonomic category or group, such as a phylum, order, family, genus, or species

Taxonomic groups - Animal or plant groupings that show evolutionary relationships between organisms.

Technical expert - A person with specific knowledge or expertise regarding species or habitats found within the state of Indiana.

Terrestrial - Of or relating to or inhabiting the land as opposed to the sea or air.

Territory - A defined area (including land and waters) in possession of and defended by an animal.

Threatened species (federal classification) - Any species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Threatened species (state classification) - There is no legal classification for state-listed threatened species.

Toxin - A poisonous substance introduced through pollution.

Wetlands - Areas shallowly flooded temporarily or permanently to cover the base of plants but not prolonged inundation of the entire plant; areas temporarily flooded often supporting aquatic plants and animals; areas temporarily or permanently flooded with woody vegetation taller than 6 meters; areas of usually shallow wetlands dominated by non-woody plants such as cattail, reeds or rushes; areas with moist non-vegetated soil, often produced in shallow wetlands by advance and retreat of water levels; areas permanently flooded and often supporting aquatic plants and animals; and areas flooded temporarily or permanently with woody vegetation shorter than 6 meters.

XVII. References and Acknowledgments

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Conservation Partners:

ACRES, Inc.
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American Society of Landscape Architects, Indiana Chapter
Amos W. Butler Audubon society
Aquatic Weed Control
Arrow Head Country Resource Conservation & Development Area, Inc.
Bartholomew County Conservation Council, Inc.
Big Oaks National Wildlife Refuge, USFWS
Blue Heron Ministries, Inc.
Center for Urban Policy and the Environment
Central Hardwoods Joint Venture/American Bird Conservancy
Central Indiana Land Trust
Central Indiana Trout Unlimited
Cinergy Corp.
Clark's Valley Land Trust
Cordry Sweetwater Conservancy District

Crooked Creek Conservation & Gun Club, Inc.
Division of Fish and Wildlife
DNR Division of Nature Preserves
Ducks Unlimited, Inc.
Dunes-Calumet Audubon Chapter
Earth Source, Inc.
EnviroScience Incorporated
Federal Highway Administration (FHWA)
Fish Lake Conservancy District
Four Rivers Resource Conservation & Development Area
Fur takers of America chapter 7-E North West IN.
Fur Takers of America, Inc
Great Lakes Commission
Hamilton Lake Conservancy District
Hoosier Conservation Alliance
Hoosier Environmental Council
Hoosier Heartland Resource Conservation and Education council
IDNR- Division of Forestry- Cooperative Forest Management Section (Private Lands)
Indian Deer Hunters Association
IN DNR, Division of State Parks & Reservoirs, Interpretive Services
Indiana Academy of Science
Indiana Association of Cities and Towns
Indiana Association of Soil and Water Conservation Districts
Indiana Bass Chapter Federation
Indiana Beaglers Alliance
Indiana Beef Cattle Association
Indiana Biodiversity Initiative
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Indiana Department of Transportation
Indiana Division of the Izaak Walton League of America
Indiana Dunes National Lakeshore
Indiana Environmental Institute
Indiana Forest Industry Council (IFIC)
Indiana Forestry and Woodland Owners Association
Indiana Forestry Educational Foundation
Indiana Grand Kankakee Marsh Restoration Project
Indiana Hunter Education Association
Indiana Karst Conservancy
Indiana Land Resources Council
Indiana Michigan Power and affiliate of American Electric Power; Land Management Department
Indiana Native Plant and Wildflower Society
Indiana Pork Producers Association
Indiana Quail Unlimited

Indiana Rural Water Association
Indiana Smallmouth Club (ISC)
Indiana Soybean Board (ISB) & Indiana Soybean Growers Association (ISGA)
Indiana Sportsmen's Roundtable
Indiana State Trappers Assoc.
Indiana Watershed Leadership (new initiative) with Purdue University
Indiana Wildlife Federation
Indianapolis Flycasters
Indianapolis Power & Light Co.
JFNew and Associates
Kankakee River Basin Commission
Lake Bruce Conservancy district
Lake Lemon Conservancy District
Lake Maxinkuckee Environmental Council (LMEC)
Lake McCoy Conservancy District
Law Enforcement Division, Indiana Department of Natural Resources
Lincoln Hills RC&D
Little River Wetlands Project, Inc.
Lost River Conservation Association
Mason & Hanger Corp. Newport Chemical Depot
Merry Lea Environmental Learning Center of Goshen College
Midwest Peregrine Falcon Recovery Project
Muscatatuck National Wildlife Refuge US FWS
MWH Americas, Inc.
National Audubon Society - Indiana Important Bird Areas Program (IBA)
National Wild Turkey Federation
Naval Support Activity Crane
NICHES Land Trust
Northeast Chapter 7 Furtakers
Northeastern Indiana Trout Association
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Northwestern Indiana Regional Planning Commission (NIRPC)
Patoka River National Wildlife Refuge & Management Area
Pheasants Forever Inc.
Potawatomi Audubon Society
Red-tail Conservancy, Inc.
Robert Cooper Audubon Society
Sassafras Audubon Society
Save the Dunes Conservation Fund
Sierra Club Hoosier Chapter
South Bend-Elkhart Audubon Society
St. Joseph County Soil & Water Conservation District (SWCD)
St. Joseph River Watershed Initiative
Steelheaders of Northwest Indiana (Northwest Indiana Steelheaders)
Summit Lake State Park
Sycamore Land Trust
The Indiana Audubon Society
The Nature Conservancy

Tippecanoe Audubon Society
Trillium Land Conservancy, Inc.
U.S. Army Corps of Engineers Regulatory Branch, Louisville District
U.S. Department of Agriculture, Forest Service, Hoosier National Forest
U.S. Fish and Wildlife Service - Indiana Private Lands Office
US Fish and Wildlife Service Ecological Services (does not include national wildlife refuges)
USDA Natural Resources Conservation Service
Valparaiso Lakes Area Conservancy District
Valparaiso Chain of Lakes Watershed Group, Inc.
Veolia Water Indianapolis, LLC
Wabash River Heritage Corridor Commission
Wawasee Area Conservancy Foundation, Inc.
Whitewater Valley Land Trust, Inc.

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XVIII. Appendices

The entire Appendices totals almost 3000 pages and thus are not included in this file. Please see <http://www.djcase.com/incws/appendices/appendices.htm> for access to these documents.

Appendix A: Complete list of Habitat definitions

Agriculture: Lands devoted to commodity production, including intensively managed nonnative grasses, row crops, fruit and nut-bearing trees.

2) Aquatic systems,

This habitat is comprised of all water, both flowing and stationary, habitats in Indiana.

Lake Michigan

Lake Michigan is Indiana's largest natural lake, although Indiana can only lay claim to about 1% (224 mi²) of its area and only 45 miles of its shoreline. The southern tip of Lake Michigan forms Indiana's extreme northwest border. Ecology of the lake is ruled by the massive amount of offshore, deep, cold water, wind seiches, and newly introduced exotic species.

Rivers and Streams by Order and Watershed

A. Great Lakes drainage (includes Lake Michigan and Lake Erie tributaries)

1). headwater (< 20 mi² drainage area) The Great Lakes drainage of Indiana includes waters that flow into Lake Michigan and Lake Erie and are located in extreme northern Indiana and northeast Indiana. Headwater streams are those having a drainage area of < 20 mi². Headwater streams of the Great Lakes drainage of Indiana are of low to medium gradient, with sandy/rocky bottoms and are highly associated with the extensive natural lakes and wetlands of the region. Many have been channelized and highly modified for drainage to maintain agricultural lands.

2). wadeable/large river (> 19 < 2,000 mi²) The Great Lakes drainage of Indiana includes waters that flow into Lake Michigan and Lake Erie and are located in extreme northern Indiana and northeast Indiana. Wadeable/large rivers are those having a drainage area of > 19 < 2,000 mi². Wadeable rivers and streams of the Great Lakes drainage of Indiana are of low to medium gradient, with sandy/rocky bottoms and are highly associated with the extensive natural lakes and wetlands of the region.

3). great river (> 1,999 mi²); this includes all of the St. Joseph River in St. Joseph and Elkhart counties, and the lower section of the Maumee River in Allen County The Great Lakes drainage of Indiana includes waters that flow into Lake Michigan and Lake Erie and are located in extreme northern Indiana and northeast Indiana. Great rivers are those having a drainage area of > 1,999 mi². This includes all of the St. Joseph River in St. Joseph and Elkhart counties (Lake Michigan drainage), and the lower section of the Maumee River in Allen County (Lake Erie drainage). Great Rivers of the Great Lakes drainage of Indiana are of low to medium gradient and characterized by sandy/rocky bottoms.

B. Kankakee River (Illinois River) drainage

1). headwater (< 20 mi² drainage area) Rivers and streams of the Kankakee River (Illinois River) drainage are those found in northwest Indiana that flow west into Illinois and eventually the Illinois River. Headwater streams are those having a drainage area of < 20 mi². Headwater streams of the Kankakee River drainage are

Appendix A: Complete list of Habitat definitions

now highly modified, often manmade, sandy/muck bottom, channelized ditches, maintained to drain agricultural lands and control flooding.

2). wadeable/large river ($> 19 < 2,000 \text{ mi}^2$) Rivers and streams of the Kankakee River (Illinois River) drainage are those found in northwest Indiana that flow west into Illinois and eventually the Illinois River. Wadeable/large rivers are those having a drainage area of $> 19 < 2,000 \text{ mi}^2$. Once a series of meandering streams through a huge wetland complex, most of the rivers and streams of the Kankakee River drainage are now highly modified, sandy/muck bottom, channelized ditches, maintained to drain agricultural lands and control flooding.

C. Ohio River drainage

1). great river ($> 1,999 \text{ mi}^2$); this includes the Ohio River, the Wabash River upstream to the Mississinewa River, the White River upstream on the West Fork to the Johnson/Morgan county line and on the East Fork to just south of Columbus (Bartholomew County) Rivers and streams of the Ohio River drainage include all waters of the lower half of Indiana and a large portion of the northern half of Indiana. Great rivers are those having a drainage area of $> 1,999 \text{ mi}^2$. This includes the Ohio River, the Wabash River upstream to the Mississinewa River, the White River upstream on the West Fork to the Johnson/Morgan county line and on the East Fork to just south of Columbus (Bartholomew County). The entire Ohio River drainage of Indiana culminates where the Wabash River meets the Ohio River in the extreme southwestern tip of Indiana.

2). eastern corn belt/interior plateau ecoregions

a. headwater ($< 20 \text{ mi}^2$ drainage area) Streams of the Ohio River drainage, Eastern Corn Belt ecoregion are found in central and east-central Indiana; Interior Plateau ecoregion streams are found in south-central and southeastern Indiana. Headwater streams are those having a drainage area of $< 20 \text{ mi}^2$. Many headwater streams of the Eastern Corn Belt ecoregion are constructed drainage ditches or channelized streams and are intermittent. The Interior Plateau ecoregion includes Indiana's karst region and the most rugged terrain of Indiana.

b. wadeable/large river ($> 19 < 2,000 \text{ mi}^2$)

Streams of the Ohio River drainage, Eastern Corn Belt ecoregion are found in central and east-central Indiana; Interior Plateau ecoregion streams are found in south-central and southeastern Indiana. Wadeable/large rivers are those having a drainage area of $> 19 < 2,000 \text{ mi}^2$. The streams of the Eastern Corn Belt ecoregion are highly influenced by the extensive agriculture that dominates the ecoregion. The Interior Plateau ecoregion includes Indiana's karst region and the most rugged terrain of Indiana.

3). interior river lowland

a. headwater ($< 20 \text{ mi}^2$ drainage area) Streams of the Ohio River drainage, Interior River Lowland ecoregion are found in southwestern Indiana. Headwater streams are those having a drainage area of $< 20 \text{ mi}^2$. Headwater streams of the Interior

Appendix A: Complete list of Habitat definitions

River Lowland have been heavily modified for agricultural purposes and many are intermittent.

b. wadeable/large river ($> 19 < 2,000 \text{ mi}^2$) Streams of the Ohio River drainage, Interior River Lowland ecoregion are found in southwestern Indiana. Wadeable/large rivers are those having a drainage area of $> 19 < 2,000 \text{ mi}^2$. Streams of the Interior River Lowland ecoregion are heavily impacted by the low, nearly level flood plains associated with the great rivers of the region.

Oxbows/Backwaters/Sloughs/Embayments

The oxbows/backwaters/sloughs/embayments of Indiana are for the most part restricted to the southwest portion of Indiana and along the Ohio River forming Indiana's southern boundary. These habitats vary highly in their structure and permanency, and are all associated with large river habitats. They characteristically have muck bottoms and function as important nursery areas for large river fish species. Although many of these habitats are natural, others are manmade. Embayments along the Ohio River are the result of the series of locks and dams that have been created along the Ohio River. Many oxbows are the result of stream channelization.

Natural Lakes

Eighteen counties in northern Indiana contain natural lakes, although Kosciusko, Lagrange, Noble and Steuben counties contain nearly 70% of the total surface acreage. Natural lakes vary widely in habitat and eutrophication. Less fertile lakes tend to be deep and well oxygenated with marl or sandy substrates. More fertile lakes tend to be shallow with muck bottoms and dense stands of aquatic vegetation.

Impoundments

Impoundments are artificially constructed or maintained standing or flowing water bodies.

River: A broad, deep inland body of water with a steady, directional current (Kusler 1983).

Kettle Lake: Lakes formed in depressions left by the melting of large blocks of glacial ice which remained after a glacier receded (Kusler 1983).

Barren Lands: Lands dominated by exposed rock or minerals with sparse vegetation.

Barren Lands Active Quarries: Vegetative cover removed to extract mineral, stone, gravel, or sand.

Barren Lands Bare Dunes: A hill, mound or ridge of wind deposited sand (Jackson 1997).

Barren Lands Cliffs: Abrupt steep sloped exposed rock face.

Appendix A: Complete list of Habitat definitions

Barren Lands Rock Outcrops: Large rock surfaces exposed along a predominantly soil covered slope.

Developed Lands: Highly impacted lands, intensively modified to support human habitation, transportation, commerce and recreation.

Developed Lands Golf Courses: Lands intensively managed, in whole or in part, for human use relative to the game of golf.

Developed Lands Industrial Lands: Areas supporting the production of manufactured goods materials and energy, for example, steel mills, petroleum refineries and electricity generating plants.

Developed Lands Roads/Rails/Bridges: Corridors, paved strips and connecting structures for the moving of goods, services and people by cars, trucks, and trains.

Forest Lands, A plant community extending over a large area and dominated by trees, the crowns of which form an unbroken covering layer or canopy.

pre-forest- This is the initial stage as an area begins to revert from a cleared condition to forest. It is typified with annual/ perennial herbs, forbs and grasses with some shrubs and intolerant tree seedlings.

early forest- Typified by tree seedlings (less than 1" diameter breast height [dbh]) and tree saplings (greater than 1" dbh but less than 5" dbh). The tree species often occur in combination with non-arborescent woody shrubs and perennial herbs/forbs.

pole stage- Typical dominant overstory vegetation is composed of pole sized trees (greater than 5" dbh but less than 9" dbh in softwoods or 11" dbh in hardwoods). Pole Stage forests may contain a higher percentage of intolerant or midtolerant species than later developmental stages. Canopy may be partially or completely closed, but is- often at a lower height than later stages. Older forests that are heavily harvested or damaged by weather or fire will often have a structure that resembles the Pole Stage.

mature high canopy stage- Typical dominant overstory vegetation is composed primarily of sawtimber sized trees (greater than 9" dbh in softwoods and 11" dbh in hardwoods). The forest canopy is usually higher than in previous stages and predominantly closed with occasional canopy gaps. Older forests that are selectively harvested will usually remain in the Mature/High Canopy condition after harvest while those areas that are clear cut or contain regeneration openings will revert back to the Early Forest Stage.

old forest stage – Main overstory canopy trees are relatively old and relatively large for the represented species on that site. There are a significant number of standing snags and downed logs present. More frequent and larger canopy gaps occur as older trees die and the gaps revert to the Early Forest Stage.

Appendix A: Complete list of Habitat definitions

Forests Floodplain Forests: Forests in a nearly level alluvial plain that border a river and is subject to flooding (Jackson 1997).

Forests Forested Wetlands: Forest that develops on hydric soils and supports hydrophytic trees such as willow, pin oak, sycamore and cottonwood.

Forests Riparian Wooded Corridors/Streams: Forests associated with river and stream banks. Often utilized as travel corridors by wildlife and affects in-stream habitat.

Generalist: Species not strongly associated with any particular natural habitat.

Grasslands: Open area dominated by grass species, for example, prairies or reclaimed minelands.

Grasslands Early Successional Areas: Areas maintained by natural or anthropogenic means in vegetation dominated by grasses, annual and perennial forbs with a poorly developed tree and shrub component.

Grasslands Farm Bill Programs: Grasslands developed in a predominately agricultural landscape to promote soil and water conservation and wildlife habitat values.

Grasslands Fescue: Areas dominated by nonnative, cool season fescue grasses. This intensively planted grass is one of the most common plants in Indiana and is often planted to control erosion along highways and other developed areas. Fescue is also extensively used for hay and pasture for livestock.

Grasslands Haylands: Open areas maintained in mixed grass (low fescue content) and forb covers or predominated by legumes and periodically harvested during the growing season to produce forage for livestock.

Grasslands Pasture: Open areas predominated by grass species and utilized by grazing livestock.

Grasslands Prairies: An open, usually treeless area, with its vegetation composed primarily of native grasses, forbs, and wildflowers. (Jackson 1997)

Grasslands Reclaimed Minelands: Open areas created by total soil disturbance related to surface mining activities and revegetated with warm or cool season grasses.

Grasslands Savannah: An area of predominately prairie mixed with scattered individual trees or groves of trees. Vegetation is transitional in type between grassland and forest (Jackson 1997).

Appendix A: Complete list of Habitat definitions

Grasslands Vegetated Dunes and Swales: Ridge and valley topography developed by wind blown sand deposits. These deposits are near Lake Michigan. Vegetative cover progresses the further the dunes are from the lakeshore.

Shrub/Scrub: Transitional areas of mixed vegetation (i.e., grasses, small shrubs, trees and forbs) undergoing natural succession to forest.

Subterranean Systems Cave Entrances: Surface openings of subterranean features reaching as far as natural light can penetrate (i.e., twilight zone).

Subterranean Systems Caves: Connected underground rooms and passages beyond natural light penetration.

Wetlands Emergent: Areas shallowly flooded temporarily or permanently to cover the base of plants but not prolonged inundation of the entire plant.

Wetlands Ephemeral: Areas temporarily flooded often supporting aquatic plants and animals.

Wetlands Forested: Area temporarily or permanently flooded with woody vegetation taller than 6 meters.

Wetlands Herbaceous Marsh: Usually shallow wetlands dominated by non-woody plants such as cattail, reeds or rushes.

Wetlands Mudflats: Moist nonvegetated soil, often produced in shallow wetlands by advance and retreat of water levels.

Wetlands Permanent: Areas permanently flooded and often supporting aquatic plants and animals.

Wetlands Shrub/Scrub: Area flooded temporarily or permanently with woody vegetation shorter than 6 meters.

(Wetland categories were adapted from Cowardin 1979)

Literature Cited

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Appendix A: Complete list of Habitat definitions

Kusler, JA. 1983. Our national wetland heritage: A protection guidebook. Environmental Law Institute, Washington, D.C. 167 p.

**Indiana Division of Fish and Wildlife
Comprehensive Wildlife Strategy
Development Communications Plan
7-1-2005 Working Document**

Background

The Indiana Department of Natural Resources Division of Fish and Wildlife (DFW) is developing a Comprehensive Wildlife Strategy (CWS) focused on conserving the habitats and communities that sustain all wildlife species. The DFW approach will help prevent state and federal listing of additional species as threatened and endangered, recover populations of species that are already listed and efficiently use resources of the agency and its partners to implement cooperative conservation projects.

The completed strategy will be used by a wide range of partners, including state, federal, private and not-for-profit organizations to facilitate coordinated efforts to conserve the diversity of wildlife species and habitats in Indiana. The CWS will also meet the requirements of the enabling legislation for the State Wildlife Grants program and complementary but slightly different language for the Wildlife Conservation and Restoration Program, making the state eligible for federal funding for conservation.

A communications plan is needed to involve all partners (target audiences) to ensure successful *development* of the CWS. A separate (or expanded) communications plan will be needed to enhance *implementation* of the CWS after it is developed and approved by the U.S. Fish & Wildlife Service (FWS). The major components of the communications plan are goals, strategic approach, target audiences, tactics, action plan and evaluation. We have identified specific objectives, tactics and key messages for each target audience. Some of these objectives and key message are the same across audiences, yet some are very different. Success of the plan will be measured by evaluating if target audience objectives are achieved.

Goals

Goal statements should help answer the question: What results are expected from this communications effort? Following are the goals of the communications plan for development of the CWS.

As a result of this strategic communications effort:

1. Target audiences will be informed and excited about the development and implementation of the CWS.
2. Target audiences will understand why the CWS is being developed (to manage wildlife species of greatest concern by protecting the habitat needed for them to thrive).
3. Target audiences will understand that there is an opportunity to use the CWS to develop an integrated approach to conserve wildlife.
4. Target audiences will support the CWS development process (and participate in it, as appropriate).
5. Target audiences will participate in implementing the CWS when it is completed.

6. DFW will develop or maintain positive relationships with target audiences.
7. Target audiences will understand the role of the DFW Wildlife Diversity Section in developing and implementing the CWS.
8. DFW will begin developing a mechanism for creating and utilizing multi-disciplinary teams to protect and enhance wildlife habitat.

Strategic Approach

It is important to have a communications plan for the development of the CWS, so the audiences involved understand the goals of the CWS, the development process, how the identified audiences can be involved, and how the strategy will conserve Indiana's wildlife.

There are numerous diverse audiences that need to be involved in the development of the CWS. To be successful, each audience needs to know or do different things. DFW/DJCA will use the following strategies to engage audiences:

- Customize communications for each partner or target audience.
- List and define each target audience and the unique objectives, key messages and communications tactics that will be used to reach each audience.
- Survey conservation organizations to gather feedback about how to best communicate with this audience about the CWS **and to** determine how engaged they may be in development and implementation.
- Conduct one-on-one discussions and presentations, as appropriate. This is one of the most effective ways to communicate key messages. Since it is impossible to do this with all target audiences, DJCA and the survey responses will determine select keystone partners and other partners who can transmit information from the DFW to additional constituents.
- Develop customizable promotional pieces to communicate with target audiences.
- Develop and maintain a database of audiences involved with the CWS that includes existing DNR constituents and develops new contacts with nontraditional audiences. The database will be used to communicate with everyone involved in the process to:
 - a) Advise them of the process;
 - b) Gather information on existing conservation efforts and needs;
 - c) Facilitate comment on the CWS; and
 - d) Prepare them for involvement in implementation.

Target Audiences

There are five general audiences that we need to engage during the CWS development process. Each audience will make a different contribution to the success of the CWS, so each audience has unique objectives, key messages and communications tactics described later in this plan. Each target audience group is listed and defined below. In an attempt to include all audiences, we

have listed some example organizations within each target audience. See *Appendix A* for a complete list of identified organizations listed by target audience group.

1. Upper-level government – executive level staff working for the state of Indiana. Audience includes: the governor’s office, the DNR Director and administrators, etc. Support is needed from executive level staff to develop and implement the CWS.
2. IN DFW staff – the Division of Fish and Wildlife staff including but not limited to administrators, field staff and section heads. All staff must support the development of the CWS because the final plan will be a blueprint that guides DFW conservation projects at all levels.
3. Technical experts – wildlife biologists or other experts that have expertise in an IN habitat or species. These experts may work for the IN DNR or outside of the DNR with another conservation organization or institution. These are the experts who conduct “on-the-ground” habitat or species conservation work or research in Indiana.
4. Conservation organizations – any conservation organization that can assist in the development and/or implementation of the CWS. DJCA sent an electronic survey to a broad list of over 500 organizations or representatives from those organizations in the state. Survey responses will be used to place each in one of the following “Conservation organization” categories. Categories are necessary to define the level of involvement of each organization, and to help the DNR better target its communications efforts.
 - I. *Keystone Partners* – these organizations will need to be intricately involved in the development process and have all of the following:
 - Staff experts that will provide technical information through the technical expert survey or by reviewing the draft CWS document. Some staff might have expertise in a species and others might have expertise in a specific habitat. There is potential overlap with the technical expert audience, #3 above.
 - Buy into the development of the CWS so each will be more likely to assist with implementation.
 - Be willing to communicate with their members and other target audiences predisposed to a topic dealing with conservation about the CWS.
 - Mechanisms to communicate with segments of the other public target audience, #5 below.
 - II. *Partners* – these organizations will have all of the following:
 - Buy into the development of the CWS so each will be more likely to assist with implementation.
 - Be willing to communicate with their members and other target audiences predisposed to a topic dealing with conservation about the CWS.
 - Mechanisms to communicate with segments of the Other Publics target audience.

- III. *Stakeholders* – these organizations need to buy into the development of the CWS so each will be more likely to assist with implementation. However, this grouping of organizations will just need to be aware of the CWS effort—there is no need at this point for the organizations to be actively involved with the development of the CWS.

5. Other Publics

Most of the communications efforts will be focused on “Other Publics” who are predisposed to conservation, #I, II, III below.

- I. Traditional constituents: hunters, trappers and anglers
- II. Non-traditional constituents: wildlife viewers, nature study, photographers, etc.
- III. Recreational land users: boaters, hikers, and campers
- IV. John “Q” public: “Everybody in Indiana”

Objectives, tactics and key messages organized by target audience

Below each of the five target audiences are listed, followed by the unique objectives, key messages and tactics for each. The key messages are listed under the objective that it will be used to achieve. After the objectives and key messages, the tactics that will be used for each audience are listed.

Target Audience #1: Upper-Level Government

Objectives

For the communications plan to be successful, all of the following measurable objectives need to be achieved.

1. Present the CWS development process to IN DNR Director and executive staff – ask Director about meeting with Governor’s office.
 - Key Messages
 - a. IN DFW is developing a Comprehensive Wildlife Strategy. The goal is to prevent wildlife from becoming endangered.
 - b. This is not just a planning effort—the strategy provides economic benefits by helping to keep species off the endangered list, and should lead to new federal funding for conservation in the future.
 - c. This is an historic effort: this kind of comprehensive effort has never been done before in our state, and every other state is also doing it at the same time.
 - d. This is a rigorous science-based process to determine priorities for declining wildlife and habitat.
 - e. This effort is asking: What are the species and habitats in trouble? Why are they in trouble? Most importantly, what are we going to do about it?
 - f. We are working with a broad cross section of our state to get this done from wildlife experts to hunters and anglers to other environmentalists to farmers and ranchers.

3. Identify technical experts that can provide habitat and species information.
 - Key Messages
 - a. All the key messages for objective 1 & 2
 - b. Information for the strategy will be gathered through a conservation organization survey and technical expert input, focused on agencies and organizations that either conduct land, water and wildlife management or provide technical and financial assistance to those efforts.
 - c. We need your help identifying technical experts to provide species and habitat information for Indiana.

Tactics

- Presentations
- One-on-one discussions
- Press kit
- Website
- Electronic newsletter
- Databases
- E-mail
- Articles (?)

Target Audience #2: IN DFW Staff

Objectives

1. Record and report the number of IN DFW Chiefs/Section Heads supportive of developing an integrated approach to managing wildlife by improving habitats.
 - Key Messages
 - a. IN DFW is developing a Comprehensive Wildlife Strategy. The goal is to prevent wildlife from becoming endangered.
 - b. This is not just a planning exercise – the strategies will guide the existing State Wildlife Grants program and should lead to future additional money.
 - c. Research suggests that habitat quality and quantity are the primary factors affecting the conservation of wildlife throughout the state. The CWS will include information on the distribution and abundance of wildlife species, including low populations and declining species.
 - d. This is an historic effort that all fifty states and U.S. territories are simultaneously engaged in, presenting a tremendous opportunity for conservation at a landscape scale.
 - e. This is a rigorous science-based process to determine priorities for declining wildlife and habitat.
 - f. This effort is asking: What are the species and habitats in trouble? Why are they in trouble? Most importantly, what are we going to do about it?

- g. IN DFW is working with a broad cross section of our state to get this done from wildlife experts to hunters and anglers to other environmentalists to farmers and ranchers.
- h. This effort has emerged through the work of a broad national bipartisan wildlife conservation coalition, called Teaming with Wildlife. Teaming With Wildlife includes more than 3000 organizations nationwide.
- i. The task of conserving declining wildlife is challenging but we know success is possible from our history with wildlife conservation successes like the wild turkey, white-tailed deer, and striped bass.
- j. The CWS will emphasize the importance of habitat conservation, restoration and protection by identifying groups of species into guilds, that are associated with specific habitats, then selecting representative species from each guild. Division staff led and contributed to this effort.

2. Participate in and understand their role in the development of the CWS

- Key Messages
 - a. All key messages from objective #1
 - b. Technical expert information will be collected through an online expert questionnaire. Support of division supervisors will be essential to encourage staff participation in: a) filling out the expert questionnaire; and b) identifying other experts to participate, both within and external to DNR.
 - c. Conservation organization information will be gathered through an on-line survey, focused on agencies and organizations that either conduct land, water and wildlife management or provide technical and financial assistance to those efforts. Agency staff will be instrumental in identifying additional conservation organizations to fill out this survey.

3. Informed consent

- Key Messages
 - a. All key messages from objectives #1 and 2
 - b. Conservation organizations and the general public may request information about the CWS process from DFW staff. Information about the CWS is on the website. Progress updates will be provided through email correspondence and news articles (WildBulletin, etc). CWS website: <http://www.djcase.com/incws>.
 - c. The CWS process incorporates several opportunities for agency and public review. Your continued engagement will ensure that the CWS is an accurate representation of wildlife needs and opportunities and can be implemented effectively through collaborative efforts.

4. Describe multi-disciplinary opportunities for implementing CWS

- Key Messages
 - a. All key messages from objectives #1,2 and 3

- b. DFW can use the CWS development process to integrate long-range internal planning for protecting and enhancing wildlife habitat. The next round of strategic planning may be integrated through the CWS.
5. Staff will have sufficient understanding to be able to broadly explain CWS to agency constituents and conservation organizations.
 - All key messages listed above will be used

Tactics

-
- Presentations
- One-on-one discussions
- Press kit
- Website
- Electronic newsletter
- Databases
- Poster
- E-mail
- Conservation organization survey
- Technical expert questionnaire
- DNR consultation

Target Audience #3: Technical Experts

Objectives

1. Present the CWS development process to **all** identified technical experts.
 - Key Messages
 - a. IN DFW is developing a Comprehensive Wildlife Strategy. The goal is to prevent wildlife from becoming endangered.
 - b. This is not just a planning exercise – the strategies will guide the existing State Wildlife Grants program and should lead to future additional money.
 - c. This is a rigorous science-based process to determine priorities for declining wildlife and habitat.
 - d. This effort is asking: What are the species and habitats in trouble? Why are they in trouble? Most importantly, what are we going to do about it?
 - e. IN DFW is working with a broad cross section of our state to get this done from wildlife experts to hunters and anglers to other environmentalists to farmers and ranchers.
 - f. This effort has emerged through the work of a broad national bipartisan wildlife conservation coalition, called Teaming with Wildlife. Teaming With Wildlife includes more than 3000 organizations nationwide.

- b. Information about the CWS is on the website. Progress updates will be provided through email correspondence and news articles (WildBulletin, etc). CWS website: <http://www.djcase.com/incws>.
4. Obtain expert information for 100 percent of the representative species listed on the survey (or at least 100 percent of the habitats that have species of greatest conservation need in the guild).
 - Use all key messages above to meet objective

Tactics

- E-mail
- One-on-one discussions
- Website
- Technical expert questionnaire
- Electronic newsletter
- Databases
- On-line input

Target Audience #4: Conservation Organizations

Conservation organizations have been grouped into three levels. There are different objectives and communication tactics for each “conservation organization” level.

i. Keystone Partners

Objectives

- 1) Identify organizations with technical expertise to provide feedback on habitat narratives. Report and record organization.
- 2) Present the CWS and need for organizational involvement to large groups of the organizations. Focus on the organizations that request a presentation via the “Conservation organization” survey. Record and report the organizations that receive presentation.
- 3) Encourage organizations to present the CWS to their members and others with a predisposed interest in conservation activities. Record and report the organizations that utilize templates to present CWS to others.
- 4) Utilize organization communication mechanisms to reach segments of the “Other Publics” target audience. Record and report the organization and the type of communication that can be utilized to reach the “Other Publics” audience.
- 5) Obtain public comment from ___% of the Keystone Partners and Partners
- 6) Record the number of “Conservation organization” surveys filled-out and list the organizations that filled the surveys out
- 7) Request/record the number of gathered organizational strategic plans.

Tactics

- E-mail
- One-on-one discussions
- Website
- Conservation organization survey

- On-line input
- Electronic newsletter
- Databases
- Presentations
- PowerPoint Template
- Press kit
- Articles
- Press release

ii. *Partners*

Objectives – All of the Keystone Partner objectives except Objective #1

Tactics – All tactics listed for Keystone Partners except technical expert survey.

iii. *Stakeholders*

Objectives – Provide periodic communications about the process

Tactics

- Electronic newsletter
- E-mail
- Press release

Key Messages

Use all key messages throughout the process. Select messages as appropriate to communicate with audiences to reach objectives.

- a. IN DFW is developing a Comprehensive Wildlife Strategy. The goal is to prevent wildlife from becoming endangered.
- b. This is not just a planning exercise – the strategies will guide the existing State Wildlife Grants program and should lead to future additional money.
- c. This is a rigorous science-based process to determine priorities for declining wildlife and habitat.
- d. This effort is asking: What are the species and habitats in trouble? Why are they in trouble? Most importantly, what are we going to do about it?
- e. IN DFW is working with a broad cross section of our state to get this done from wildlife experts to hunters and anglers to other environmentalists to farmers and ranchers.
- f. This effort has emerged through the work of a broad national bipartisan wildlife conservation coalition, called Teaming with Wildlife. Teaming With Wildlife includes more than 3000 organizations nationwide.
- g. The task of conserving declining wildlife is challenging but we know success is possible from our history with wildlife conservation successes like the wild turkey, white-tailed deer, and striped bass.

- h. This is a historic effort: this kind of comprehensive effort have never been done before in our states, and every other state is also doing it the same time.
- i. Research suggests that habitat quality and quantity are the primary factors affecting the conservation of wildlife throughout the state
 - a. To develop a CWS focusing on habitat, DFW will identify and integrate a broad range of agency and organization efforts that conserve wildlife species of greatest concern and their habitats.
 - b. The CWS will include information on the distribution and abundance of wildlife species, including low populations and declining species. The strategy will consider the broad range of the state's wildlife species with priority placed on those species with greatest conservation need and their habitats.
 - c. The CWS will conserve wildlife through habitat conservation, restoration and protection. Wildlife will be categorized into guilds that are associated with specific habitats, and representative species will be selected from each guild. By conserving habitats, wildlife associated with the habitats will also be conserved.
 - d. Many agencies and organizations are involved with "on the ground" habitat conservation projects. DFW needs your help to identify these efforts by taking an electronic survey.
 - e. Many agencies and organizations are involved with "on the ground" habitat conservation projects. DFW wants to develop and strengthen partnerships with these organizations and agencies. Partnering agencies and organizations will be able to provide feedback about wildlife habitat and together conserve wildlife.
 - f. The CWS process provided several opportunities for agency and public review. Your continued engagement will ensure that the CWS is an accurate representation of wildlife needs and opportunities that can be implemented through collaborative efforts.
 - g. Information about the CWS is on the website. Progress updates will be provided through email correspondence and news articles (WildBulletin, etc). CWS website: <http://www.djcase.com/incws>.

Target Audience #5: Other Publics

Objectives

1. Obtain Other Publics comments during the CWS development process.
 - **Key Messages**
 - a. The goal is to prevent wildlife from becoming endangered.
 - b. This is a rigorous science-based process to determine priorities for declining wildlife and habitat.
 - c. This effort is asking: What are the species and habitats in trouble? Why are they in trouble? Most importantly, what are we going to do about it?

- d. This is an historic effort: this kind of comprehensive effort has never been done before in our state, and every other state is also doing it at the same time.
- e. We are working with a broad cross section of our state to get this done from wildlife experts to hunters and anglers to other environmentalists to farmers and ranchers.
- f. This is not just a planning exercise – the strategies will guide the existing State Wildlife Grants program and should lead to future additional money.
- g. The task of conserving declining wildlife is challenging but we know success is possible from our history with wildlife conservation successes like the wild turkey, white-tailed deer, and striped bass.

Tactics

- Databases
- PowerPoint through keystone partners and partners
- Website
- Press kit
- Electronic newsletter
- E-mail
- On-line input
- Press release
- Articles

Tactics Defined

Below the communications tactics that will be used to achieve the goals identified in this plan are defined.

- **Databases** – Develop databases grouped by target audience. Research existing databases that can be used to communicate with segments of the target audiences.
- **Presentations** – DFW/DJCA will present the CWS and process to groups of audiences. Each presentation will be customized for each audience.
- **PowerPoint** – A generic template will be developed to use during presentations. Templates will be customized for each presentation. IN DFW staff, Keystone Partners and Partners will be taught how to utilize presentations to communicate with other audiences about the CWS.
- **One-on-one discussions** - Whether in-person or over the phone, some audiences will need to hear the key messages numerous times. One of the most effective ways to communicate key messages is to have one-on-one discussions. It will be impossible to have one-on-one discussions with all target audiences, so we will have one-on-one discussions as opportunities are presented.
- **Press kit** – We will develop and distribute a press kit with customizable templates to distribute during discussions/interviews/presentations. The press kit will have a CWS fact sheet, press release, and FAQ. It will explain the process, how the selected audience can be involved and the kit will refer audiences to the website.

Each audience will want different information out of the press kit. Some audiences might want just a one-pager while other will want to review all available information. ID DFW, Keystone Partners and Partners will be taught how to use the Press kit template to communicate with audiences.

- **Indiana CWS website** – During all communications, target audiences will be directed to the CWS website. The website will describe the development process, connect to surveys, electronic newsletters, the drafts of the CWS and other relevant information.
- **Electronic newsletter** – The newsletter will be distributed via e-mail to all target audiences through the developed databases. This tool will be used to keep target audiences informed about the CWS process and how they can help.
- **Poster** – DFW will develop a 2-page legal size poster to display in areas where DFW employees typically have a few moments to review (i.e.: break rooms, bathrooms, etc.). The poster will have an overview explaining the CWS and a section that describes the 8 required elements of the strategy.
- **E-mail** – It would be ideal to have face-to-face discussions with each target audience. However, there are numerous audiences involved in development of the CWS. To gather feedback and to communicate with audiences that we cannot talk with input, we will utilize e-mail.
- **Technical Expert Questionnaire** – identified audiences will receive access to an electronic survey to provide expertise on a specific species or habitat.
- **“Conservation organization” Survey** – identified audiences will receive access and asked to fill-out a “conservation organization” information survey.
- **On-line Input** – Target audiences will have the opportunity to comment on the CWS and development process on-line. The draft CWS will be posted to the CWS website for easy review and input. Target audiences need to understand the value of the CWS and potential opportunities for collaboration. Input is needed from all audiences for successful implementation of the CWS. Target audiences need to know that we are including their input. By including input, target audiences will buy into the CWS development process and support the CWS.
- **Articles** – We will place articles in identified publications (magazines, newsletters, newspapers, others) about how the CWS development process and how target audiences can be involved.
- **Press release to radio, television and print publications** – We will send press releases to media through the Wild Bulletin listserv to let target audiences know that the DFW is developing the CWS and will need participation (Indianapolis, Ft. Wayne, South Bend and Evansville). Follow-up with key media representatives after distributing.
- **IN DFW consultation** – DFW section heads will be consulted to evaluate their knowledge of CWS. During the interviews, we can discuss with section heads the benefits of developing the CWS. The CWS has the potential to allow the DFW to start developing an integrated habitat approach to the division’s strategic planning process. Instead of having a strategic plan for the fishing program, one for the wildlife diversity program and another for the aquatic nuisance species; the CWS

could allow the sections to work together for the benefit of conserving and protecting Indiana's fish and wildlife habitat.

Action Plan

We need to communicate with target audiences throughout the CWS development process. Each target audience is needed to make the development process of the CWS a success. The following action plan will be used to reach the goals identified in this communications plan.

Date	Action	Assignment
Aug. 2004	DJCA/DFW develop CWS website	Complete
Sept.	DJCA/DFW identify "conservation organizations" and begin to categorize into levels	Complete
	DJCA develop database of technical experts	Complete
	DJCA/DFW select meetings that a large number of IN DFW staff attend	Complete
	DJCA develop "Conservation organizations" and "Technical Expert" surveys	Complete
Sept. 23	DJCA meet with DFW about CWS and the communications plan	Complete
Oct.	DFW hang posters in selected areas for staff to read	Complete
Oct. 12	CWS presentation at DNR Directors meeting	Complete
Oct. 19	CWS briefing at DNR Advisory Council Meeting	Complete
Oct. 25	Announcement "press release" to technical experts describing the CWS and the development and asking them to fill-out an electronic survey	Complete
Oct. 25-Nov. 22	Technical experts fill-out surveys	Complete
	DJCA make presentations to DFW staff and upper-level government at selected meetings	Complete
Oct. -Nov.	DJCA/DFW create PowerPoint template	Complete
Nov. 11	Distribute "Press release"/announcement asking "Conservation organizations" to fill-out information survey.	
Nov. 23	CWS presentation at Landholders meeting.	Complete
Oct. -Dec.	Follow-up with technical experts via e-mail and phone reminders asking them to fill-out survey	Complete
Nov - Feb 2005	Follow-up phone calls to "conservation organizations" specifically those defined by DJCA and DFW as keystone and ask to fill-out survey and provide a strategic plan.	Complete
Jan. - Feb.	DJCA compile "Conservation organization" survey and "Technical Expert" questionnaire	Complete
	DJCA review "Technical Expert" questionnaire feedback	Complete
Feb.	Identify keystone partners	Complete
Feb. 2	CWS meeting with IN DNR DFW staff	Complete
Feb. 10	CWS presentation at DFW staff Annual Conference	Complete
Feb. 19	CWS presentation at Hoosier Outdoor Writers Conference	Complete - Jon
Feb-April	DJCA review "conservation organization" survey responses	Monica - Ongoing
	DJCA draft CWS habitat narratives from technical expert surveys	Complete
	Edit and complete technical expert habitat narratives	Complete
	Upload technical expert habitat narratives on website	Complete
Mar. 9	CWS meeting with DNR DWS	Complete
Mar. 29	CWS presentation to DNR Directors	Complete
April	Develop databases for communications	Complete
	Thank-you package to Hupfer	Complete
	Review media contact list to utilize for distribution of press kit materials	Complete

	Review keystone list and identify up to 15 that should be contacted about organization communications mechanisms and talk with them about the need for their organization to review the first draft of the strategy.	Complete
	Develop CWS "awareness" news release for press kit	Complete
	Develop CWS "awareness" fact sheet for press kit	Complete
	Develop CWS "awareness" print PSA for press kit	Complete
	Develop CWS "awareness" short article about CWS for press kit	Complete
	Meet with new "upper-level" government administration	Complete
	Draft 1 st issue of CWS electronic newsletter to audiences 1,2,3 and 4. Customize newsletter for each audience.	Complete
	Distribute newsletter electronically	Complete
	Send e-mail(s) to technical experts and keystone partners about providing feedback on the CWS narratives.	Complete
	Follow-up e-mail to keystones and technical experts.	Complete
	Post press kits materials on website	Jon and Jenny
	Presentations to groups of identified keystone partners	Complete
Apr. 5	CWS meeting with DNR DWF	Complete
May 19	CWS presentation to FWS administrators	Complete - Gwen
July	DJCA use survey input and feedback gathered through one-on-one discussions and other communications to develop first draft of CWS.	Complete
July	DJCA draft CWS for public comment.	Complete
August	First draft of CWS to DFW	Complete
July	Continue to call "Keystone Partners" to inquire about using existing communication channels to solicit public input	Complete
August	Develop "news release" Keystone Partners to distribute through communication channels.	Monica and Phil
August	Review feedback from keystone partners to prioritize large group meetings.	Complete
August	Communicate with "Keystone Partners" to get them to utilize communication channels to distribute public input press kit materials.	Monica
August	Develop database of conservation organizations with information from electronic surveys and communication mechanisms gathered through phone calls. The database will be utilized for implementation of CWS.	Tim, Phil, Gwen, Monica and Jon
August	DJCA make DFW edits	Tim
August	Send CWS draft to Kyle Hupfer two weeks prior to public comment	Complete
September	Draft CWS ready for public comment period (all audiences review and provide feedback)	Tim
	Send press release soliciting public input to Wild Bulletin and other media contacts in databases announcing the public comment period. Post CWS draft to the website for public comment period.	Monica, Phil and Jon
	Present CWS at Conservation Partnership meeting at NRCS offices	Gwen
	Follow-up with DFW media contacts to encourage them to announce the CWS public comment period.	Monica
	Public comment period	
	DJCA/DFW review public input and make adjustments to the CWS.	
October	CWS finalized and ready for NAAT review.	
	DJCA present final CWS to DFW	
	DJCA/DFW edit CWS after NAAT review.	
	DJCA/DFW meet to determine next steps for communicating about the implementation of the CWS.	

TBD	NAAT approves the CWS and is ready for implementation.	
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Evaluation

It will be important to evaluate the effectiveness of this communications plan to see if we reached our goals and should continue communications with target audiences when the CWS is ready for implementation. We will measure the effectiveness of this plan three ways:

1. Assess the objectives for each target audience to see if they were achieved.
Potential Action: one year after the plan is completed, DFW could review the objectives listed for each target audience and determine if each objective was achieved.
2. Assess database of target audiences and review qualitative information gathered from presentations and discussions.
Potential Action: Throughout the implementation of the communications plan, we will gather qualitative information from target audiences that will be tracked for each contact. This information could be used to assess developed relationships using qualitative database information.
3. Surveys.
Potential Action: At DNR's direction, we could send pre-surveys to Conservation organizations to gather information needed for the CWS. These surveys would ask target audiences questions about how to best communicate with them about the CWS, measure how much audiences currently know about CWS and how interested they are in CWS. Once the CWS is finalized, DNR could resurvey the audiences to re-assess their knowledge and solicit their opinion of the CWS development process and the final strategy.

Appendix A

1. Upper-level government
 - IN DNR Director and other executive level staff
 - IN DNR Division heads (see list of Divisions outlined for target audience #3)
 - State legislature?
 - Governor's Office (Agriculture Advisor/Dept?; Environment/Natural Resources Advisor)
 - Office of Commissioner of Agriculture
 - Indiana State Soil Conservation Board
 - IDEM
 - ISDH
 - State Chemists' Office
2. IN DFW staff
3. Technical experts (Identified previously or IN DNR staff selected because expert information missing for an identified species)
 - Technical experts outside DNR
 - a. Technical Advisory Committees
 - b. Other species and habitat experts outside DFW
 - c. Indiana State University project team
 - d. Professional societies (SAF, AFS, TWS, ASWCD)
 - e. Department of Transportation (biologists)
 - f. Indiana Academy of Sciences
 - g. IN Quail Unlimited
 - h. IN Ducks Unlimited
 - i. National Wild Turkey Federation
 - j. Pheasants Forever
 - k. Airport Animal Damage Control Group
 - l. Utilities
 - m. USFWS Ecological Services
 - n. USFWS Migratory Bird Office
 - o. Federal Law Enforcement
 - IN DNR technical experts in the following divisions
 - a. Entomology & Plant Pathology
 - b. Fish & Wildlife
 - c. Forestry
 - d. Law Enforcement
 - e. Nature Preserves
 - f. Outdoor Recreation
 - g. Public Info. & Education
 - h. Reclamation
 - i. Soil Conservation
 - j. State Parks & Reservoirs
 - k. Water
 - l. State Park Naturalists
4. Conservation organizations – (List organized by group)

- I. Keystone Partners
- II. Partners
- III. Stakeholders
 - Land Management Groups (list???)
 - [need examples]
 - State conservation partners
 - a. Hunting, trapping and fishing organizations
 - b. Wildlife viewing organizations
 - c. Recreational land user organizations
 - d. IN Teaming with Wildlife Coalition
 - e. Indiana Wetlands Conservation Plan TAT and WAG
 - f. Indiana Lake Management Work Group
 - g. Professional societies (SAF, AFS, TWS, IASWCD)
 - h. NRCS Field Staff
 - i. Purdue Extension
 - j. IN Farm Bureau
 - k. Indiana Department of Environmental Management (IDEM)
 - Federal land management
 - a. Bureau of Land Management
 - b. Department of Defense
 - c. U.S. Forest Service
 - d. U.S. Fish and Wildlife Service
 - e. U.S. Department of Agriculture
 - f. National Parks Service
 - Adjacent states connected by water or land management
 - Illinois
 - Michigan
 - Kentucky
 - Ohio
 - Existing multi-state collaborative partnerships
 - Great Lakes Commission
 - Great Lakes Fishery Commission
 - MICRA
 - ORSANCO
 - NAWMP
 - Partners in Flight
 - National conservation partners
 - IAFWA (Congress) – align state communications efforts with national outreach campaign.
6. Agricultural and forestry producers organizations
7. Development organizations
8. Regional and local planning, watershed management and parks departments
9. Indiana Association of Cities and Towns
10. Land trusts
11. Lake associations
12. Tourism organizations

13. Commerce organizations
 - Chambers of Commerce
 14. Regional or statewide utilities
 15. Natural resources, engineering and environmental law consulting firms
 16. Other businesses related to land and water use
 17. Environmental learning programs
-
5. Other Publics
 - Traditional constituents: hunters, trappers, anglers, Hoosier Outdoor Writers Association, retail conservation companies (Gander Mountain, Dicks, etc>)
 - Non-traditional constituents: wildlife viewers, Private land owners, Hoosier Association of Science Teachers, Environmental Educators Association of Indiana (EEAI), Wild Birds Unlimited
 - Recreational land users: boaters, hikers, and campers, Hiking Association, 4-Wheeling Associations, Equestrian Associations
 - John “Q” Public: “Everyone in Indiana”

Appendix C: Guilds by Habitat and Sub-habitat

Range (within state):

Statewide (I), North (N), South (S), West (W), East (E), Central (C) and various combinations.

Relative abundance (within state):

Abundant (A), Common (C), Occasional (O), Rare (R)

Status:

Extirpated (Ex), Exotic- accidentally or deliberately released species (X)

(Federal)

Federally Endangered (FE), Federally Threatened (FT), candidates for federal listing (FC)

(State)

State Endangered (SE), State Threatened (ST), Special Concern in need of further study (SC)

Seasonal Occurrence (for birds):

Summer resident (S), winter resident (W), year-round resident (R), migrant (M), accidental (A), hypothetical (H), and breeder (*), former breeders [*].

Additional:

Species Row (bold)- indicates Representative Species

Underlined Species and Scientific Name indicates Species of Greatest conservation need.

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Agriculture	<i>Cereal Grains</i>				Mammal	Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	NW	C		
Agriculture	<i>Feedlots</i>				Bird	Brown-Headed Cowbird	<i>Molothrus ater</i>	I	A	R*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Agriculture	Row Crops				Bird	Horned Lark	<i>Eremophila alpestris</i>	I	C	R*	
Agriculture	Row Crops				Bird	Killdeer	<i>Charadrius vociferous</i>	I	C	R*	
Agriculture					Amphibian	Bullfrog	<i>Rana catesbeiana</i>	I	A		
Agriculture					Amphibian	American Toad	<i>Bufo americanus</i>	N, C, SE	C		
Agriculture					Amphibian	Cricket Frog	<i>Acris crepitans</i>	I	C		
Agriculture					Amphibian	Fowler's Toad	<i>Bufo fowleri</i>	I	C		
Agriculture					Amphibian	Green Frog	<i>Rana clamitans</i>	I	C		
Agriculture					Amphibian	<u>Northern Leopard Frog</u>	<i>Rana pipiens</i>	N, E	C		SC
Agriculture					Amphibian	Tiger Salamander	<i>Ambystoma tigrinum</i>	I	C		
Agriculture					Amphibian	<u>Crawfish Frog</u>	<i>Rana areolata</i>	W	O		ST
Agriculture					Amphibian	Eastern Spadefoot	<i>Scaphiopus holbrookii</i>	S	O		
Agriculture					Amphibian	<u>Plains Leopard Frog</u>	<i>Rana blairi</i>	W	R		SC

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Agriculture					Bird	American Crow	<i>Corvus brachyrhynchos</i>	I	A	R*	
Agriculture					Bird	Barn Swallow	<i>Hirundo rustica</i>	I	A	S*	
Agriculture					Bird	Canada Goose	<i>Branta canadensis</i>	I	A	R*	
Agriculture					Bird	Common Grackle	<i>Quiscalus quiscula</i>	I	A	R*	
Agriculture					Bird	European Starling	<i>Sturnus vulgaris</i>	I	A	R*	X
Agriculture					Bird	House Sparrow	<i>Passer domesticus</i>	I	A	R*	X
Agriculture					Bird	Mourning Dove	<i>Zenaida macroura</i>	I	A	R*	
Agriculture					Bird	Red-Tailed Hawk	<i>Buteo jamaicensis</i>	I	A	R*	
Agriculture					Bird	Red-Winged Blackbird	<i>Agelaius phoeniceus</i>	I	A	R*	
Agriculture					Bird	Rock Dove	<i>Columba livia</i>	I	A	R*	X
Agriculture					Bird	American Kestrel	<i>Falco sparverius</i>	I	C	R*	
Agriculture					Bird	Eastern Bluebird	<i>Sialia sialis</i>	I	C	R*	
Agriculture					Bird	Eastern Kingbird	<i>Tyrannus tyrannus</i>	I	C	S*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Agriculture					Bird	Field Sparrow	<i>Spizella pusilla</i>	I	C	R*	
Agriculture					Bird	Northern Bobwhite	<i>Colinus virginianus</i>	I	C	R*	
Agriculture					Bird	Turkey Vulture	<i>Cathartes aura</i>	I	C	R*	
Agriculture					Bird	American Golden-Plover	<i>Pluvialis dominica</i>	I	O	M	
Agriculture					Bird	Lapland Longspur	<i>Calcarius lapponicus</i>	I	O	W	
Agriculture					Bird	Ring-Necked Pheasant	<i>Phasianus colchicus</i>	N	O	R*	X
Agriculture					Bird	<u>Sandhill Crane</u>	<u><i>Grus canadensis</i></u>	I	O	M*	SC
Agriculture					Bird	Snow Bunting	<i>Plectrophenax nivalis</i>	I	O	W	
Agriculture					Bird	Snow Goose	<i>Chen caerulescens</i>	I	O	M	
Agriculture					Bird	Vesper Sparrow	<i>Pooecetes gramineus</i>	I	O	S*	
Agriculture					Bird	Wild Turkey	<i>Meleagris gallopavo</i>	I	O	R*	
Agriculture					Bird	<u>Barn Owl</u>	<u><i>Tyto alba</i></u>	I	R	R*	SE

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Agriculture					Bird	Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	W	R	M*	
Agriculture					Bird	Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	I	R	S*	
Agriculture					Bird	Eurasian Collared-Dove	<i>Streptopelia decaocto</i>	I	R	R*	X
Agriculture					Bird	Greater White-Fronted Goose	<i>Anser albifrons</i>	I	R	M	
Agriculture					Bird	Mccown's Longspur	<i>Calcarius mccownii</i>	I	R	A	
Agriculture					Bird	Ross's Goose	<i>Chen rossii</i>	I	R	A	
Agriculture					Bird	Rusty Blackbird	<i>Euphagus carolinus</i>	I	R	W	
Agriculture					Bird	Smith's Longspur	<i>Calcarius pictus</i>	I	R	M	
Agriculture					Bird	Gray Partridge (Extirpated)	<i>Perdix perdix</i>	N		R*	X, Ex (1977)
Agriculture					Mammal	Eastern Mole	<i>Scalopus aquaticus</i>	I	A		
Agriculture					Mammal	Norway Rat	<i>Rattus norvegicus</i>	I	A		X

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Agriculture					Mammal	Raccoon	<i>Procyon lotor</i>	I	A		
Agriculture					Mammal	Coyote	<i>Canis latrans</i>	I	C		
Agriculture					Reptile	Black Racer	<i>Coluber constrictor</i>	I	C		
Agriculture					Reptile	Eastern Hognose Snake	<i>Heterodon platirhinos</i>	I	C		
Agriculture					Reptile	Eastern Milksnake	<i>Lampropeltis triangulum</i>	I	C		
Agriculture					Reptile	Western Fox Snake	<i>Elaphe vulpina</i>	NW, SW	C		
Agriculture					Reptile	Bull Snake	<i>Pituophis melanoleucus</i>	NW, SW	O		
Agriculture					Reptile	Common (Black) Kingsnake	<i>Lampropeltis getulus</i>	S	O		
Agriculture					Reptile	<u>Ornate Box Turtle</u>	<i>Terrapene ornata</i>	NW, SW	O		SC
Agriculture					Reptile	Prairie Kingsnake	<i>Lampropeltis calligaster</i>	W	O		
Aquatic Systems	Dunes, shorelines				Bird	Killdeer	<i>Charadrius vociferus</i>	I	C	R*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Dunes, shorelines				Bird	Spotted Sandpiper	<i>Actitis macularia</i>	I	O	S*	
Aquatic Systems	Dunes, shorelines				Bird	American Pipit	<i>Anthus rubescens</i>	I	R	M	
Aquatic Systems	Dunes, shorelines				Bird	<u>Least Tern</u>	<i>Sterna antillarum</i>	I	R	S*	SE, FE
Aquatic Systems	Dunes, shorelines				Bird	<u>Piping Plover</u>	<i>Charadrius melodus</i>	I	R	A(*)	SE, FE
Aquatic Systems	Dunes, shorelines				Bird	Red Knot	<i>Calidris canutus</i>	I	R	M	
Aquatic Systems	Dunes, shorelines				Bird	Snowy Plover	<i>Charadrius alexandrinus</i>	I	R	A	
Aquatic Systems	Great Lakes drainage	Great river			Fish	Walleye	<i>Sander vitreus</i>	I	C		
Aquatic Systems	Great Lakes drainage	headwater			Fish	Central Mudminnow	<i>Umbra limi</i>	N	A		
Aquatic Systems	Great Lakes drainage	wadeable/large			Fish	Goldfish	<i>Carassius auratus</i>	I	C		X
Aquatic Systems	Great Lakes drainage	wadeable/large			Fish	Common Shiner	<i>Luxilus cornutus</i>	N	O		
Aquatic Systems	Great Lakes drainage	wadeable/large			Fish	Rudd	<i>Scardinius erythrophthalmus</i>	NW	R		X

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Great Lakes drainage	wadeable/large			Mussel	<u>Ellipse</u>	<i>Venustaconcha ellipsiformis</i>				SC
Aquatic Systems	Great Lakes drainage Rivers and Streams	headwater Great Lakes drainage	<i>headwater</i>		Fish	Blacknose Dace	<i>Rhinichthys atratulus</i>	NW, C, SE	C		
Aquatic Systems	Great Lakes drainage Rivers and Streams	wadeable/large river Great Lakes drainage	<i>wadeable/large river</i>		Fish	Hornyhead Chub	<i>Nocomis biguttatus</i>	N	C		
Aquatic Systems	Great Lakes drainage Rivers and Streams	headwater Great Lakes drainage	<i>headwater</i>		Fish	Northern Brook Lamprey	<i>Ichthyomyzon fossor</i>	NE	R		
Aquatic Systems	Great Lakes drainage Rivers and Streams	Great river Great Lakes drainage	<i>great river</i>		Fish	<u>Greater Redhorse</u>	<i><u>Moxostoma valenciennesi</u></i>	N	R		SE
Aquatic Systems	Impoundments				Bird	Canada Goose	<i>Branta canadensis</i>	I	A	R*	
Aquatic Systems	Impoundments				Bird	American Black Duck	<i>Anas rubripes</i>	I	C	R*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Impoundments				Bird	Common Goldeneye	<i>Bucephala clangula</i>	I	C	W	
Aquatic Systems	Impoundments				Bird	Common Loon	<i>Gavia Immer</i>	I	C	M(*)	
Aquatic Systems	Impoundments				Bird	Herring Gull	<i>Larus argentatus</i>	I	C	R*	
Aquatic Systems	Impoundments				Bird	Lesser Scaup	<i>Aythya Affinis</i>	I	C	W(*)	
Aquatic Systems	Impoundments				Bird	Pied-Billed Grebe	<i>Podilymbus podiceps</i>	I	C	R*	
Aquatic Systems	Impoundments				Bird	Ring-Billed Gull	<i>Larus delawarensis</i>	I	C	R*	
Aquatic Systems	Impoundments Potholes				Bird	Mallard	<i>Anas platyrhncos</i>	I	C	R*	
Aquatic Systems	Impoundments				Bird	American Wigeon	<i>Anas americana</i>	I	O	M(*)	
Aquatic Systems	Impoundments				Bird	<u>Black Tern</u>	<i>Chlidonias niger</i>	I	O	S*	SE
Aquatic Systems	Impoundments				Bird	Blue-Winged Teal	<i>Anas discors</i>	I	O	S*	
Aquatic Systems	Impoundments				Bird	Bonaparte's Gull	<i>Larus philadelphia</i>	I	O	M	
Aquatic Systems	Impoundments				Bird	Bufflehead	<i>Bucephala albeola</i>	I	O	W	
Aquatic Systems	Impoundments				Bird	Canvasback	<i>Aythya Valisineria</i>	I	O	M	

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Aquatic Systems	Impoundments				Bird	Caspian Tern	<i>Sterna caspia</i>	I	O	M*	
Aquatic Systems	Impoundments				Bird	Common Merganser	<i>Mergus merganser</i>	I	O	W	
Aquatic Systems	Impoundments				Bird	Common Tern	<i>Sterna hirundo</i>	I	O	M(*)	
Aquatic Systems	Impoundments				Bird	Double-Crested Cormorant	<i>Phalacrocorax auritus</i>	I	O	M*	
Aquatic Systems	Impoundments				Bird	Forster's Tern	<i>Sterna forsteri</i>	I	O	M(*)	
Aquatic Systems	Impoundments				Bird	Gadwall	<i>Anas strepera</i>	I	O	M*	
Aquatic Systems	Impoundments				Bird	Greater Scaup	<i>Aythya marila</i>	N	O	W	
Aquatic Systems	Impoundments				Bird	Green-Winged Teal	<i>Anas crecca</i>	I	O	M*	
Aquatic Systems	Impoundments				Bird	Hooded Merganser	<i>Lophodytes cucullatus</i>	I	O	R*	
Aquatic Systems	Impoundments				Bird	Horned Grebe	<i>Podiceps auritus</i>	I	O	W(*)	
Aquatic Systems	Impoundments				Bird	Long-Tailed Duck	<i>Clangula hyemalis</i>	N	O	W	
Aquatic Systems	Impoundments				Bird	Mute Swan	<i>Cygnus olor</i>	I	O	R*	X
Aquatic Systems	Impoundments				Bird	Northern Pintail	<i>Anas acuta</i>	I	O	M*	
Aquatic Systems	Impoundments				Bird	Northern Shoveler	<i>Anas clypeata</i>	I	O	M*	

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Aquatic Systems	Impoundments				Bird	Red-Breasted Merganser	<i>Mergus serrator</i>	I	O	M*	
Aquatic Systems	Impoundments				Bird	Red-Throated Loon	<i>Gavia stellata</i>	I	O	M	
Aquatic Systems	Impoundments				Bird	Ring-Necked Duck	<i>Aythya collaris</i>	I	O	M*	
Aquatic Systems	Impoundments				Bird	Ruddy Duck	<i>Oxyura jamaicensis</i>	I	O	M*	
Aquatic Systems	Impoundments				Bird	Snow Goose	<i>Chen caerulescens</i>	I	O	M	
Aquatic Systems	Impoundments				Bird	Tundra Swan	<i>Cygnus columbianus</i>	I	O	M	
Aquatic Systems	Impoundments				Bird	American White Pelican	<i>Pelecanus erythrorhynchos</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Ancient Murrelet	<i>Synthlibornaphus antiquus</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Arctic Tern	<i>Sterna paradisaea</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	<u>Bald Eagle</u>	<i>Haliaeetus leucocephalus</i>	I	R	R*	SE, FT

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Aquatic Systems	Impoundments				Bird	Band-Rumped Storm-Petrel	<i>Oceanodroma castro</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Barrow's Goldeneye	<i>Bucephala islandica</i>	N	R	A	
Aquatic Systems	Impoundments				Bird	Black Scoter	<i>Melanitta nigra</i>	N	R	M	
Aquatic Systems	Impoundments				Bird	Black Skimmer	<i>Rynchops niger</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Black-Headed Gull	<i>Larus ridibundus</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Black-Legged Kittiwake	<i>Rissa tridactyla</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Brant	<i>Branta bernicla</i>	N	R	A	
Aquatic Systems	Impoundments				Bird	Brown Pelican	<i>Pelecanus occidentalis</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	California Gull	<i>Larus californicus</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Cinnamon Teal	<i>Anas Cyanoptera</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Common Moorhen	<i>Gallinula chloropus</i>	I	R	S*	
Aquatic Systems	Impoundments				Bird	Eared Grebe	<i>Podiceps nigricollis</i>	I	R	A	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Impoundments				Bird	Eurasian Wigeon	<i>Anas penelope</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Franklin's Gull	<i>Larus pipixcan</i>	I	R	M	
Aquatic Systems	Impoundments				Bird	Glaucous Gull	<i>Larus hyperboreus</i>	I	R	W	
Aquatic Systems	Impoundments				Bird	Golden Eagle	<i>Aquila chrysaetos</i>	I	R	M	
Aquatic Systems	Impoundments				Bird	Great Black-Backed Gull	<i>Larus marinus</i>	I	R	M	
Aquatic Systems	Impoundments				Bird	Greater White-Fronted Goose	<i>Anser albifrons</i>	I	R	M	
Aquatic Systems	Impoundments				Bird	Gull-Billed Tern	<i>Sterna nilotica</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Harlequin Duck	<i>Histrionicus histrionicus</i>	N	R	A	
Aquatic Systems	Impoundments				Bird	Iceland Gull	<i>Larus glaucooides</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	King Eider	<i>Somateria spectabilis</i>	N	R	A	
Aquatic Systems	Impoundments				Bird	Laughing Gull	<i>Larus atricilla</i>	I	R	M	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Impoundments				Bird	Lesser Black-Backed Gull	<i>Larus fuscus</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Little Gull	<i>Larus minutus</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Long-Billed Murrelet	<i>Brachyramphus perdix</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Long-Tailed Jaeger	<i>Stercorarius longicaudus</i>	N	R	M	
Aquatic Systems	Impoundments				Bird	Magnificent Frigatebird	<i>Fregata magnificens</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Mew Gull	<i>Larus canus</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Northern Gannet	<i>Morus bassanus</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	<u>Osprey</u>	<u>Pandion haliaetus</u>	I	R	S*	SE
Aquatic Systems	Impoundments				Bird	Pacific Loon	<i>Gavia pacifica</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Parasitic Jaeger	<i>Stercorarius parasiticus</i>	N	R	M	
Aquatic Systems	Impoundments				Bird	<u>Peregrine Falcon</u>	<i>Falco peregrinus</i>	I	R	R*	SE

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Impoundments				Bird	Pomarine Jaeger	<i>Stercorarius pomarinus</i>	N	R	M	
Aquatic Systems	Impoundments				Bird	Red-Necked Grebe	<i>Podiceps grisegena</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	<u>Roseate Tern</u>	<i>Sterna dougallii</i>	I	R	A	FE
Aquatic Systems	Impoundments				Bird	Ross's Goose	<i>Chen rossii</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Ross's Gull	<i>Rhodostethia rosea</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Royal Tern	<i>Sterna maxima</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Sabine's Gull	<i>Xema sabini</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Slaty-Backed Gull	<i>Larus schistisagus</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Sooty Tern	<i>Sterna fuscata</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Surf Scoter	<i>Melanitta perspicillata</i>	N	R	M	
Aquatic Systems	Impoundments				Bird	Thayer's Gull	<i>Larus thayeri</i>	I	R	M	
Aquatic Systems	Impoundments				Bird	Thick-Billed Murre	<i>Uria lomvia</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Western Grebe	<i>Aechmophorus occidentalis</i>	I	R	A	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Impoundments				Bird	White-Winged Black Tern	<i>Chidonias leucopterus</i>	N	R	A	
Aquatic Systems	Impoundments				Bird	White-Winged Scoter	<i>Melanitta fusca</i>	N	R	M	
Aquatic Systems	Impoundments				Bird	Yellow-Billed Loon	<i>Gavia adamsii</i>	I	R	A	
Aquatic Systems	Impoundments				Bird	Redhead	<i>melodie citronique</i>				
Aquatic Systems	Impoundments				Bird	Trumpeter Swan	<i>Olor buccinator</i>				
Aquatic Systems	Impoundments				Fish	Bluegill	<i>Lepomis macrochirus</i>	I	A		
Aquatic Systems	Impoundments				Fish	Redear Sunfish	<i>Lepomis microlophus</i>	N,S	C		
Aquatic Systems	Impoundments				Fish	White Crappie	<i>Pomoxis annularis</i>	I	C		
Aquatic Systems	Impoundments				Fish	Hybrid Striped Bass	<i>Morone saxatilis x M. chrysops</i>				
Aquatic Systems	Impoundments				Mussel	Paper Pondshell	<i>Utterbackia imbecillis</i>				

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Impoundments <i>Natural Lakes</i>				Mussel	Giant Floater	<i>Pyganodon grandis</i>				
Aquatic Systems	Kankakee River	headwater			Fish	Brook Stickleback	<i>Culaea inconstans</i>	N, SE	C		
Aquatic Systems	Kankakee River	headwater			Fish	Ironcolor Shiner	<i>Notropis chalybaeus</i>	NW	O		
Aquatic Systems	Kankakee River	headwater			Fish	Weed Shiner	<i>Notropis texanus</i>	NW	R		
Aquatic Systems	Kankakee River	wadeable/large river			Fish	Largescale Stoneroller	<i>Campostoma oligolepis</i>	N	A		
Aquatic Systems	Kankakee River	wadeable/large river			Fish	Red Shiner	<i>Cyprinella lutrensis</i>	NW	O		X
Aquatic Systems	Kankakee River	wadeable/large river			Fish	<u>Bigmouth Shiner</u>	<i>Notropis dorsalis</i>	NW	R		SE
Aquatic Systems	Kankakee River <i>Rivers and Streams</i>	headwater <i>Kankakee River</i>	<i>headwater</i>		Fish	Least Darter	<i>Etheostoma microperca</i>	N	C		
Aquatic Systems	Kankakee River <i>Rivers and Streams</i>	headwater <i>Kankakee River</i>	<i>Headwater</i>		Fish	Tadpole Madtom	<i>Noturus gyrinus</i>	I	C		
Aquatic Systems	Lake Michigan				Bird	Common Loon	<i>Gavia Immer</i>	I	C	M(*)	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Lake Michigan				Bird	Herring Gull	<i>Larus argentatus</i>	I	C	R*	
Aquatic Systems	Lake Michigan				Bird	Ring-Billed Gull	<i>Larus delawarensis</i>	I	C	R*	
Aquatic Systems	Lake Michigan				Bird	Caspian Tern	<i>Sterna caspia</i>	I	O	M*	
Aquatic Systems	Lake Michigan				Bird	Common Tern	<i>Sterna hirundo</i>	I	O	M(*)	
Aquatic Systems	Lake Michigan				Bird	Forster's Tern	<i>Sterna forsteri</i>	I	O	M(*)	
Aquatic Systems	Lake Michigan				Bird	Long-Tailed Duck	<i>Clangula hyemalis</i>	N	O	W	
Aquatic Systems	Lake Michigan				Bird	Red-Throated Loon	<i>Gavia stellata</i>	I	O	M	
Aquatic Systems	Lake Michigan				Bird	Ancient Murrelet	<i>Synthlibormaphus antiquus</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Arctic Tern	<i>Sterna paradisaea</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Band-Rumped Storm-Petrel	<i>Oceanodroma castro</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Black Scoter	<i>Melanitta nigra</i>	N	R	M	
Aquatic Systems	Lake Michigan				Bird	Black-Headed Gull	<i>Larus ridibundus</i>	I	R	A	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Lake Michigan				Bird	Black-Legged Kittiwake	<i>Rissa tridactyla</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Brant	<i>Branta bernicla</i>	N	R	A	
Aquatic Systems	Lake Michigan				Bird	California Gull	<i>Larus californicus</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Glaucous Gull	<i>Larus hyperboreus</i>	I	R	W	
Aquatic Systems	Lake Michigan				Bird	Great Black-Backed Gull	<i>Larus marinus</i>	I	R	M	
Aquatic Systems	Lake Michigan				Bird	Gull-Billed Tern	<i>Sterna nilotica</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Harlequin Duck	<i>Histrionicus histrionicus</i>	N	R	A	
Aquatic Systems	Lake Michigan				Bird	Iceland Gull	<i>Larus glaucooides</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	King Eider	<i>Somateria spectabilis</i>	N	R	A	
Aquatic Systems	Lake Michigan				Bird	Lesser Black-Backed Gull	<i>Larus fuscus</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Little Gull	<i>Larus minutus</i>	I	R	A	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Lake Michigan				Bird	Long-Billed Murrelet	<i>Brachyramphus perdix</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Long-Tailed Jaeger	<i>Stercorarius longicaudus</i>	N	R	M	
Aquatic Systems	Lake Michigan				Bird	Magnificent Frigatebird	<i>Fregata magnificens</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Mew Gull	<i>Larus canus</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Northern Gannet	<i>Morus bassanus</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Pacific Loon	<i>Gavia pacifica</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Parasitic Jaeger	<i>Stercorarius parasiticus</i>	N	R	M	
Aquatic Systems	Lake Michigan				Bird	<u>Peregrine Falcon</u>	<i>Falco peregrinus</i>	I	R	R*	SE
Aquatic Systems	Lake Michigan				Bird	Pomarine Jaeger	<i>Stercorarius pomarinus</i>	N	R	M	
Aquatic Systems	Lake Michigan				Bird	<u>Roseate Tern</u>	<i>Sterna dougallii</i>	I	R	A	FE
Aquatic Systems	Lake Michigan				Bird	Ross's Gull	<i>Rhodostethia rosea</i>	I	R	A	

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Lake Michigan				Bird	Royal Tern	<i>Sterna maxima</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Sabine's Gull	<i>Xema sabini</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Sanderling	<i>Calidris alba</i>	I	R	M	
Aquatic Systems	Lake Michigan				Bird	Slaty-Backed Gull	<i>Larus schistisagus</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	Surf Scoter	<i>Melanitta perspicillata</i>	N	R	M	
Aquatic Systems	Lake Michigan				Bird	Thayer's Gull	<i>Larus thayeri</i>	I	R	M	
Aquatic Systems	Lake Michigan				Bird	Thick-Billed Murre	<i>Uria lomvia</i>	I	R	A	
Aquatic Systems	Lake Michigan				Bird	White-Winged Black Tern	<i>Chidonias leucopterus</i>	N	R	A	
Aquatic Systems	Lake Michigan				Bird	White-Winged Scoter	<i>Melanitta fusca</i>	N	R	M	
Aquatic Systems	Lake Michigan				Bird	Yellow-Billed Loon	<i>Gavia adamsii</i>	I	R	A	
Aquatic Systems	Lake Michigan				Fish	Great Lakes Muskellunge	<i>Esox masquinongy</i>	N	1910		Ex
Aquatic Systems	Lake Michigan				Fish	Shortnose Cisco	<i>Coregonus reighardi</i>	NW	1972		Ex

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Lake Michigan				Fish	Blackfin Cisco	<i>Coregonus nigripinnis</i>	NW	?		Ex
Aquatic Systems	Lake Michigan				Fish	Alewife	<i>Alosa pseudoharengus</i>	NW	A		X
Aquatic Systems	Lake Michigan				Fish	Round Goby	<i>Neogobius melanostomus</i>	NW	A		X
Aquatic Systems	Lake Michigan				Fish	Spottail Shiner	<i>Notropis hudsonius</i>	NW	A		
Aquatic Systems	Lake Michigan				Fish	Brown Trout	<i>Salmo trutta</i>	N	C		X
Aquatic Systems	Lake Michigan				Fish	Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	NW	C		X
Aquatic Systems	Lake Michigan				Fish	Coho Salmon	<i>Oncorhynchus kisutch</i>	NW	C		X
Aquatic Systems	Lake Michigan				Fish	<u>Lake Whitefish</u>	<i>Coregonus clupeaformis</i>	NW	C		SE
Aquatic Systems	Lake Michigan				Fish	Rainbow Smelt	<i>Osmerus mordax</i>	NW	C		X
Aquatic Systems	Lake Michigan				Fish	Rainbow Trout	<i>Oncorhynchus mykiss</i>	N	C		X
Aquatic Systems	Lake Michigan				Fish	Yellow Perch	<i>Perca flavescens</i>	N	C		

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Lake Michigan				Fish	Atlantic Salmon	<i>Salmo salar</i>	NW	O		X
Aquatic Systems	Lake Michigan				Fish	Burbot	<i>Lota lota</i>	NW, WE	O		
Aquatic Systems	Lake Michigan				Fish	Lake Trout	<i>Salvelinus namaycush</i>	NW	O		
Aquatic Systems	Lake Michigan				Fish	Longnose Dace	<i>Rhinichthys cataractae</i>	N	O		
Aquatic Systems	Lake Michigan				Fish	Ninespine Stickleback	<i>Pungitius pungitius</i>	NW	O		
Aquatic Systems	Lake Michigan				Fish	Sea Lamprey	<i>Petromyzon marinus</i>	NW	O		X
Aquatic Systems	Lake Michigan				Fish	Three-Spine Stickleback	<i>Gasterosteus aculeatus</i>	NW	O		X
Aquatic Systems	Lake Michigan				Fish	Bloater	<i>Coregonus hoyi</i>	NW	R		
Aquatic Systems	Lake Michigan				Fish	Brook Trout	<i>Salvelinus fontinalis</i>	NW	R		
Aquatic Systems	Lake Michigan				Fish	Deepwater Sculpin	<i>Myoxocephalus thompsoni</i>	NW	R		
Aquatic Systems	Lake Michigan				Fish	Kiyi	<i>Coregonus kiyi</i>	NW	R		

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Lake Michigan				Fish	Lake Chub	<i>Couesius plumbeus</i>	NW	R		
Aquatic Systems	Lake Michigan				Fish	Longnose Sucker	<i>Catostomus catostomus</i>	NW	R		
Aquatic Systems	Lake Michigan				Fish	Shortjaw Cisco	<i>Coregonus zenithicus</i>	NW	R		
Aquatic Systems	Lake Michigan				Fish	Slimy Sculpin	<i>Cottus cognatus</i>	NW	R		
Aquatic Systems	Lake Michigan				Fish	Trout-Perch	<i>Percopsis omiscomaycus</i>	NW, S	R		
Aquatic Systems	Lake Michigan				Fish	White Perch	<i>Morone americana</i>	NW	R		X
Aquatic Systems	Natural Lakes				Fish	Pugnose Shiner	<i>Notropis anogenus</i>	NE	1945		Ex
Aquatic Systems	Natural Lakes				Fish	Largemouth Bass	<i>Micropterus salmoides</i>	I	A		
Aquatic Systems	Natural Lakes				Fish	Banded Killifish	<i>Fundulus diaphanus</i>	N	C		
Aquatic Systems	Natural Lakes				Fish	Black Crappie	<i>Pomoxis nigromaculatus</i>	I	C		

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Aquatic Systems	Natural Lakes				Fish	Brook Silverside	<i>Labidesthes sicculus</i>	I	C		
Aquatic Systems	Natural Lakes				Fish	Brown Bullhead	<i>Ameiurus nebulosus</i>	S	C		
Aquatic Systems	Natural Lakes				Fish	Golden Shiner	<i>Notemigonus crysoleucas</i>	I	C		
Aquatic Systems	Natural Lakes				Fish	Pumpkinseed	<i>Lepomis gibbosus</i>	I	C		
Aquatic Systems	Natural Lakes				Fish	Starhead Topminnow	<i>Fundulus dispar</i>	NW	C		
Aquatic Systems	Natural Lakes				Fish	Warmouth	<i>Lepomis gulosus</i>	N	C		
Aquatic Systems	Natural Lakes				Fish	Bowfin	<i>Amia calva</i>	N,S	O		
Aquatic Systems	Natural Lakes				Fish	Iowa Darter	<i>Etheostoma exile</i>	N	O		
Aquatic Systems	Natural Lakes				Fish	Lake Chubsucker	<i>Erimyzon sucetta</i>	N	O		
Aquatic Systems	Natural Lakes				Fish	Northern Pike	<i>Esox lucius</i>	N	O		
Aquatic Systems	Natural Lakes				Fish	Spotted Gar	<i>Lepisosteus oculatus</i>	NE, SW	O		
Aquatic Systems	Natural Lakes				Fish	Blackchin Shiner	<i>Notropis heterodon</i>	N	R		
Aquatic Systems	Natural Lakes				Fish	Blacknose Shiner	<i>Notropis heterolepis</i>	N	R		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Natural Lakes				Fish	<u>Cisco Or Lake Herring</u>	<i>Coregonus artedi</i>	NW	R		SC
Aquatic Systems	Natural Lakes				Mussel	Pond Mussel	<i>Ligumia subrostrata</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Black Sandshell	<i>Ligumia recta</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Butterfly	<i>Ellipsaria lineolata</i>				
Aquatic Systems	Ohio River	Great river			Mussel	<u>Catspaw</u>	<i>Epioblasma obliquata obliquata</i>				FE-extirpated
Aquatic Systems	Ohio River	Great river			Mussel	<u>Cracking Pearlymussel</u>	<i>Hemistena lata</i>				FE-extirpated
Aquatic Systems	Ohio River	Great river			Mussel	Deertoe	<i>Truncilla truncata</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Ebonysell	<i>Fusconaia ebena</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Elephantear	<i>Elliptio crassidens</i>				
Aquatic Systems	Ohio River	Great river			Mussel	<u>Fat Pocketbook</u>	<i>Potamilus capax</i>				FE
Aquatic Systems	Ohio River	Great river			Mussel	Fawnsfoot	<i>Truncilla donaciformis</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Fragile Papershell	<i>Leptodea fragilis</i>				

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River	Great river			Mussel	Leafshell	<i>Epioblasma flexuosa</i>				extirpated
Aquatic Systems	Ohio River	Great river			Mussel	Longsolid	<i>Fusconaia subrotunda</i>				SE
Aquatic Systems	Ohio River	Great river			Mussel	Mapleleaf	<i>Quadrula quadrula</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Monkeyface	<i>Quadrula metanevra</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Ohio Pigtoe	<i>Pleurobema cordatum</i>				SC
Aquatic Systems	Ohio River	Great river			Mussel	Orangefoot Pimpleback	<i>Plethobasus cooperianus</i>				FE
Aquatic Systems	Ohio River	Great river			Mussel	Pimpleback	<i>Quadrula pustulosa</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Pink Mucket	<i>Lampsilis abrupta</i>				FE
Aquatic Systems	Ohio River	Great river			Mussel	Pink Papershell	<i>Potamilus ohioensis</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Pocketbook	<i>Lampsilis ovata</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Pyramid Pigtoe	<i>Pleurobema rubrum</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Ring Pink	<i>Obovaria retusa</i>				FE- extirpated

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River	Great river			Mussel	Rock Pocketbook	<i>Arcidens confragosus</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Round Combshell	<i>Epioblasma personata</i>				extirpated
Aquatic Systems	Ohio River	Great river			Mussel	Scaleshell	<i>Leptodea leptodon</i>				extirpated
Aquatic Systems	Ohio River	Great river			Mussel	Spectaclecase	<i>Cumberlandia monodonta</i>				extirpated
Aquatic Systems	Ohio River	Great river			Mussel	Tennessee Riffleshell	<i>Epioblasma propinqua</i>				extirpated
Aquatic Systems	Ohio River	Great river			Mussel	Threehorn Wartyback	<i>Obliquaria reflexa</i>				
Aquatic Systems	Ohio River	Great river			Mussel	<u>Tubercled Blossom</u>	<i>Epioblasma torulosa torulosa</i>				FE
Aquatic Systems	Ohio River	Great river			Mussel	Wabash Riffleshell	<i>Epioblasma sampsonii</i>				extirpated
Aquatic Systems	Ohio River	Great river			Mussel	Wartyback	<i>Quadrula nodulata</i>				
Aquatic Systems	Ohio River	Great river			Mussel	Washboard	<i>Megaloniais nervosa</i>				

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River	Great river			Mussel	<u>White Catspaw</u>	<i>Epioblasma obliquata perobliqua</i>				FE
Aquatic Systems	Ohio River	Great river			Mussel	<u>White Wartyback</u>	<i>Plethobasus cicatricosus</i>				FE
Aquatic Systems	Ohio River	Great river			Mussel	<u>Winger Mapleleaf</u>	<i>Quadrula fragosa</i>				FE-exterpaited
Aquatic Systems	Ohio River drainage	Great river			Fish	Harelip Sucker	<i>Lagochila lacera</i>	C	1893		Ex
Aquatic Systems	Ohio River drainage	Great river			Fish	Alabama Shad	<i>Alosa alabamae</i>	SW	1902		Ex
Aquatic Systems	Ohio River drainage	Great river			Fish	Stargazing Darter	<i>Percina uranidea</i>	SW	1920		Ex
Aquatic Systems	Ohio River drainage	Great river			Fish	Crystal Darter	<i>Crystallaria asprella</i>	S	1892-95		Ex
Aquatic Systems	Ohio River drainage	Great river			Fish	Carp	<i>Cyprinus carpio</i>	I	A		X
Aquatic Systems	Ohio River drainage	Great river			Fish	Emerald Shiner	<i>Notropis atherinoides</i>	I	A		
Aquatic Systems	Ohio River drainage	Great river			Fish	Gizzard Shad	<i>Dorosoma cepedianum</i>	I	A		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River drainage	Great river			Fish	Channel Shiner	<i>Notropis wickliffi</i>	S	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Flathead Catfish	<i>Pylodictis olivaris</i>	I	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Freshwater Drum	<i>Aplodinotus grunniens</i>	I	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Longnose Gar	<i>Lepisosteus osseus</i>	I	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Mississippi Silvery Minnow	<i>Hybognathus nuchalis</i>	SC, SW	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	River Carpsucker	<i>Carpionodes carpio</i>	W, S	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	River Shiner	<i>Notropis blennioides</i>	W, S	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Silver Chub	<i>Macrhybopsis storeriana</i>	W	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Silverband Shiner	<i>Notropis shumardi</i>	SW	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Skipjack Herring	<i>Alosa chrysochloris</i>	W, S	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Smallmouth Buffalo	<i>Ictiobus bubalus</i>	W, S	C		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River drainage	Great river			Fish	Steelcolor Shiner	<i>Cyprinella whipplei</i>	C, S	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Threadfin Shad	<i>Dorosoma petenense</i>	S	C		X
Aquatic Systems	Ohio River drainage	Great river			Fish	White Bass	<i>Morone chrysops</i>	W	C		
Aquatic Systems	Ohio River drainage	Great river			Fish	Bighead Carp	<i>Hypothalmichthys nobilis</i>	SW	O	X	
Aquatic Systems	Ohio River drainage	Great river			Fish	Bigmouth Buffalo	<i>Ictiobus cyprinellus</i>	W, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Blue Catfish	<i>Ictalurus furcatus</i>	S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Bullhead Minnow	<i>Pimephales vigilax</i>	W, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Freckled Madtom	<i>Noturus nocturnus</i>	W	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Ghost Shiner	<i>Notropis buchmanii</i>	NW, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Goldeye	<i>Hiodon alosoides</i>	S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Grass Carp	<i>Ctenopharyngodon idella</i>	NW, C, SE	O		X

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River drainage	Great river			Fish	Highfin Carpsucker	<i>Carpionodes velifer</i>	W, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Mooneye	<i>Hiodon tergisus</i>	W, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Mountain Madtom	<i>Noturus eleutherus</i>	W, C	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Paddlefish	<i>Polydon spathula</i>	W, SE	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	River Darter	<i>Percina shumardi</i>	C, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	River Redhorse	<i>Moxostoma carinatum</i>	C, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Shoal Chub (Formerly Speckled Chub)	<i>Macrhybopsis hyostoma</i>	W, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Shortnose Gar	<i>Lepisosteus platostomus</i>	W, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	Western Sand Darter	<i>Ammocrypta clara</i>	Nw, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	White Catfish	<i>Ameiurus catus</i>	S	O		X

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River drainage	Great river			Fish	Yellow Bass	<i>Morone mississippiensis</i>	W, S	O		
Aquatic Systems	Ohio River drainage	Great river			Fish	American Eel	<i>Anguilla rostrata</i>	W, S	R		
Aquatic Systems	Ohio River drainage	Great river			Fish	Black Buffalo	<i>Ictiobus niger</i>	NW, S	R		
Aquatic Systems	Ohio River drainage	Great river			Fish	<u>Channel Darter</u>	<i>Percina copelandi</i>	C	R		ST
Aquatic Systems	Ohio River drainage	Great river			Fish	Inland Silverside	<i>Menidia beryllina</i>	S	R		X
Aquatic Systems	Ohio River drainage	Great river			Fish	<u>Lake Sturgeon</u>	<i>Acipenser fulvescens</i>	W, S	R		SE
Aquatic Systems	Ohio River drainage	Great river			Fish	Northern Madtom	<i>Noturus stigmosus</i>	W, C	R		
Aquatic Systems	Ohio River drainage	Great river			Fish	Saddleback Darter	<i>Percina vigil</i>	SW	R		
Aquatic Systems	Ohio River drainage	Great river			Fish	Silver Carp	<i>Hypophthalmichthys molitrix</i>	SE, SW	R		X
Aquatic Systems	Ohio River drainage	Great river			Fish	Striped Mullet	<i>Mugil cephalus</i>	S	R		X
Aquatic Systems	Ohio River drainage	Great river			Fish	<u>Tippecanoe Darter</u>	<i>Etheostoma tippecanoe</i>	C	R		SC

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River drainage <i>Rivers and Streams</i>	Great river <i>Ohio River drainage</i>	<i>Great river</i>		Fish	Channel Catfish	<i>Ictalurus Punctatus</i>	I	C		
Aquatic Systems	Ohio River drainage <i>Rivers and Streams</i>	Great river <i>Ohio River drainage</i>	<i>Great river</i>		Fish	Sauger	<i>Sander canadense</i>	W,S	C		
Aquatic Systems	Ohio River drainage <i>Rivers and Streams</i>	Great river <i>Ohio River drainage</i>	<i>Great river</i>		Fish	<u>Blue Sucker</u>	<u><i>Cycleptus elongatus</i></u>	C, S	O		FC
Aquatic Systems	Ohio River drainage <i>Rivers and Streams</i>	Great river <i>Ohio River drainage</i>	<i>Great river</i>		Fish	Shovelnose Sturgeon	<i>Scaphirhynchus platorynchus</i>	W, SE	O		
Aquatic Systems	Ohio River <i>Rivers and Streams</i>	Great river <i>Ohio River drainage</i>	<i>Great river</i>		Mussel	<u>Fanshell</u>	<u><i>Cyprogenia stegaria</i></u>				FE
Aquatic Systems	Ohio River <i>Rivers and Streams</i>	Great river <i>Ohio River drainage</i>	<i>Great river</i>		Mussel	Hickorynut	<i>Obovaria olivaria</i>				

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River Rivers and Streams	Great river Great Lakes drainage	Wadeable/large river		Mussel	<u>Rough Pigtoe</u>	<i>Pleurobema plenum</i>				FE
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Blackstripe Topminnow	<i>Fundulus notatus</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Bluntnose Minnow	<i>Pimephales notatus</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Creek Chub	<i>Semolitus atromaculatus</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Green Sunfish	<i>Lepomis cyanellus</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Johnny Darter	<i>Etheostoma nigrum</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	White Sucker	<i>Catostomus commersoni</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Fathead Minnow	<i>Pimephales promelas</i>	N, SE	C		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Grass Pickerel	<i>Esox americanus</i>		C		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Redfin Shiner	<i>Lythrurus umbratilis</i>	W, C	C		

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Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Creek Chubsucker	<i>Erimyzon oblongus</i>	NW, C, SW	O		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	Least Brook Lamprey	<i>Lampetra aepyptera</i>	SW	R		
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Fish	<u>Redside Dace</u>	<i>Clinostomus elongatus</i>	E	R		ST
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Creeper	<i>Strophitus undulatus</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Elktoe	<i>Alasmidonta marginata</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Fatmucket	<i>Lampsilis siliquoidea</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Flutedshell	<i>Lasmigona costata</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Kidneyshel	<i>Prychobranchnus fasciolaris</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Lilliput	<i>Toxolasma parvus</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	<u>Little Spectaclecase</u>	<i>Villosa lienosa</i>				SC

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Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	<u>Northern Riffleshell</u>	<i>Epioblasma torulosa rangiana</i>				FE
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Pink Heelsplitter	<i>Potamilus alatus</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Pistolgrip	<i>Pistolgrip</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Plain Pocketbook	<i>Lampsilis cardium</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	<u>Purple Lilliput</u>	<i>Toxolasma lividus</i>				SC
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Purple Wartyback	<i>Cyclonaias tuberculata</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Rabbitsfoot	<i>Quadrula cylindrica</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	<u>Rayed Bean</u>	<i>Villosa fabalis</i>				SC
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	<u>Round Hickorynut</u>	<i>Obovaria subrotunda</i>				SC
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Round Pigtoe	<i>Pleurobema sintoxia</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	<u>Salamandar Mussel</u>	<i>Simpsonaias ambigua</i>				SC

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Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Sheepnose	<i>Plethobasus cyphus</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Snuffbox	<i>Epioblasma triquetra</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	Wabash Pigtoe	<i>Fusconaia flava</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	<u>Wavyrayed Lampmussel</u>	<i>Lampsilis fasciola</i>				SC
Aquatic Systems	Ohio River/E.C.-I.P.	headwater			Mussel	White Heelsplitter	<i>Lasmigona complanata</i>				
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Popeye Shiner	<i>Notropis ariommus</i>	WC	1894		Ex
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Black Bullhead	<i>Ameiurus melas</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Central Stoneroller	<i>Campostoma anomalum</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Golden Redhorse	<i>Moxostoma erythrurum</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Longear Sunfish	<i>Lepomis megalotis</i>	I	A		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Sand Shiner	<i>Notropis stramineus</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Spotfin Shiner	<i>Cyprinella spiloptera</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Striped Shiner	<i>Luxilus chrysocephalus</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Yellow Bullhead	<i>Ameiurus natalis</i>	I	A		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Banded Darter	<i>Etheostoma zonale</i>	NW, SE	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Bigeye Chub	<i>Hybopsis amblops</i>	NW	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Bigeye Shiner	<i>Notropis boops</i>	C	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Black Redhorse	<i>Moxostoma duquesnei</i>	C	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Blackside Darter	<i>Percina maculata</i>	I	C		

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Dusky Darter	<i>Percina sciera</i>	C	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Fantail Darter	<i>Etheostoma flabellare</i>	E, C	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Greenside Darter	<i>Etheostoma blennioides</i>	C, E	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Logperch Sunfish	<i>Percina caprodes</i>	I	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Northern Studfish	<i>Fundulus catenatus</i>	C	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Quillback	<i>Carpionodes cyprinus</i>	I	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Rainbow Darter	<i>Etheostoma caeruleum</i>	N, C	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	River Chub	<i>Nocomis micropogon</i>	NE, C	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Rosyface Shiner	<i>Notropis rubellus</i>	N, C	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Scarlet Shiner (Formerly Rosefin Shiner)	<i>Lythrurus ardens</i>	SE	C		

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Silver Redhorse	<i>Moxostoma anisurum</i>	N, C	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Silverjaw Minnow	<i>Ericymba buccata</i>	I	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Spotted Sucker	<i>Minytrema melanops</i>	NE, C	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Stonecat	<i>Noturus flavus</i>	I	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Suckermouth Minnow	<i>Phenacobius mirabilis</i>	C, S	C		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	American Brook Lamprey	<i>Lampetra appendix</i>	NW	O		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Banded Sculpin	<i>Cottus carolinae</i>	SC, SW	O		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Brindled Madtom	<i>Noturus miuris</i>	C	O		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Chestnut Lamprey	<i>Ichthyomyzon castaneus</i>	SW	O		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	<u>Gilt Darter</u>	<i>Percina evides</i>	C	O		SE
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Mimic Shiner	<i>Notropis volucellus</i>	E, C, S	O		

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Orangespotted Sunfish	<i>Lepomis humilis</i>	N	O		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Silver Lamprey	<i>Ichthyomyzon unicuspis</i>	W, S	O		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Silver Shiner	<i>Notropis photogenis</i>	C, SE	O		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Bluebreast Darter	<i>Etheostoma camurum</i>	C	R		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Gravel Chub	<i>Erimystax x-punctatus</i>	W, S	R		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Harlequin Darter	<i>Etheostoma histrio</i>	S	R		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Ohio Lamprey	<i>Ichthyomyzon bdellium</i>	W, S	R		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Ohio River Muskellunge	<i>Esox masquinongy</i>	S	R		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	<u>Spotted Darter</u>	<i><u>Etheostoma maculatum</u></i>	C	R		SC
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Streamline Chub	<i>Erimystax dissimilis</i>	NW	R		
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	<u>Variegate Darter</u>	<i><u>Etheostoma variatum</u></i>	SE	R		SC

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River/E.C.-I.P.	wadeable/large			Fish	Slenderhead Darter	<i>Percina phoxocephala</i>	C	S		
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	wadeable/large Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Wadeable/large river	Fish	Northern Hogsucker	<i>Hypentelium nigricans</i>	N, C	C		
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	wadeable/large Great Lakes drainage	Headwater		Fish	Mottled Sculpin	<i>Cottus bairdi</i>	I	C		
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	headwater Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Headwater	Fish	Orangethroat Darter	<i>Etheostoma spectabile</i>	C	A		
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	wadeable/large Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Wadeable/large river	Fish	<u>Eastern Sand Darter</u>	<u><i>Ammocrypta pellucida</i></u>	C, SW	O		SC, FC

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	wadeable/large Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Wadeable/large river	Fish	Rock Bass	<i>Ambloplites rupestris</i>	I	C		
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	headwater Great Lakes drainage	Headwater		Mussel	Slippershell Mussel	<i>Alasmidonta viridis</i>				
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	headwater Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Headwater	Mussel	Cylindrical Papershell	<i>Anodontoides ferussacianus</i>				
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	headwater Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Wadeable/large river	Mussel	Spike	<i>Elliptio dilatata</i>				
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	headwater Great Lakes drainage	Great river		Mussel	Mucket	<i>Actinonaias ligamentina</i>				

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	headwater Great Lakes drainage	Wadeable/large river		Mussel	Rainbow	<i>Villosa iris</i>				
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	headwater Kankakee River	Headwater		Mussel	Creek Heelsplitter	<i>Lasmigona compressa</i>				
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	headwater Kankakee River	Wadeable/large river		Mussel	Threeridge	<i>Amblema plicata</i>				
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	headwater Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Headwater	Fish	Southern Redbelly Dace	<i>Phoxinus erythrogaster</i>	NW, C	O		
Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	headwater Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Wadeable/large river	Mussel	<u>Clubshell</u>	<i>Pleurobema clava</i>				FE

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Aquatic Systems	Ohio River/E.C.-I.P. Rivers and Streams	wadeable/large Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Wadeable/large river	Fish	Smallmouth Bass	<i>Micropterus dolomieu</i>	I	A		
Aquatic Systems	Ohio River/I.R.L.	headwater			Fish	Blackspotted Topminnow	<i>Fundulus olivaceus</i>	W, NE	R		
Aquatic Systems	Ohio River/I.R.L.	headwater			Fish	Pirate Perch	<i>Aphredoderus sayanus</i>	N, SW	C		
Aquatic Systems	Ohio River/I.R.L.	headwater			Fish	Pugnose Minnow	<i>Opsopoeodus emiliae</i>	N, SW	R		
Aquatic Systems	Ohio River/I.R.L.	headwater			Fish	Western Mosquitofish	<i>Gambusia affinis</i>	W	O		
Aquatic Systems	Ohio River/I.R.L.	wadeable/large			Fish	Mud Darter	<i>Etheostoma asprigene</i>	S	C		
Aquatic Systems	Ohio River/I.R.L.	wadeable/large			Fish	Bluntnose Darter	<i>Etheostoma chlorosoma</i>	W	R		
Aquatic Systems	Ohio River/I.R.L.	wadeable/large			Fish	<u>Pallid Shiner</u>	<i>Hybopsis amnis</i>	W	R		SE
Aquatic Systems	Ohio River/I.R.L.	wadeable/large			Fish	Ribbon Shiner	<i>Lythrurus fumeus</i>	SW	R		

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Aquatic Systems	Ohio River/I.R.L.	wadeable/large			Mussel	Texas Lilliput	<i>Toxolasma texasiensis</i>				
Aquatic Systems	Ohio River/I.R.L. Rivers and Streams	wadeable/large Ohio River drainage	<i>Interior river lowland</i>	<i>Wadeable/large river</i>	Mussel	Yellow Sandshell	<i>Lampsilis teres</i>				
Aquatic Systems	Ohio River/I.R.L. Rivers and Streams	headwater Ohio River drainage	<i>Interior river lowland</i>	<i>Headwater</i>	Fish	<u>Spottail Darter</u>	<i><u>Etheostoma squamiceps</u></i>	SW	R		SC
Aquatic Systems	Ohio River/I.R.L. Rivers and Streams	headwater Ohio River drainage	<i>Interior river lowland</i>	<i>Headwater</i>	Mussel	Pond Horn	<i>Unio merus tetralasmus</i>				
Aquatic Systems	Ohio River/I.R.L. Rivers and Streams	wadeable/large Ohio River drainage	<i>Interior river lowland</i>	<i>Wadeable/large river</i>	Fish	Slough Darter	<i>Etheostoma gracile</i>	SW	O		
Aquatic Systems	Ohio River/I.R.L. Rivers and Streams	wadeable/large Ohio River drainage	<i>Interior river lowland</i>	<i>Wadeable/large river</i>	Fish	Spotted Bass	<i>Micropterus punctulatus</i>	S	A		

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Aquatic Systems	Oxbows				Bird	Wood Duck	<i>Aix sponsa</i>	I	C	R*	
Aquatic Systems	Oxbows	Oxbows/backwaters/ sloughs/embayments			Amphibian	Western Lesser Siren	<i>Siren intermedia</i>	W	O		
Aquatic Systems	Oxbows, etc.	Oxbows/backwaters/ sloughs/embayments			Fish	Flier	<i>Centrarchus macropterus</i>	SW	O		
Aquatic Systems	Oxbows, etc.	Oxbows/backwaters /sloughs/embayments			Fish	Redspotted Sunfish (Formerly Spotted Sunfish)	<i>Lepomis miniatus</i>	SW	R		
Aquatic Systems	Oxbows, etc.	Oxbows/backwaters/ sloughs/embayments			Mussel	Flat Floater	<i>Anodonta suborbiculata</i>				
Aquatic Systems	Oxbows, etc.				Fish	Alligator Gar	<i>Atractosteus spatula</i>	S	1976		Ex
Aquatic Systems	Oxbows, etc.				Fish	Banded Pygmy Sunfish	<i>Elassoma zonatum</i>	SW	R		
Aquatic Systems	Oxbows, etc.				Fish	Bantam Sunfish	<i>Lepomis symmetricus</i>	W	R		ST
Aquatic Systems	Oxbows, etc.				Fish	Cypress Darter	<i>Etheostoma proeliare</i>	SW	R		

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Aquatic Systems	Oxbows, etc.				Fish	Cypress Minnow	<i>Hybognathus hayi</i>	SW	R		
Aquatic Systems	Rivers and Streams	Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Headwater	Amphibian	Streamside Salamander	<i>Ambystoma barbouri</i>	SE	C		
Aquatic Systems	Rivers and Streams	Ohio River drainage	Eastern corn belt/interior plateau ecoregions	Headwater	Amphibian	Two-Lined Salamander	<i>Eurycea cirrigera</i>	C, S	A		
Aquatic Systems	Rivers and Streams	Great Lakes drainage	Great river		Fish	Smallmouth Bass	<i>Micropterus dolomieu</i>	I	A		
Aquatic Systems	Rivers and Streams	Great Lakes drainage	Wadeable/large river		Fish	Smallmouth Bass	<i>Micropterus dolomieu</i>	I	A		
Aquatic Systems	Rivers and Streams	Kankakee River	Wadeable/large river		Fish	Northern Pike	<i>Esox lucius</i>	N	O		
Aquatic Systems	Rivers and Streams	Ohio River drainage	Interior river lowland	Wadeable/large river	Reptile	<u>Alligator Snapping Turtle</u>	<u><i>Macrolemys temminckii</i></u>	SW	R		SE
Aquatic Systems	Rivers and Streams	Ohio River drainage	Interior river lowland	Wadeable/large river	Reptile	River Cooter	<i>Pseudemys concinna</i>	SW	1950		

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Aquatic Systems	Rivers and Streams	Ohio River drainage on rep. species list	Eastern corn belt/interior plateau ecoregions	Wadeable/large river	Amphibian	Hellbender	<i>Cryptobranchus alleganiensis</i>	S	R		SE, FC
Aquatic Systems	Rivers and Streams				Bird	Common Goldeneye	<i>Bucephala clangula</i>	I	C	W	
Aquatic Systems	Rivers and Streams				Bird	Ring-Billed Gull	<i>Larus delawarensis</i>	I	C	R*	
Aquatic Systems	Rivers and Streams				Bird	Wood Duck	<i>Aix sponsa</i>	I	C	R*	
Aquatic Systems	Rivers and Streams				Bird	Bank Swallow	<i>Riparia riparia</i>	I	O	S*	
Aquatic Systems	Rivers and Streams				Bird	Belted Kingfisher	<i>Ceryle alcyon</i>	I	O	R*	
Aquatic Systems	Rivers and Streams				Bird	Bonaparte's Gull	<i>Larus philadelphia</i>	I	O	M	
Aquatic Systems	Rivers and Streams				Bird	Bufflehead	<i>Bucephala albeola</i>	I	O	W	
Aquatic Systems	Rivers and Streams				Bird	Common Merganser	<i>Mergus merganser</i>	I	O	W	
Aquatic Systems	Rivers and Streams				Bird	Double-Crested Cormorant	<i>Phalacrocorax auritus</i>	I	O	M*	

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Aquatic Systems	Rivers and Streams				Bird	Red-Breasted Merganser	<i>Mergus serrator</i>	I	O	M*	
Aquatic Systems	Rivers and Streams				Bird	Ruddy Duck	<i>Oxyura jamaicensis</i>	I	O	M*	
Aquatic Systems	Rivers and Streams				Mammal	Mink	<i>Mustela vison</i>	I	O		
Aquatic Systems	Rivers and Streams				Bird	American White Pelican	<i>Pelecanus erythrorhynchos</i>	I	R	A	
Aquatic Systems	Rivers and Streams				Bird	<u>Bald Eagle</u>	<i>Haliaeetus leucocephalus</i>	I	R	R*	SE, FT
Aquatic Systems	Rivers and Streams				Bird	Barrow's Goldeneye	<i>Bucephala islandica</i>	N	R	A	
Aquatic Systems	Rivers and Streams				Bird	<u>Least Tern</u>	<i>Sterna antillarum</i>	I	R	S*	SE, FE
Aquatic Systems	Rivers and Streams				Bird	<u>Osprey</u>	<i>Pandion haliaetus</i>	I	R	S*	SE
<i>Aquatic Systems</i>	<i>Unimpounded rivers and streams</i>				<i>Bird</i>	<i>Wood Duck</i>	<i>Aix sponsa</i>	<i>I</i>	<i>C</i>	<i>R*</i>	
Aquatic Systems					Amphibian	Bullfrog	<i>Rana catesbeiana</i>	I	A		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems					Amphibian	American Toad	<i>Bufo americanus</i>	N, C, SE	C		
Aquatic Systems					Amphibian	Cave Salamander	<i>Eurycea lucifuga</i>	S	C		
Aquatic Systems					Amphibian	Cricket Frog	<i>Acris crepitans</i>	I	C		
Aquatic Systems					Amphibian	Fowler's Toad	<i>Bufo fowleri</i>	I	C		
Aquatic Systems					Amphibian	Green Frog	<i>Rana clamitans</i>	I	C		
Aquatic Systems					Amphibian	Longtail Salamander	<i>Eurycea longicauda</i>	S	C		
Aquatic Systems					Amphibian	<u>Blue-Spotted Salamander</u>	<i>Ambystoma laterale</i>	N	O		SC
Aquatic Systems					Amphibian	Eastern Newt	<i>Notophthalmus viridescens</i>	I	O		
Aquatic Systems					Amphibian	Lesser Siren	<i>Siren intermedia</i>	W	O		
Aquatic Systems					Amphibian	<u>Mudpuppy</u>	<i>Necturus maculosus</i>	I	O		SC
Aquatic Systems					Amphibian	Northern Dusky Salamander	<i>Desmognathus fuscus</i>	SE	O		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems					Amphibian	Pickereel Frog	<i>Rana palustris</i>	E, C, WC	O		SC
Aquatic Systems					Amphibian	Four-Toed Salamander	<i>Hemidactylum scutatum</i>	N, C	R		ST
Aquatic Systems					Amphibian	Northern Red Salamander	<i>Pseudotriton ruber</i>	SC	R		SE
Aquatic Systems					Amphibian	Plains Leopard Frog	<i>Rana blairi</i>	W	R		SC
Aquatic Systems					Amphibian	Green Treefrog	<i>Hyla cinerea</i>				
<i>Aquatic Systems</i>					<i>Bird</i>	<i>Red-Winged Blackbird</i>	<i>Agelaius phoeniceus</i>	<i>I</i>	<i>A</i>	<i>R*</i>	
Aquatic Systems					Mammal	Beaver	<i>Castor canadensis</i>	I	C		reintroduced
<i>Aquatic Systems</i>					<i>Mammal</i>	<i>Mink</i>	<i>Mustela vison</i>	<i>I</i>	<i>O</i>		
Aquatic Systems					Mammal	River Otter	<i>Lutra canadensis</i>	I	R		reintroduced
Aquatic Systems					Reptile	Banded Water Snake	<i>Nerodia sipedon</i>	I	A		
Aquatic Systems					Reptile	Common Musk Turtle	<i>Sternotherus odoratus</i>	I	A		
Aquatic Systems					Reptile	Common Snapping Turtle	<i>Chelydra serpentina</i>	I	A		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems					Reptile	Painted Turtle	<i>Chrysemys picta</i>	I	A		
Aquatic Systems					Reptile	Map Turtle	<i>Graptemys geographica</i>	I	C		
Aquatic Systems					Reptile	Queen Snake	<i>Regina Septemvittata</i>	E, C, WC, N	C		
Aquatic Systems					Reptile	Red-Eared Turtle	<i>Trachemys scripta</i>	S, WC	C		
Aquatic Systems					Reptile	Spiny Softshell	<i>Apalone spinifera</i>	I	C		
Aquatic Systems					Reptile	<u>Blanding's Turtle</u>	<i>Emydoidea blandingii</i>	N	O		SC
Aquatic Systems					Reptile	Diamondback Water Snake	<i>Nerodia rhombifer</i>	SW	O		
Aquatic Systems					Reptile	False Map Turtle	<i>Graptemys pseudogeographica</i>	W, S	O		
Aquatic Systems					Reptile	<u>Northern Copperbelly</u>	<i>Nerodia erythrogaster</i>	SW, NE, SC	O		ST, FC
Aquatic Systems					Reptile	Smooth Softshell	<i>Apalone mutica</i>	W, S	O		
Aquatic Systems					Reptile	<u>Spotted Turtle</u>	<i>Clemmys guttata</i>	N	O		ST

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Aquatic Systems					Reptile	<u>Cottonmouth</u>	<i>Agkistrodon piscivorus</i>	S	R		ST
Aquatic Systems					Reptile	<u>Eastern Mud Turtle</u>	<i>Kinosternon subrubrum</i>	NW, SW	R		ST
Aquatic Systems					Reptile	<u>Ouachita Map Turtle</u>	<i>Graptemys ouachitensis</i>				
Barren Lands					Amphibian	<u>Bullfrog</u>	<i>Rana catesbeiana</i>	I	A		
Barren Lands					Amphibian	<u>American Toad</u>	<i>Bufo americanus</i>	N, C, SE	C		
Barren Lands					Amphibian	<u>Cricket Frog</u>	<i>Acris crepitans</i>	I	C		
Barren Lands					Amphibian	<u>Fowler's Toad</u>	<i>Bufo fowleri</i>	I	C		
Barren Lands					Amphibian	<u>Green Frog</u>	<i>Rana clamitans</i>	I	C		
Barren Lands					Amphibian	<u>Crawfish Frog</u>	<i>Rana areolata</i>	W	O		ST
Barren Lands					Amphibian	<u>Northern Dusky Salamander</u>	<i>Desmognathus fuscus</i>	SE	O		
Barren Lands					Amphibian	<u>Plains Leopard Frog</u>	<i>Rana blairi</i>	W	R		SC

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Barren Lands					Reptile	Black Rat Snake	<i>Elaphe obsoleta</i>	I	C		
Barren Lands					Reptile	Eastern Milksnake	<i>Lampropeltis triangulum</i>	I	C		
Barren Lands					Reptile	Common (Black) Kingsnake	<i>Lampropeltis getula</i>	S	O		
Barren Lands	Active quarries				Bird	Bank Swallow	<i>Riparia riparia</i>	I	O	S*	
Barren Lands	Active quarries				Bird	N. Rough-Winged Swallow	<i>Stelgidopteryx serripennis</i>	I	O	S*	
<i>Barren Lands</i>	<i>Active quarries</i>				<i>Bird</i>	<i>Rough-Winged Swallow</i>	<i>Stelgidopteryx serripennis</i>	<i>I</i>	<i>O</i>	<i>S*</i>	
Barren Lands	Bare dunes				Bird	Lark Sparrow	<i>Chondestes grammacus</i>	I	R	S*	
Barren Lands	Bare dunes				Bird	<u>Piping Plover</u>	<i><u>Charadrius melodus</u></i>	I	R	A(*)	SE, FE
Barren Lands	<i>Bare dunes</i>				Reptile	<u>Six-Lined Racerunner</u>	<i><u>Cnemidophorus sexlineatus</u></i>	NW, SW	O		
Barren Lands	<i>Cliffs</i>				Amphibian	<u>Green Salamander</u>	<i><u>Aneides aeneus</u></i>	SE	R		SE

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Barren Lands	Cliffs				Bird	Black Vulture	<i>Coragyps atratus</i>	S	R	R*	
Barren Lands	Cliffs				Mammal	<u>Allegheny Woodrat</u>	<i>Neotoma magister</i>	SC	R		SE
Barren Lands	Rock outcrops				Bird	Eastern Phoebe	<i>Sayornis phoebe</i>	I	O	R*	
Barren Lands	Rock outcrops				Bird	N. Rough-Winged Swallow	<i>Stelgidopteryx serripennis</i>	I	O	S*	
Barren Lands	Rock outcrops				Mammal	<u>Allegheny Woodrat</u>	<i>Neotoma magister</i>	SC	R		SE
Developed Lands					Amphibian	Bullfrog	<i>Rana catesbeiana</i>	I	A		
Developed Lands					Amphibian	Tiger Salamander	<i>Ambystoma tigrinum</i>	I	C		
Developed Lands					Amphibian	Eastern Spadefoot	<i>Scaphiopus holbrookii</i>	S	O		
Developed Lands					Bird	Northern Cardinal	<i>Cardinalis cardinalis</i>	I	A	R*	
Developed Lands					Bird	Rock Dove	<i>Columba livia</i>	I	A	R*	X
Developed Lands					Mammal	House Mouse	<i>Mus musculus</i>	I	A		X
Developed Lands					Mammal	Norway Rat	<i>Rattus norvegicus</i>	I	A		X

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Developed Lands					Reptile	Banded Water Snake	<i>Nerodia sipedon</i>	I	A		
Developed Lands					Reptile	Black Rat Snake	<i>Elaphe obsoleta</i>	I	C		
Developed Lands					Reptile	Brown Snake	<i>Storeria dekayi</i>	I	C		
Developed Lands					Reptile	Eastern Hognose Snake	<i>Heterodon platirhinos</i>	I	C		
Developed Lands					Reptile	Eastern Milksnake	<i>Lampropeltis triangulum</i>	I	C		
Developed Lands					Reptile	Western Fox Snake	<i>Elaphe vulpina</i>	NW	C		
Developed Lands					Reptile	Bull Snake	<i>Pituophis melanoleucus</i>	NW, SW	O		
Developed Lands					Reptile	Common (Black) Kingsnake	<i>Lampropeltis getula</i>	S	O		
Developed Lands					Reptile	<u>Kirtland's Snake</u>	<u>Clonophis kirtlandii</u>	N, C, SE	O		ST, FC
Developed Lands					Reptile	Prairie Kingsnake	<i>Lampropeltis calligaster</i>	W	O		
Developed Lands					Reptile	<u>Smooth Green Snake</u>	<i>Opheodrys vernalis</i>	NW	R		ST

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
<i>Developed Lands</i>	<i>Borrow pits</i>				<i>Bird</i>	<i>Canada Goose</i>	<i>Branta canadensis</i>	<i>I</i>	<i>A</i>	<i>R*</i>	
Developed Lands	<i>Borrow pits</i>				Bird	Mallard	<i>Anas platyrhynchos</i>	I	C	R*	
<i>Developed Lands</i>	<i>Golf courses</i>				<i>Bird</i>	<i>American Robin</i>	<i>Turdus migratorius</i>	<i>I</i>	<i>A</i>	<i>R*</i>	
<i>Developed Lands</i>	<i>Golf courses</i>				<i>Bird</i>	<i>Eastern Bluebird</i>	<i>Sialia sialis</i>	<i>I</i>	<i>C</i>	<i>R*</i>	
Developed Lands	Golf Courses				Mammal	Thirteen-Lined Ground Squirrel	<i>Spermophilus tridecemlineatus</i>	N	C		
Developed Lands	Industrial				Bird	Common Nighthawk	<i>Chordeiles minor</i>	I	O	S*	
Developed Lands	Industrial				Bird	<u>Peregrine Falcon</u>	<u>Falco peregrinus</u>	I	R	R*	SE
<i>Developed Lands</i>	<i>Industrial lands</i>				<i>Bird</i>	<i>European Starling</i>	<i>Sturnus vulgaris</i>	<i>I</i>	<i>A</i>	<i>R*</i>	<i>X</i>
<i>Developed Lands</i>	<i>Industrial lands</i>				<i>Bird</i>	<i>Rock Pigeon</i>	<i>Columba guinea</i>				
Developed Lands	Rights of way				Mammal	Franklin's Ground Squirrel	<i>Spermophilus franklinii</i>	NW	R		SE
Developed Lands	Roads/rails (bridges)				Bird	Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	I	R	S*	

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Developed Lands	Roads/rails (bridges)				Bird	N. Rough-Winged Swallow	<i>Stelgidopteryx serripennis</i>	I	O	S*	
<i>Developed Lands</i>	<i>Storm water retention ponds</i>				<i>Bird</i>	<i>Canada Goose</i>	<i>Branta canadensis</i>	<i>I</i>	<i>A</i>	<i>R*</i>	
<i>Developed Lands</i>	<i>Storm water retention ponds</i>				<i>Bird</i>	<i>Mallards</i>	<i>Anas platyrhynchos</i>	<i>I</i>	<i>C</i>	<i>R*</i>	
Forests					Amphibian	Bullfrog	<i>Rana catesbeiana</i>	I	A		
Forests					Amphibian	Cope's Gray Treefrog	<i>Hyla chrysoscelis</i>	I	A		
Forests					Amphibian	Eastern Gray Treefrog	<i>Hyla versicolor</i>	I	A		
Forests					Amphibian	Redback Salamander	<i>Plethodon cinereus</i>	I	A		
Forests					Amphibian	Smallmouth Salamander	<i>Ambystoma texanum</i>	I	A		
Forests					Amphibian	Two-Lined Salamander	<i>Eurycea cirrigera</i>	C, S	A		
Forests					Amphibian	Cave Salamander	<i>Eurycea lucifuga</i>	S	C		

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Amphibian	Green Frog	<i>Rana clamitans</i>	I	C		
Forests					Amphibian	Longtail Salamander	<i>Eurycea longicauda</i>	S	C		
Forests					Amphibian	Marbled Salamander	<i>Ambystoma opacum</i>	C, S	C		
Forests					Amphibian	Slimy Salamander	<i>Plethodon glutinosus</i>	S, C	C		
Forests					Amphibian	Southern Leopard Frog	<i>Rana utricularia</i>	S, C	C		
Forests					Amphibian	Spotted Salamander	<i>Ambystoma maculatum</i>	I	C		
Forests					Amphibian	Spring Peeper	<i>Pseudacris crucifer</i>	I	C		
Forests					Amphibian	Streamside Salamander	<i>Ambystoma barbouri</i>	SE	C		
Forests					Amphibian	Tiger Salamander	<i>Ambystoma tigrinum</i>	I	C		
Forests					Amphibian	Zigzag Salamander	<i>Plethodon dorsalis</i>	C, S	C		

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Forests					Amphibian	Blue-Spotted Salamander	<i>Ambystoma laterale</i>	N	O		SC
Forests					Amphibian	Eastern Newt	<i>Notophthalmus viridescens</i>	I	O		
Forests					Amphibian	Jefferson's Salamander	<i>Ambystoma jeffersonianum</i>	SC	O		
Forests					Amphibian	Northern Dusky Salamander	<i>Desmognathus fuscus</i>	SE	O		
Forests					Amphibian	Ravine Salamander	<i>Plethodon richmondi</i>	SE	O		
Forests					Amphibian	Wood Frog	<i>Rana sylvatica</i>	I	O		
Forests					Amphibian	Four-Toed Salamander	<i>Hemidactylium scutatum</i>	N, C	R		ST
Forests					Amphibian	Green Salamander	<i>Aneides aeneus</i>	SE	R		SE
Forests					Amphibian	Northern Red Salamander	<i>Pseudotriton ruber</i>	SC	R		SE
Forests					Bird	American Crow	<i>Corvus brachyrhynchos</i>	I	A	R*	

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Blue Jay	<i>Cyanocitta cristata</i>	I	A	R*	
Forests					Bird	Brown-Headed Cowbird	<i>Molothrus ater</i>	I	A	R*	
Forests					Bird	Chimney Swift	<i>Chaetura pelagica</i>	I	A	S*	
Forests					Bird	Mourning Dove	<i>Zenaida macroura</i>	I	A	R*	
Forests					Bird	Northern Cardinal	<i>Cardinalis cardinalis</i>	I	A	R*	
Forests					Bird	Red-Tailed Hawk	<i>Buteo jamaicensis</i>	I	A	R*	
Forests					Bird	American Kestrel	<i>Falco sparverius</i>	I	C	R*	
Forests					Bird	Black-Capped Chickadee	<i>Poecile atricapillus</i>	N	C	R*	
Forests					Bird	Blue-Gray Gnatcatcher	<i>Poliophtila caerulea</i>	I	C	S*	
Forests					Bird	Carolina Chickadee	<i>Poecile carolinensis</i>	S	C	R*	
Forests					Bird	Carolina Wren	<i>Thryothorus ludovicianus</i>	I	C	R*	
Forests					Bird	Chipping Sparrow	<i>Spizella passerina</i>	I	C	S*	

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Downy Woodpecker	<i>Picoides pubescens</i>	I	C	R*	
Forests					Bird	Eastern Bluebird	<i>Sialia sialis</i>	I	C	R*	
Forests					Bird	Eastern Kingbird	<i>Tyrannus tyrannus</i>	I	C	S*	
Forests					Bird	Eastern Screech-Owl	<i>Otus asio</i>	I	C	R*	
Forests					Bird	Eastern Wood-Pewee	<i>Contopus virens</i>	I	C	S*	
Forests					Bird	Golden-Crowned Kinglet	<i>Regulus satrapa</i>	I	C	W*	
Forests					Bird	Great Horned Owl	<i>Bubo virginianus</i>	I	C	R*	
Forests					Bird	Hairy Woodpecker	<i>Picoides villosus</i>	I	C	R*	
Forests					Bird	Northern Flicker	<i>Colaptes auratus</i>	I	C	R*	
Forests					Bird	Red-Bellied Woodpecker	<i>Melanerpes carolinus</i>	I	C	R*	
Forests					Bird	Rose-Breasted Grosbeak	<i>Pheucticus ludovicianus</i>	I	C	S*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Ruby-Throated Hummingbird	<i>Archilochus colubris</i>	I	C	S*	
Forests					Bird	Tennessee Warbler	<i>Vermivora peregrina</i>	I	C	M	
Forests					Bird	Turkey Vulture	<i>Cathartes aura</i>	I	C	R*	
Forests					Bird	Warbling Vireo	<i>Vireo gilvus</i>	I	C	S*	
Forests					Bird	White-Breasted Nuthatch	<i>Sitta carolinensis</i>	I	C	R*	
Forests					Bird	Yellow-Rumped Warbler	<i>Dendroica coronata</i>	I	C	W	
Forests					Bird	Acadian Flycatcher	<i>Empidonax vireescens</i>	I	O	S*	
Forests					Bird	American Redstart	<i>Setophaga ruticilla</i>	I	O	S*	
Forests					Bird	Barred Owl	<i>Strix varia</i>	I	O	R*	
Forests					Bird	Bay-Breasted Warbler	<i>Dendroica castanea</i>	I	O	M	
Forests					Bird	Black-And-White Warbler	<i>Mniotilta varia</i>	I	O	S*	SC
Forests					Bird	Blackburnian Warbler	<i>Dendroica fusca</i>	I	O	M*	
Forests					Bird	Blackpoll Warbler	<i>Dendroica striata</i>	I	O	M	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Black-Throated Blue Warbler	<i>Dendroica caerulescens</i>	I	O	M	
Forests					Bird	<u>Broad-Winged Hawk</u>	<i>Buteo platypterus</i>	I	O	S*	SC
Forests					Bird	Cape May Warbler	<i>Dendroica tigrina</i>	I	O	M	
Forests					Bird	Cedar Waxwing	<i>Bombycilla cedrorum</i>	I	O	R*	
Forests					Bird	Common Nighthawk	<i>Chordeiles minor</i>	I	O	S*	
Forests					Bird	Cooper's Hawk	<i>Accipiter cooperii</i>	I	O	R*	
Forests					Bird	Eastern Phoebe	<i>Sayornis phoebe</i>	I	O	R*	
Forests					Bird	Gray-Cheeked Thrush	<i>Catharus minimus</i>	I	O	M	
Forests					Bird	Great Crested Flycatcher	<i>Myiarchus crinitus</i>	I	O	S*	
Forests					Bird	Hermit Thrush	<i>Catharus guttatus</i>	I	O	W	
Forests					Bird	Magnolia Warbler	<i>Dendroica magnolia</i>	I	O	M*	
Forests					Bird	Nashville Warbler	<i>Verminvora ruficapilla</i>	I	O	M	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Northern Parula	<i>Parula americana</i>	I	O	S*	
Forests					Bird	Orange-Crowned Warbler	<i>Vermivora celata</i>	I	O	M	
Forests					Bird	Orchard Oriole	<i>Icterus spurius</i>	I	O	S*	
Forests					Bird	Ovenbird	<i>Seiurus aurocapillus</i>	I	O	S*	
Forests					Bird	Palm Warbler	<i>Dendroica palmarum</i>	I	O	M	
Forests					Bird	Pine Siskin	<i>Carduelis pinus</i>	I	O	W*	
Forests					Bird	Purple Finch	<i>Carpodacus purpureus</i>	I	O	W	
Forests					Bird	Red-Headed Woodpecker	<i>Melanerpes erythrocephalus</i>	I	O	R*	
Forests					Bird	Scarlet Tanager	<i>Piranga olivacea</i>	I	O	S*	
Forests					Bird	Summer Tanager	<i>Piranga rubra</i>	S	O	S*	
Forests					Bird	Swainson's Thrush	<i>Catharus ustulatus</i>	I	O	M	
Forests					Bird	Veery	<i>Catharus fuscescens</i>	I	O	S*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Wild Turkey	<i>Meleagris gallopavo</i>	I	O	R*	
Forests					Bird	Wilson's Warbler	<i>Wilsonia pusilla</i>	I	O	M	
Forests					Bird	Winter Wren	<i>Troglodytes troglodytes</i>	I	O	W	
Forests					Bird	Yellow-Throated Vireo	<i>Vireo flavifrons</i>	I	O	S*	
Forests					Bird	Barn Owl	<i>Tyto alba</i>	I	R	R*	SE
Forests					Bird	Black Vulture	<i>Coragyps atratus</i>	S	R	R*	
Forests					Bird	Black-Backed Woodpecker	<i>Picoides arcticus</i>	N	R	A	
Forests					Bird	Black-Headed Grosbeak	<i>Pheucticus melanocephalus</i>	I	R	A	
Forests					Bird	Bohemian Waxwing	<i>Bombycilla garrulus</i>	N	R	W	
Forests					Bird	Canada Warbler	<i>Wilsonia canadensis</i>	N	R	M*	
Forests					Bird	Chuck-Will's-Widow	<i>Caprimulgus carolinensis</i>	S	R	S*	
Forests					Bird	Common Redpoll	<i>Carduelis flammea</i>	N	R	W	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Evening Grosbeak	<i>Coccothraustes vespertinus</i>	I	R	W	
Forests					Bird	Golden Eagle	<i>Aquila chrysaetos</i>	I	R	M	
Forests					Bird	Hoary Redpoll	<i>Carduelis hornemanni</i>	N	R	A	
Forests					Bird	<u>Hooded Warbler</u>	<i>Wilsonia citrina</i>	I	R	S*	SC
Forests					Bird	Least Flycatcher	<i>Empidonax minimus</i>	I	R	S*	
Forests					Bird	Long-Eared Owl	<i>Asio otus</i>	I	R	R*	
Forests					Bird	Merlin	<i>Falco columbarius</i>	I	R	M	
Forests					Bird	<u>Mississippi Kite</u>	<i>Ictinia mississippiensis</i>	I	R	A*	SC
Forests					Bird	Northern Goshawk	<i>Accipiter gentilis</i>	N, E	R	W	
Forests					Bird	Northern Saw-Whet Owl	<i>Aegolius acadicus</i>	I	R	W*	
Forests					Bird	Olive-Sided Flycatcher	<i>Contopus borealis</i>	I	R	M	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Philadelphia Vireo	<i>Vireo philadelphicus</i>	I	R	M	
Forests					Bird	Pine Grosbeak	<i>Pinicola enucleator</i>	N	R	W	
Forests					Bird	Red Crossbill	<i>Loxia curvirostra</i>	N	R	W*	
Forests					Bird	Ruby-Crowned Kinglet	<i>Regulus calendula</i>	I	R	M	
Forests					Bird	Rufous Hummingbird	<i>Selasphorus rufus</i>	I	R	A	
Forests					Bird	Rusty Blackbird	<i>Euphagus carolinus</i>	I	R	W	
Forests					Bird	Say's Phoebe	<i>Sayornis saya</i>	I	R	A	
Forests					Bird	Vermilion Flycatcher	<i>Pyrocephalus rubinus</i>	I	R	A	
Forests					Bird	Western Kingbird	<i>Tyrannus verticalis</i>	I	R	A*	
Forests					Bird	Western Wood-Pewee	<i>Contopus sordidulus</i>	W	R	A	
Forests					Bird	White-Winged Crossbill	<i>Loxia leucoptera</i>	N	R	W	
Forests					Bird	<u>Worm-Eating Warbler</u>	<i>Helmintheros vermivorous</i>	I	R	S*	SC

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Bird	Yellow-Bellied Flycatcher	<i>Empidonax flaviventris</i>	I	R	M	
Forests					Bird	Yellow-Bellied Sapsucker	<i>Sphyrapicus varius</i>	I	R	M*	
Forests					Mammal	Big Brown Bat	<i>Eptesicus fuscus</i>	I	A		
Forests					Mammal	Eastern Chipmunk	<i>Tamias striatus</i>	I	A		
Forests					Mammal	Eastern Mole	<i>Scalopus aquaticus</i>	I	A		
Forests					Mammal	Fox Squirrel	<i>Sciurus niger</i>	I	A		
Forests					Mammal	House Mouse	<i>Mus musculus</i>	I	A		X
Forests					Mammal	Opossum	<i>Didelphis virginiana</i>	I	A		
Forests					Mammal	Raccoon	<i>Procyon lotor</i>	I	A		
Forests					Mammal	Red Bat	<i>Lasiurus borealis</i>	I	A		
Forests					Mammal	White-Footed Mouse	<i>Peromyscus leucopus</i>	I	A		
Forests					Mammal	White-Tailed Deer	<i>Odocoileus virginianus</i>	I	A		reintroduced

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Mammal	Coyote	<i>Canis latrans</i>	I	C		
Forests					Mammal	Eastern Pipistrelle	<i>Pipistrellus subflavus</i>	S	C		
Forests					Mammal	Gray Squirrel	<i>Sciurus carolinensis</i>	I	C		
Forests					Mammal	Little Brown Myotis	<i>Myotis lucifugus</i>	I	C		
Forests					Mammal	Masked Shrew	<i>Sorex cinereus</i>	N	C		
Forests					Mammal	Northern Myotis	<i>Myotis septentrionalis</i>	I	C		
Forests					Mammal	Red Squirrel	<i>Tamiasciurus hudsonicus</i>	N	C		
Forests					Mammal	Southern Flying Squirrel	<i>Glaucomys volans</i>	I	C		
Forests					Mammal	Striped Skunk	<i>Mephitis mephitis</i>	I	C		
Forests					Mammal	<u>Evening Bat</u>	<i>Nycticeius humeralis</i>	SC	O		FE
Forests					Mammal	Gray Fox	<i>Urocyon cinereoargenteus</i>	I	O		
Forests					Mammal	Hoary Bat	<i>Lasiurus cinereus</i>	I	O		

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests					Mammal	Indiana Myotis	<i>Myotis sodalis</i>	I	O		FE
Forests					Mammal	Pygmy Shrew	<i>Sorex hoyi</i>	SC	O		
Forests					Mammal	Red Fox	<i>Vulpes vulpes</i>	I	O		
Forests					Mammal	Silver-Haired Bat	<i>Lasionycteris noctivagans</i>	I	O		
Forests					Mammal	Southeastern Shrew	<i>Sorex longirostris</i>	SC	O		
Forests					Mammal	Woodland Vole	<i>Microtus pinetorum</i>	I	O		
Forests					Mammal	<u>Bobcat</u>	<i>Lynx rufus</i>	I	R		SE
Forests					Mammal	<u>Least Weasel</u>	<i>Mustela nivalis</i>	N	R		SC
Forests					Mammal	<u>Rafinesque's Big-Eared Bat</u>	<i>Corynorhinus rafinesquii</i>	SC	R		SC
Forests					Reptile	Black Racer	<i>Coluber constrictor</i>	I	C		
Forests					Reptile	Black Rat Snake	<i>Elaphe obsoleta</i>	I	C		
Forests					Reptile	Eastern Box Turtle	<i>Terrapene carolina</i>	I	C		

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Forests					Reptile	Eastern Fence Lizard	<i>Sceloporus undulatus</i>	S	C		
Forests					Reptile	Eastern Milksnake	<i>Lampropeltis triangulum</i>	I	C		
Forests					Reptile	Five-Lined Skink	<i>Eumeces fasciatus</i>	I	C		
Forests					Reptile	Broad-Headed Skink	<i>Eumeces laticeps</i>	C, S	O		
Forests					Reptile	Bull Snake	<i>Pituophis melanoleucus</i>	NW, SW	O		
Forests					Reptile	Common (Black) Kingsnake	<i>Lampropeltis getulus</i>	S	O		
Forests					Reptile	Ground Skink	<i>Scincella lateralis</i>	S	O		
Forests					Reptile	<u>Kirtland's Snake</u>	<i>Clonophis kirtlandii</i>	N, C, SE	O		ST, FC
Forests					Reptile	<u>Copperbelly Water Snake</u>	<i>Nerodia erythrogaster neglecta</i>	SW, NE, SC	O		ST, FC
Forests					Reptile	Northern Copperhead	<i>Agkistrodon contortrix</i>	S, WC	O		

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Forests					Reptile	Northern Ringneck Snake	<i>Diadophis punctatus</i>	S	O		
Forests					Reptile	Red-Bellied Snake	<i>Storeria occipitomaculata</i>	I	O		
Forests					Reptile	<u>Rough Green Snake</u>	<i>Opheodrys aestivus</i>	S	O		SC
Forests					Reptile	Western Earth Snake	<i>Virginia valeriae</i>	S	O		
Forests					Reptile	Worm Snake	<i>Carphophis amoenus</i>	S	O		
Forests					Reptile	<u>Crowned Snake</u>	<i>Tantilla coronata</i>	S	R		ST
Forests					Reptile	<u>Scarlet Snake</u>	<i>Cemophora coccinea</i>	S	R		ST
Forests					Reptile	<u>Smooth Green Snake</u>	<i>Opheodrys vernalis</i>	NW	R		ST
Forests	<i>Deciduous forest</i>				Bird	Red-Eyed Vireo	<i>Vireo olivaceus</i>	I	C	S*	
Forests	<i>Deciduous forest</i>				Bird	Wood Thrush	<i>Hylocichla mustelina</i>	I	C	S*	
Forests	Early Forest Stage				Bird	Indigo Bunting	<i>Passerina cyanea</i>	I	A	S*	

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Early Forest Stage				Bird	Brown Thrasher	<i>Toxostoma rufum</i>	I	C	R*	
Forests	Early Forest Stage				Bird	Common Yellowthroat	<i>Geothlypis trichas</i>	I	C	S*	
Forests	Early Forest Stage				Bird	Gray Catbird	<i>Dumetella carolinensis</i>	I	C	S*	
Forests	Early Forest Stage				Bird	Northern Mockingbird	<i>Mimus polyglottos</i>	I	C	R*	
Forests	Early Forest Stage				Bird	Whip-Poor-Will	<i>Caprimulgus vociferous</i>	I	C	S*	
Forests	Early Forest Stage				Bird	White-Eyed Vireo	<i>Vireo griseus</i>	I	C	S*	
Forests	Early Forest Stage				Bird	Yellow-Breasted Chat	<i>Icteria virens</i>	I	C	S*	
Forests	Early Forest Stage				Bird	American Woodcock	<i>Scolopax minor</i>	I	O	S*	
Forests	Early Forest Stage				Bird	Black-Billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	I	O	S*	
Forests	Early Forest Stage				Bird	Blue-Winged Warbler	<i>Verminvora pinus</i>	I	O	S*	

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Early Forest Stage				Bird	Chestnut-Sided Warbler	<i>Dendroica pensylvanica</i>	N	O	M*	
Forests	Early Forest Stage				Bird	Prairie Warbler	<i>Dendroica discolor</i>	I	O	S*	
Forests	Early Forest Stage				Bird	Ruffed Grouse	<i>Bonasa umbellus</i>	S	O	R*	
Forests	Early Forest Stage				Bird	Yellow-Billed Cuckoo	<i>Coccyzus americanus</i>	I	O	S*	
Forests	Early Forest Stage				Bird	Golden-Winged Warbler	<i>Verminvora chrysoptera</i>	I	R	S*	SE
Forests	Early Forest Stage				Mammal	Cottontail Rabbit	<i>Sylvilagus floridanus</i>	I	A		
Forests	Early Forest Stage				Mammal	Woodchuck	<i>Marmota monax</i>	I	C		
Forests	Early Forest Stage <i>Pre-forest stage</i>				Bird	Field Sparrow	<i>Spizella pusilla</i>	I	C	R*	

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Early Forest Stage <i>Pre-forest stage</i>				Bird	Eastern Towhee	<i>Pipilo erythrophthalmus</i>	I	O	R*	
Forests	Evergreen				Bird	Black-Throated Green Warbler	<i>Dendroica virens</i>	I	O	S*	
Forests	Evergreen				Bird	Pine Warbler	<i>Dendroica pinus</i>	S	O	S*	
Forests	Evergreen				Bird	Red-Breasted Nuthatch	<i>Sitta canadensis</i>	I	O	W*	
Forests	Evergreen				Bird	Sharp-Shinned Hawk	<i>Accipiter striatus</i>	I	O	R*	
Forests	Evergreen				Bird	<u>Bachman's Sparrow</u>	<i>Aimophila aestivalis</i>	S	R	S(*)	SE
Forests	Evergreen				Bird	<u>Kirtland's Warbler</u>	<i>Dendroica kirtlandii</i>	I	R	M	SE, FE
Forests	Evergreen				Bird	Northern Saw-Whet Owl	<i>Aegolius acadicus</i>	I	R	W*	
Forests	<i>Floodplain forest</i>				Bird	<u>Cerulean Warbler</u>	<i>Dendroica cerulea</i>	I	O	S*	SC
Forests	<i>Floodplain forest</i>				Bird	<i>Yellow-Throated Warbler</i>	<i>Dendroica dominica</i>	I	O	S*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Forested wetlands				Bird	<u>Cerulean Warbler</u>	<u>Dendroica cerulea</u>	I	O	S*	SC
Forests	Forested wetlands				Bird	Yellow-Throated Warbler	<i>Dendroica dominica</i>	I	O	S*	
Forests	Forested wetlands				Bird	<u>Red-Shouldered Hawk</u>	<u>Buteo lineatus</u>	I	O	R*	SC
Forests	Mature or high canopy stage				Bird	Pileated Woodpecker	<i>Dryocopus pileatus</i>	I	O	R*	
Forests	Mature or high canopy stage				Bird	<u>Cerulean Warbler</u>	<u>Dendroica cerulea</u>	I	O	S*	SC
Forests	Mature or high canopy stage				Mammal	Cottontail Rabbit	<i>Sylvilagus floridanus</i>	I	A		
Forests	Mature or high canopy stage				Mammal	<u>Allegheny Woodrat</u>	<u>Neotoma magister</u>	SC	R		SE
Forests	Mature or high canopy stage				Reptile	<u>Timber Rattlesnake</u>	<u>Crotalus horridus</u>	S	R		ST
Forests	Old forest stage				Bird	<u>Cerulean Warbler</u>	<u>Dendroica cerulea</u>	I	O	S*	SC

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Old forest stage				Bird	Pileated Woodpecker	<i>Dryocopus pileatus</i>	I	O	R*	
Forests	Old Forest stage				Mammal	Allegheny Woodrat	<i>Neotoma magister</i>	SC	R		SE
Forests	Pole stage				Bird	Wood Thrush	<i>Hylocichla mustelina</i>	I	C	S*	
Forests	Pole stage				Bird	Tufted Titmouse	<i>Baeolophus bicolor</i>	I	C	R*	
Forests	Pole Stage				Mammal	Cottontail Rabbit	<i>Sylvilagus floridanus</i>	I	A		
Forests	Pole Stage				Mammal	Woodchuck	<i>Marmota monax</i>	I	C		
Forests	Pre-forest Stage				Mammal	Cottontail Rabbit	<i>Sylvilagus floridanus</i>	I	A		
Forests	Pre-forest Stage				Mammal	Woodchuck	<i>Marmota monax</i>	I	C		
Forests	Pre-forest Stage				Mammal	Long-Tailed Weasel	<i>Mustela frenata</i>	I	O		
Forests	Riparian wooded corridors/streams/counties				Bird	Common Grackle	<i>Quiscalus quiscula</i>	I	A	R*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Riparian wooded corridors/steams/counties				Bird	Great Blue Heron	<i>Ardea herodias</i>	I	C	R*	
Forests	Riparian wooded corridors/steams/counties				Bird	Green Heron	<i>Butorides virescens</i>	I	C	S*	
Forests	Riparian wooded corridors/steams/counties				Bird	House Wren	<i>Troglodytes aedon</i>	I	C	S*	
Forests	Riparian wooded corridors/steams/counties				Bird	American Redstart	<i>Setophaga ruticilla</i>	I	O	S*	
Forests	Riparian wooded corridors/steams/counties				Bird	Barred Owl	<i>Strix varia</i>	I	O	R*	
Forests	Riparian wooded corridors/steams/counties				Bird	Brown Creeper	<i>Certhia americana</i>	I	O	R*	
Forests	Riparian wooded corridors/steams/counties				Bird	<u>Cerulean Warbler</u>	<u>Dendroica cerulea</u>	I	O	S*	SC

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Riparian wooded corridors/streams/counties				Bird	Great Egret	<i>Ardea alba</i>	I	O	S*	SC
Forests	Riparian wooded corridors/streams/counties				Bird	Hooded Merganser	<i>Lophodytes cucullatus</i>	I	O	R*	
Forests	Riparian wooded corridors/streams/counties				Bird	Kentucky Warbler	<i>Oporornis formosus</i>	I	O	S*	
Forests	Riparian wooded corridors/streams/counties				Bird	Louisiana Waterthrush	<i>Seiurus motacilla</i>	I	O	S*	
Forests	Riparian wooded corridors/streams/counties				Bird	Northern Parula	<i>Parula americana</i>	I	O	S*	
Forests	Riparian wooded corridors/streams/counties				Bird	Prothonotary Warbler	<i>Protonotaria citrea</i>	I	O	S*	
Forests	Riparian wooded corridors/streams/counties				Bird	Red-Headed Woodpecker	<i>Melanerpes erythrocephalus</i>	I	O	R*	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Riparian wooded corridors/streams/counties				Bird	<u>Red-Shouldered Hawk</u>	<i>Buteo lineatus</i>	I	O	R*	SC
Forests	Riparian wooded corridors/streams/counties				Bird	Yellow-Throated Warbler	<i>Dendroica dominica</i>	I	O	S*	
Forests	Riparian wooded corridors/streams/counties				Bird	<u>Bald Eagle</u>	<i>Haliaeetus leucocephalus</i>	I	R	R*	SE, FT
Forests	Riparian wooded corridors/streams/counties				Bird	<u>Black-Crowned Night-Heron</u>	<i>Nycticorax nycticorax</i>	I	R	S*	SE
Forests	Riparian wooded corridors/streams/counties				Bird	Cattle Egret	<i>Bubulcus ibis</i>	I	R	M*	
Forests	Riparian wooded corridors/streams/counties				Bird	Connecticut Warbler	<i>Oporornis agilis</i>	I	R	M	
Forests	Riparian wooded corridors/streams/counties				Bird	Fish Crow	<i>Corvus ossifragus</i>	SW	R	S	

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Riparian wooded corridors/streams/counties				Bird	Little Blue Heron	<i>Egretta caerulea</i>	I	R	S*	
Forests	Riparian wooded corridors/streams/counties				Bird	<u>Mississippi Kite</u>	<i>Ictinia mississippiensis</i>	I	R	A*	SC
Forests	Riparian wooded corridors/streams/counties				Bird	Mourning Warbler	<i>Oporornis philadelphia</i>	I	R	M	
Forests	Riparian wooded corridors/streams/counties				Bird	Northern Waterthrush	<i>Seiurus noveboracensis</i>	I	R	S*	
Forests	Riparian wooded corridors/streams/counties				Bird	<u>Osprey</u>	<i>Pandion haliaetus</i>	I	R	S*	SE
Forests	Riparian wooded corridors/streams/counties				Bird	Snowy Egret	<i>Egretta thula</i>	I	R	A*	
Forests	Riparian wooded corridors/streams/counties				Bird	Swainson's Warbler	<i>Limnothlypis swainsonii</i>	SW	R	A	

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Riparian wooded corridors/streams/counties				Bird	Swallow-Tailed Kite	<i>Elanoides forficatus</i>	I	R	A(*)	
Forests	Riparian wooded corridors/streams/counties				Bird	Tricolored Heron	<i>Egretta tricolor</i>	I	R	A	
Forests	Riparian wooded corridors/streams/counties				Bird	<u>Yellow-Crowned Night-Heron</u>	<i>Nyctanassa violacea</i>	SW	R	S*	SE
Forests	Riparian wooded corridors/streams/counties				Mammal	<u>Gray Myotis</u>	<i>Myotis grisescens</i>	SC	R		FE
<i>Forests</i>	<i>Species Composition</i>				<i>Plants</i>	<i>Aspen/Birch</i>					
<i>Forests</i>	<i>Species Composition</i>				<i>Plants</i>	<i>Cherry/Ash/Yellow Poplar</i>					
<i>Forests</i>	<i>Species Composition</i>				<i>Plants</i>	<i>E Redcedar/Hardwoods</i>					
<i>Forests</i>	<i>Species Composition</i>				<i>Plants</i>	<i>Eastern Red Cedar</i>	<i>Juniperus virginiana</i>				

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Forests	Species Composition				Plants	Elm/Ash/Cottonwood					
Forests	Species Composition				Plants	Maple/Beech					
Forests	Species Composition				Plants	Oak/Gum/Cypress					
Forests	Species Composition				Plants	Oak/Hickory					
Forests	Species Composition				Plants	Oak/Pine					
Forests	Species Composition				Plants	Shortleaf/Virginia Pine					
Forests	Species Composition				Plants	White Pine	<i>Pinus strobus</i>				
Forests	Suburban forest				Bird	American Robin	<i>Turdus migratorius</i>	I	A	R*	
Forests	Suburban forest				Bird	Baltimore Oriole	<i>Icterus galbula</i>	I	O	S*	
Forests	Urban forest				Bird	American Robin	<i>Turdus migratorius</i>	I	A	R*	
Forests	Urban forest				Bird	Baltimore Oriole	<i>Icterus galbula</i>	I	O	S*	
Grasslands					Amphibian	Bullfrog	<i>Rana catesbeiana</i>	I	A		

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Grasslands					Amphibian	American Toad	<i>Bufo americanus</i>	N, C, SE	C		
Grasslands					Amphibian	Cricket Frog	<i>Acris crepitans</i>	I	C		
Grasslands					Amphibian	Fowler's Toad	<i>Bufo fowleri</i>	I	C		
Grasslands					Amphibian	Green Frog	<i>Rana clamitans</i>	I	C		
Grasslands					Amphibian	<u>Northern Leopard Frog</u>	<i>Rana pipiens</i>	N, E	C		SC
Grasslands					Amphibian	Tiger Salamander	<i>Ambystoma tigrinum</i>	I	C		
Grasslands					Amphibian	<u>Blue-Spotted Salamander</u>	<i>Ambystoma laterale</i>	N	O		SC
Grasslands					Amphibian	<u>Crawfish Frog</u>	<i>Rana areolata</i>	W	O		ST
Grasslands					Amphibian	Eastern Spadefoot	<i>Scaphiopus holbrookii</i>	S	O		
Grasslands					Amphibian	<u>Plains Leopard Frog</u>	<i>Rana blairi</i>	W	R		SC
Grasslands					Bird	Barn Swallow	<i>Hirundo rustica</i>	I	A	S*	
Grasslands					Bird	Brown-Headed Cowbird	<i>Molothrus ater</i>	I	A	R*	

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Grasslands					Bird	Dark-Eyed Junco	<i>Junco hyemalis</i>	I	A	W	
Grasslands					Bird	Eastern Meadowlark	<i>Sturnella magna</i>	I	A	R*	
Grasslands					Bird	Mourning Dove	<i>Zenaida macroura</i>	I	A	R*	
Grasslands					Bird	Red-Tailed Hawk	<i>Buteo jamaicensis</i>	I	A	R*	
Grasslands					Bird	Song Sparrow	<i>Melospiza melodia</i>	I	A	R*	
Grasslands					Bird	American Goldfinch	<i>Carduelis tristis</i>	I	C	R*	
Grasslands					Bird	American Kestrel	<i>Falco sparverius</i>	I	C	R*	
Grasslands					Bird	American Tree Sparrow	<i>Spizella arborea</i>	I	C	W	
Grasslands					Bird	Common Yellowthroat	<i>Geothlypis trichas</i>	I	C	S*	
Grasslands					Bird	Eastern Bluebird	<i>Sialia sialis</i>	I	C	R*	
Grasslands					Bird	Field Sparrow	<i>Spizella pusilla</i>	I	C	R*	
Grasslands					Bird	Horned Lark	<i>Eremophila alpestris</i>	I	C	R*	
Grasslands					Bird	Purple Martin	<i>Progne subis</i>	I	C	S*	

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Grasslands					Bird	Blue Grosbeak	<i>Passerina caerulea</i>	S	O	S*	
Grasslands					Bird	Fox Sparrow	<i>Passerella iliaca</i>	I	O	W	
Grasslands					Bird	Lapland Longspur	<i>Calcarius lapponicus</i>	I	O	W	
Grasslands					Bird	<u>Northern Harrier</u>	<u>Circus cyaneus</u>	I	O	R*	SE
Grasslands					Bird	Ring-Necked Pheasant	<i>Phasianus colchicus</i>	N	O	R*	X
Grasslands					Bird	Rough-Legged Hawk	<i>Buteo lagopus</i>	I	O	W	
Grasslands					Bird	Snow Bunting	<i>Plectrophenax nivalis</i>	I	O	W	
Grasslands					Bird	Tree Swallow	<i>Tachycineta bicolor</i>	I	O	S*	
Grasslands					Bird	Vesper Sparrow	<i>Pooecetes gramineus</i>	I	O	S*	
Grasslands					Bird	White-Crowned Sparrow	<i>Zonotrichia leucophrys</i>	I	O	W	
Grasslands					Bird	<u>American Bittern</u>	<u><i>Botaurus lentiginosus</i></u>	I	R	S*	SE

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Grasslands					Bird	American Pipit	<i>Anthus rubescens</i>	I	R	M	
Grasslands					Bird	Bachman's Sparrow	<i>Aimophila aestivalis</i>	S	R	S(*)	SE
Grasslands					Bird	Barn Owl	<i>Tyto alba</i>	I	R	R*	SE
Grasslands					Bird	Blue-Headed Vireo	<i>Vireo solitarius</i>	I	R	M*	
Grasslands					Bird	Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	W	R	M*	
Grasslands					Bird	Buff-Breasted Sandpiper	<i>Tryngites subruficollis</i>	I	R	M	
Grasslands					Bird	Burrowing Owl	<i>Athene cunicularia</i>	W	R	A	
Grasslands					Bird	Cassin's Sparrow	<i>Aimophila cassinii</i>	I	R	A	
Grasslands					Bird	Cattle Egret	<i>Bubulcus ibis</i>	I	R	M*	
Grasslands					Bird	Clay-Colored Sparrow	<i>Spizella pallida</i>	I	R	A	
Grasslands					Bird	Ferruginous Hawk	<i>Buteo regalis</i>	W	R	A	
Grasslands					Bird	Franklin's Gull	<i>Larus pipixcan</i>	I	R	M	

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Grasslands					Bird	Golden Eagle	<i>Aquila chrysaetos</i>	I	R	M	
Grasslands					Bird	Gyr Falcon	<i>Falco rusticolis</i>	N	R	A	
Grasslands					Bird	Harris's Sparrow	<i>Zonotrichia querula</i>	I	R	W	
Grasslands					Bird	<u>Henslow's Sparrow</u>	<i>Ammodramus</i> <i>henslowii</i>	I	R	S*	SE
Grasslands					Bird	Lark Sparrow	<i>Chondestes</i> <i>grammacus</i>	I	R	S*	
Grasslands					Bird	Leconte's Sparrow	<i>Ammodramus</i> <i>leconteii</i>	I	R	W	
Grasslands					Bird	Lincoln's Sparrow	<i>Melospiza lincolnii</i>	I	R	M	
Grasslands					Bird	<u>Loggerhead Shrike</u>	<i>Lanius ludovicianus</i>	I	R	R*	SE, FC
Grasslands					Bird	Mccown's Longspur	<i>Calcarius mccownii</i>	I	R	A	
Grasslands					Bird	Northern Shrike	<i>Lanius excubitor</i>	N	R	W	
Grasslands					Bird	Prairie Falcon	<i>Falco mexicanus</i>	W	R	A	
Grasslands					Bird	Scissor-Tailed Flycatcher	<i>Tyrannus forficatus</i>	S	R	A*	

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Grasslands					Bird	<u>Sedge Wren</u>	<i>Cistothorus platensis</i>	I	R	S*	SE
Grasslands					Bird	<u>Short-Eared Owl</u>	<i>Asio flammeus</i>	I	R	R*	SE
Grasslands					Bird	Smith's Longspur	<i>Calcarius pictus</i>	I	R	M	
Grasslands					Bird	Snowy Owl	<i>Nyctea scandiac</i>	N	R	W	
Grasslands					Bird	Swainson's Hawk	<i>Buteo swainsoni</i>	W	R	A	
Grasslands					Bird	<u>Upland Sandpiper</u>	<i>Bartramia longicauda</i>	I	R	S*	SE
Grasslands					Bird	<u>Western Meadowlark</u>	<i>Sturnella neglecta</i>	N	R	R*	SC
Grasslands					Bird	Gray Partridge (Extirpated)	<i>Perdix perdix</i>	N		R*	X, Ex (1977)
Grasslands					Bird	Greater Prairie-Chicken (Extirpated)	<i>Tympanuchus cupido</i>	NW		R(*)	Ex (1972)
Grasslands					Mammal	Eastern Mole	<i>Scalopus aquaticus</i>	I	A		
Grasslands					Mammal	Opossum	<i>Didelphis virginiana</i>	I	A		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Grasslands					Mammal	Raccoon	<i>Procyon lotor</i>	I	A		
Grasslands					Mammal	Coyote	<i>Canis latrans</i>	I	C		
Grasslands					Mammal	Meadow Vole	<i>Microtus pennsylvanicus</i>	I	C		
Grasslands					Mammal	<u>Plains Pocket Gopher</u>	<i>Geomys bursarius</i>	NW	C		SC
Grasslands					Mammal	Prairie Vole	<i>Microtus ochrogaster</i>	I	C		
Grasslands					Mammal	Striped Skunk	<i>Mephitis mephitis</i>	I	C		
Grasslands					Mammal	Thirteen-Lined Ground Squirrel	<i>Spermophilus tridecemlineatus</i>	N	C		
Grasslands					Mammal	Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	NW	C		
Grasslands					Mammal	Woodchuck	<i>Marmota monax</i>	I	C		
Grasslands					Mammal	Least Shrew	<i>Cryptotis parva</i>	I	O		
Grasslands					Mammal	Red Fox	<i>Vulpes vulpes</i>	I	O		
Grasslands					Mammal	Southern Bog Lemming	<i>Synaptomys cooperi</i>	I	O		
Grasslands					Mammal	<u>Badger</u>	<i>Taxidea taxus</i>	I	R		ST

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Grasslands					Mammal	Bobcat	<i>Lynx rufus</i>	I	R		SE
Grasslands					Mammal	Least Weasel	<i>Mustela nivalis</i>	N	R		SC
Grasslands					Reptile	Black Racer	<i>Coluber constrictor</i>	I	C		
Grasslands					Reptile	Black Rat Snake	<i>Elaphe obsoleta</i>	I	C		
Grasslands					Reptile	Brown Snake	<i>Storeria dekayi</i>	I	C		
Grasslands					Reptile	Eastern Hognose Snake	<i>Heterodon platirhinos</i>	I	C		
Grasslands					Reptile	Eastern Milksnake	<i>Lampropeltis triangulum</i>	I	C		
Grasslands					Reptile	Western Fox Snake	<i>Elaphe vulpina</i>	NW	C		
Grasslands					Reptile	Blanding's Turtle	<i>Emydoidea blandingii</i>	N	O		SC
Grasslands					Reptile	Bull Snake	<i>Pituophis melanoleucus</i>	NW, SW	O		
Grasslands					Reptile	Common (Black) Kingsnake	<i>Lampropeltis getulus</i>	S	O		
Grasslands					Reptile	Eastern Ribbon Snake	<i>Thamnophis sauritus</i>	I	O		

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Grasslands					Reptile	<u>Kirtland's Snake</u>	<i>Clonophis kirtlandii</i>	N, C, SE	O		ST, FC
Grasslands					Reptile	<u>Ornate Box Turtle</u>	<i>Terrapene ornata</i>	NW, SW	O		SC
Grasslands					Reptile	Plains Garter Snake	<i>Thamnophis radix</i>	NW	O		
Grasslands					Reptile	Prairie Kingsnake	<i>Lampropeltis calligaster</i>	W	O		
Grasslands					Reptile	Six-Lined Racerunner	<i>Cnemidophorus sexlineatus</i>	NW, SW	O		
Grasslands					Reptile	<u>Spotted Turtle</u>	<i>Clemmys guttata</i>	N	O		ST
Grasslands					Reptile	<u>Western Ribbon Snake</u>	<i>Thamnophis proximus</i>	NW, SW	O		SC
Grasslands					Reptile	<u>Butler's Garter Snake</u>	<i>Thamnophis butleri</i>	NE, C	R		ST
Grasslands					Reptile	Slender Glass Lizard	<i>Ophisaurus attenuatus</i>	NW	R		
Grasslands					Reptile	<u>Smooth Green Snake</u>	<i>Opheodrys vernalis</i>	NW	R		ST

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Grasslands	Early Successional Area				Mammal	Cottontail Rabbit	<i>Sylvilagus floridanus</i>	I	A		
Grasslands	Early Successional Area				Mammal	Short-Tailed Shrew	<i>Blarina brevicauda</i>	I	A		
Grasslands	Early Successional Area				Mammal	Deer Mouse	<i>Peromyscus maniculatus</i>	I	C		
Grasslands	Early Successional Area				Mammal	<u>Franklin's Ground Squirrel</u>	<u><i>Spermophilus franklinii</i></u>	NW	R		SE
Grasslands	<i>Fescue</i>				Bird	Red-Winged Blackbird	<i>Agelaius phoeniceus</i>	I	A	R*	
Grasslands	<i>Farm Bill Program Lands (CRP, CP1, CP2, CP10)</i>				Bird	Northern Bobwhite	<i>Colinus virginianus</i>	I	C	R*	
Grasslands	<i>Early successional areas</i>				Bird	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	I	O	S*	
Grasslands	<i>Haylands</i>				Bird	Bobolink	<i>Dolichonyx oryzivorus</i>	I	O	S*	

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Grasslands	Haylands				Bird	Dickcissel	<i>Spiza americana</i>	I	O	S*	
Grasslands	Historic				Mammal	Meadow Jumping Mouse	<i>Zapus hudsonius</i>	I	O		
Grasslands	Historic				Mammal	<u>Franklin's Ground Squirrel</u>	<i>Spermophilus franklinii</i>	NW	R		SE
Grasslands	Pasture				Bird	Red-Winged Blackbird	<i>Agelaius phoeniceus</i>	I	A	R*	
Grasslands	Prairies				Bird	Savannah Sparrow	<i>Passerculus sandwichensis</i>	I	O	S*	
Grasslands	Prairies				Mammal	<u>Franklin's Ground Squirrel</u>	<i>Spermophilus franklinii</i>	NW	R		SE
Grasslands	Reclaimed minelands				Bird	Red-Winged Blackbird	<i>Agelaius phoeniceus</i>	I	A	R*	
Grasslands	Savannah				Bird	Eastern Wood-Pewee	<i>Contopus virens</i>	I	C	S*	
Grasslands	Savannah				Bird	Red-Headed Woodpecker	<i>Melanerpes erythrocephalus</i>	I	O	R*	
Subterranean Systems					Amphibian	Two-Lined Salamander	<i>Eurycea cirrigera</i>	C, S	A		

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Subterranean Systems					Amphibian	Northern Dusky Salamander	<i>Desmognathus fuscus</i>	SE	O		
Subterranean Systems					Amphibian	<u>Pickerel Frog</u>	<i>Rana palustris</i>	E, C, WC	O		SC
Subterranean Systems					Amphibian	<u>Green Salamander</u>	<i>Aneides aeneus</i>	SE	R		SE
Subterranean Systems	Cave aquatic and terrestrial features				Mammal	Big Brown Bat	<i>Eptesicus fuscus</i>	I	A		
Subterranean Systems	Cave aquatic and terrestrial features				Mammal	Eastern Pipistrelle	<i>Pipistrellus subflavus</i>	S	C		
Subterranean Systems	Cave aquatic and terrestrial features				Mammal	Little Brown Myotis	<i>Myotis lucifugus</i>	I	C		
Subterranean Systems	Cave aquatic and terrestrial features				Mammal	Northern Myotis	<i>Myotis septentrionalis</i>	I	C		

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Subterranean Systems	Cave aquatic and terrestrial features				Mammal	<u>Indiana Myotis</u>	<u>Myotis sodalis</u>	I	O		FE
Subterranean Systems	Cave aquatic and terrestrial features				Mammal	<u>Gray Myotis</u>	<u>Myotis grisescens</u>	SC	R		FE
Subterranean Systems	Cave aquatic and terrestrial features				Mammal	<u>Rafinesque's Big-Eared Bat</u>	<u>Corynorhinus rafinesquii</u>	SC	R		SC
Subterranean Systems	<u>Cave Entrances/Seeps</u>				Amphibian	<u>Cave Salamander</u>	<u>Eurycea lucifuga</u>	S	C		
Subterranean Systems	<u>Cave Entrances/Seeps</u>				Amphibian	<u>Longtail Salamander</u>	<u>Eurycea longicauda</u>	S	C		
Subterranean Systems	<u>Cave Entrances/Seeps</u>				Amphibian	<u>Four-Toed Salamander</u>	<u>Hemidactylium scutatum</u>	N, C	R		ST
Subterranean Systems	Caves				Fish	<u>Northern Cavefish</u>	<u>Amblyopsis spelaea</u>	S	R		SE, FC
Subterranean Systems	Caves				Fish	<u>Southern Cavefish</u>	<u>Typhlichthys subterraneus</u>	S	R		SE

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Wetlands					Bird	Red-Winged Blackbird	<i>Agelaius phoeniceus</i>	I	A	R*	
Wetlands	emergent				Bird	Red-Winged Blackbird	<i>Agelaius phoeniceus</i>	I	A	R*	
Wetlands	emergent				Bird	American Black Duck	<i>Anas rubripes</i>	I	C	R*	
Wetlands	emergent				Bird	Killdeer	<i>Charadrius vociferus</i>	I	C	R*	
Wetlands	emergent				Bird	Pied-Billed Grebe	<i>Podilymbus podiceps</i>	I	C	R*	
Wetlands	emergent				Bird	Wood Duck	<i>Aix sponsa</i>	I	C	R*	
Wetlands	emergent				Bird	Yellow Warbler	<i>Dendroica petechia</i>	I	C	S*	
Wetlands	emergent <i>Ephemeral</i>	<i>Emergent</i>			Bird	Common Yellowthroat	<i>Geothlypis trichas</i>	I	C	S*	
Wetlands	emergent <i>Ephemeral</i>	Emergent			Bird	Mallard	<i>Anas platyrhynchos</i>	I	C	R*	
Wetlands	emergent				Bird	American Coot	<i>Fulica americana</i>	I	O	R*	
Wetlands	emergent				Bird	American Wigeon	<i>Anas americana</i>	I	O	M(*)	

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Wetlands	emergent				Bird	<u>Black Tern</u>	<i>Chlidonias niger</i>	I	O	S*	SE
Wetlands	emergent				Bird	Black-Bellied Plover	<i>Pluvialis squatarola</i>	I	O	M	
Wetlands	emergent				Bird	Blue-Winged Teal	<i>Anas discors</i>	I	O	S*	
Wetlands	emergent				Bird	Dunlin	<i>Calidris alpina</i>	I	O	M	
Wetlands	emergent				Bird	Gadwall	<i>Anas strepera</i>	I	O	M*	
Wetlands	emergent				Bird	<u>Great Egret</u>	<i>Ardea alba</i>	I	O	S*	SC
Wetlands	emergent				Bird	Greater Yellowlegs	<i>Tringa melanoleuca</i>	I	O	M	
Wetlands	emergent				Bird	Green-Winged Teal	<i>Anas crecca</i>	I	O	M*	
Wetlands	emergent				Bird	Horned Grebe	<i>Podiceps auritus</i>	I	O	W(*)	
Wetlands	emergent				Bird	Least Sandpiper	<i>Calidris minutilla</i>	I	O	M	
Wetlands	emergent				Bird	Lesser Yellowlegs	<i>Tringa flavipes</i>	I	O	M	
Wetlands	emergent				Bird	Long-Billed Dowitcher	<i>Limnodromus scolopaceus</i>	I	O	M	
Wetlands	emergent				Bird	Mute Swan	<i>Cygnus olor</i>	I	O	R*	X

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Wetlands	emergent				Bird	Northern Pintail	<i>Anas Acuta</i>	I	O	M*	
Wetlands	emergent				Bird	Northern Shoveler	<i>Anas clypeata</i>	I	O	M*	
Wetlands	emergent				Bird	Pectoral Sandpiper	<i>Calidris melanotos</i>	I	O	M	
Wetlands	emergent				Bird	<u>Sandhill Crane</u>	<i>Grus canadensis</i>	I	O	M*	SC
Wetlands	emergent				Bird	Semipalmated Plover	<i>Charadrius semipalmatus</i>	I	O	M	
Wetlands	emergent				Bird	Semipalmated Sandpiper	<i>Calidris pusilla</i>	I	O	M	
Wetlands	emergent				Bird	Short-Billed Dowitcher	<i>Limnodromus griseus</i>	I	O	M	
Wetlands	emergent				Bird	Solitary Sandpiper	<i>Tringa solitaria</i>	I	O	M	
Wetlands	emergent				Bird	Spotted Sandpiper	<i>Actitis macularia</i>	I	O	S*	
Wetlands	emergent				Bird	Swamp Sparrow	<i>Melospiza georgiana</i>	I	O	R*	
Wetlands	emergent				Bird	Tree Swallow	<i>Tachycineta bicolor</i>	I	O	S*	

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Wetlands	emergent				Bird	Tundra Swan	<i>Cygnus columbianus</i>	I	O	M	
Wetlands	emergent				Bird	Western Sandpiper	<i>Calidris mauri</i>	I	O	M	
Wetlands	emergent				Bird	Wilson's Snipe	<i>Gallinago delicata</i>	I	O	R*	
Wetlands	emergent Ephemeral	Emergent			Bird	Sora	<i>Porzana carolina</i>	I	O	S*	
Wetlands	emergent				Bird	American Avocet	<i>Recurvirostra americana</i>	I	R	M(*)	
Wetlands	emergent				Bird	<u>American Bittern</u>	<u><i>Botaurus lentiginosus</i></u>	I	R	S*	SE
Wetlands	emergent				Bird	Baird's Sandpiper	<i>Calidris bairdii</i>	I	R	M	
Wetlands	emergent				Bird	<u>Black Rail</u>	<u><i>Laterallus jamaicensis</i></u>	I	R	A*	SE
Wetlands	emergent				Bird	<u>Black-Crowned Night-Heron</u>	<u><i>Nycticorax nycticorax</i></u>	I	R	S*	SE
Wetlands	emergent				Bird	Black-Necked Stilt	<i>Himantopus mexicanus</i>	I	R	A	

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Wetlands	emergent				Bird	Cinnamon Teal	<i>Anas Cyanoptera</i>	I	R	A	
Wetlands	emergent				Bird	Common Crane	<i>Grus grus</i>	I	R	A	
Wetlands	emergent				Bird	Common Moorhen	<i>Gallinula chloropus</i>	I	R	S*	
Wetlands	emergent				Bird	Curlew Sandpiper	<i>Calidris ferruginea</i>	I	R	A	
Wetlands	emergent				Bird	Eurasian Wigeon	<i>Anas penelope</i>	I	R	A	
Wetlands	emergent				Bird	Fulvous Whistling-Duck	<i>Dendrocygna bicolor</i>	I	R	A	
Wetlands	emergent				Bird	Glossy Ibis	<i>Plegadis falcinellus</i>	I	R	A	
Wetlands	emergent				Bird	Hudsonian Godwit	<i>Limosa haemastica</i>	I	R	A	
Wetlands	emergent				Bird	<u>King Rail</u>	<i>Rallus elegans</i>	I	R	S*	SE
Wetlands	emergent				Bird	<u>Least Bittern</u>	<i>Ixobrychus exilis</i>	I	R	S*	SE
Wetlands	emergent				Bird	Little Blue Heron	<i>Egretta caerulea</i>	I	R	S*	
Wetlands	emergent				Bird	Marbled Godwit	<i>Limosa fedoa</i>	I	R	A	
Wetlands	emergent				Bird	<u>Marsh Wren</u>	<i>Cistothorus palustris</i>	I	R	S*	SE

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Wetlands	emergent				Bird	Nelson's Sharp-Tailed Sparrow	<i>Ammodramus nelsoni</i>	I	R	M	
Wetlands	emergent				Bird	Purple Gallinule	<i>Porphyrio martinica</i>	I	R	A	
Wetlands	emergent				Bird	Purple Sandpiper	<i>Calidris maritima</i>	I	R	W	
Wetlands	emergent				Bird	Red Phalarope	<i>Phalaropus fulicarius</i>	I	R	M	
Wetlands	emergent				Bird	Reddish Egret	<i>Egretta rufescens</i>	I	R	A	
Wetlands	emergent				Bird	Red-Necked Phalarope	<i>Phalaropus lobatus</i>	I	R	M	
Wetlands	emergent				Bird	Ruddy Turnstone	<i>Arenaria interpres</i>	I	R	M	
Wetlands	emergent				Bird	Ruff	<i>Philomachus pugnax</i>	I	R	A	
Wetlands	emergent				Bird	Sharp-Tailed Sandpiper	<i>Calidris acuminata</i>	I	R	A	
Wetlands	emergent				Bird	Snowy Egret	<i>Egretta thula</i>	I	R	A*	
Wetlands	emergent				Bird	Stilt Sandpiper	<i>Calidris himantopus</i>	I	R	M	
Wetlands	emergent				Bird	Tricolored Heron	<i>Egretta tricolor</i>	I	R	A	

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	emergent				Bird	<u>Virginia Rail</u>	<i>Rallus limicola</i>	I	R	R*	SE
Wetlands	emergent				Bird	Whimbrel	<i>Numenius phaeopus</i>	I	R	M	
Wetlands	emergent				Bird	White Ibis	<i>Eudocimus albus</i>	S	R	A	
Wetlands	emergent				Bird	White-Faced Ibis	<i>Plegadis chihi</i>	I	R	A	
Wetlands	emergent				Bird	White-Rumped Sandpiper	<i>Calidris fuscicollis</i>	I	R	M	
Wetlands	emergent				Bird	Willet	<i>Catoptrophorus semipalmatus</i>	I	R	M	
Wetlands	emergent				Bird	Wilson's Phalarope	<i>Phalaropus tricolor</i>	I	R	M(*)	
Wetlands	emergent				Bird	Wilson's Plover	<i>Charadrius wilsonia</i>	I	R	A	
Wetlands	emergent				Bird	<u>Wood Stork</u>	<i>Mycteria americana</i>	SW	R	A	FE
Wetlands	emergent				Bird	Yellow Rail	<i>Coturnicops noveboracensis</i>	I	R	M	
Wetlands	emergent				Bird	<u>Yellow-Crowned Night-Heron</u>	<i>Nyctanassa violacea</i>	SW	R	S*	SE

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	emergent				Bird	Yellow-Headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	W, S	R	S*	SE
Wetlands	emergent				Bird	Trumpeter Swan	<i>Olor buccinator</i>				
Wetlands	emergent				Bird	Whooping Crane	<i>Grus americana</i>	N		M	SE,FE,Ex (1907)
Wetlands	emergent Herbaceous Marsh				Bird	Sedge Wren	<i>Cistothorus platensis</i>	I	R	S*	SE
Wetlands	emergent Other	Potholes			Bird	Canada Goose	<i>Branta canadensis</i>	I	A	R*	
Wetlands	emergent Permanent	Forested			Bird	Great Blue Heron	<i>Ardea herodias</i>	I	C	R*	
Wetlands	Ephemeral				Amphibian	Bullfrog	<i>Rana catesbeiana</i>	I	A		
Wetlands	Ephemeral				Amphibian	Cope's Gray Treefrog	<i>Hyla chrysoscelis</i>	I	A		
Wetlands	Ephemeral				Amphibian	Eastern Gray Treefrog	<i>Hyla versicolor</i>	I	A		
Wetlands	Ephemeral				Amphibian	Smallmouth Salamander	<i>Ambystoma texanum</i>	I	A		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Ephemeral				Amphibian	Western Chorus Frog	<i>Pseudacris triseriata</i>	I	A		
Wetlands	Ephemeral				Amphibian	American Toad	<i>Bufo americanus</i>	N, C, SE	C		
Wetlands	Ephemeral				Amphibian	Cricket Frog	<i>Acris crepitans</i>	I	C		
Wetlands	Ephemeral				Amphibian	Fowler's Toad	<i>Bufo fowleri</i>	I	C		
Wetlands	Ephemeral				Amphibian	Green Frog	<i>Rana clamitans</i>	I	C		
Wetlands	Ephemeral				Amphibian	Marbled Salamander	<i>Ambystoma opacum</i>	C, S	C		
Wetlands	Ephemeral				Amphibian	<u>Northern Leopard Frog</u>	<i>Rana pipiens</i>	N, E	C		SC
Wetlands	Ephemeral				Amphibian	Southern Leopard Frog	<i>Rana utricularia</i>	S, C	C		
Wetlands	Ephemeral				Amphibian	Spotted Salamander	<i>Ambystoma maculatum</i>	I	C		
Wetlands	Ephemeral				Amphibian	Spring Peeper	<i>Pseudacris crucifer</i>	I	C		
Wetlands	Ephemeral				Amphibian	Tiger Salamander	<i>Ambystoma tigrinum</i>	I	C		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Ephemeral				Amphibian	<u>Blue-Spotted Salamander</u>	<i>Ambystoma laterale</i>	N	O		SC
Wetlands	Ephemeral				Amphibian	<u>Crawfish Frog</u>	<i>Rana areolata</i>	W	O		ST
Wetlands	Ephemeral				Amphibian	Eastern Newt	<i>Notophthalmus viridescens</i>	I	O		
Wetlands	Ephemeral				Amphibian	Eastern Spadefoot	<i>Scaphiopus holbrookii</i>	S	O		
Wetlands	Ephemeral				Amphibian	Jefferson's Salamander	<i>Ambystoma jeffersonianum</i>	SC	O		
Wetlands	Ephemeral				Amphibian	Lesser Siren	<i>Siren intermedia</i>	W	O		
Wetlands	Ephemeral				Amphibian	Wood Frog	<i>Rana sylvatica</i>	I	O		
Wetlands	Ephemeral	Forested			Mammal	<u>Bobcat</u>	<i>Lynx rufus</i>	I	R		SE
Wetlands	Ephemeral	Shrub/Scrub			Mammal	<u>Bobcat</u>	<i>Lynx rufus</i>	I	R		SE
Wetlands	Ephemeral				Amphibian	<u>Four-Toed Salamander</u>	<i>Hemidactylium scutatum</i>	N, C	R		ST
Wetlands	Ephemeral				Amphibian	<u>Plains Leopard Frog</u>	<i>Rana blairi</i>	W	R		SC

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Ephemeral				Amphibian	*Mole Salamander	<i>Ambystoma talpoideum</i>				
Wetlands	Ephemeral				Amphibian	Green Treefrog	<i>Hyla cinerea</i>				
Wetlands	Ephemeral				Mammal	Raccoon	<i>Procyon lotor</i>	I	A		
Wetlands	Ephemeral <i>(no sub-level habitat included on rep. species list)</i>				Mammal	<u>Star-Nosed Mole</u>	<u>Condylura cristata</u>	NE	R		SC
Wetlands	forested				Bird	Wood Duck	<i>Aix sponsa</i>	I	C	R*	
Wetlands	forested Ephemeral	<i>Forested</i>			Bird	Great Blue Heron	<i>Ardea herodias</i>	I	C	R*	
Wetlands	forested Ephemeral	Forested			Bird	Yellow-Throated Warbler	<i>Dendroica dominica</i>	I	O	S*	
Wetlands	Herbaceous Marsh				Amphibian	Bullfrog	<i>Rana catesbeiana</i>	I	A		
Wetlands	Herbaceous Marsh				Amphibian	Cope's Gray Treefrog	<i>Hyla chrysoscelis</i>	I	A		
Wetlands	Herbaceous Marsh				Amphibian	Eastern Gray Treefrog	<i>Hyla versicolor</i>	I	A		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Herbaceous Marsh				Amphibian	Western Chorus Frog	<i>Pseudacris triseriata</i>	I	A		
Wetlands	Herbaceous Marsh				Amphibian	American Toad	<i>Bufo americanus</i>	N, C, SE	C		
Wetlands	Herbaceous Marsh				Amphibian	Cricket Frog	<i>Acris crepitans</i>	I	C		
Wetlands	Herbaceous Marsh				Amphibian	Fowler's Toad	<i>Bufo fowleri</i>	I	C		
Wetlands	Herbaceous Marsh				Amphibian	Green Frog	<i>Rana clamitans</i>	I	C		
Wetlands	Herbaceous Marsh				Amphibian	Southern Leopard Frog	<i>Rana utricularia</i>	S, C	C		
Wetlands	Herbaceous Marsh				Amphibian	Spring Peeper	<i>Pseudacris crucifer</i>	I	C		
Wetlands	Herbaceous Marsh				Amphibian	<u>Northern Leopard Frog</u>	<i>Rana pipiens</i>	N, E	C		F
Wetlands	Herbaceous Marsh				Amphibian	<u>Crawfish Frog</u>	<i>Rana areolata</i>	W	O		ST
Wetlands	Herbaceous Marsh				Amphibian	Eastern Newt	<i>Notophthalmus viridescens</i>	I	O		
Wetlands	Herbaceous Marsh				Amphibian	Eastern Spadefoot	<i>Scaphiopus holbrookii</i>	S	O		
Wetlands	Herbaceous Marsh				Amphibian	Lesser Siren	<i>Siren intermedia</i>	W	O		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Herbaceous Marsh				Amphibian	Wood Frog	<i>Rana sylvatica</i>	I	O		
Wetlands	Herbaceous Marsh				Amphibian	<u>Plains Leopard Frog</u>	<i>Rana blairi</i>	W	R		SC
Wetlands	Herbaceous Marsh				Amphibian	*Mole Salamander	<i>Ambystoma talpoideum</i>				
Wetlands	Herbaceous Marsh				Amphibian	Green Treefrog	<i>Hyla cinerea</i>				
<i>Wetlands</i>	<i>Herbaceous Marsh</i>				<i>Bird</i>	<i>Common Yellowthroat</i>	<i>Geothlypis trichas</i>	<i>I</i>	<i>C</i>	<i>S*</i>	
Wetlands	Herbaceous Marsh	native			Mammal	Southeastern Shrew	<i>Sorex longirostris</i>	SC	O		
Wetlands	Herbaceous Marsh <i>(no sub-level habitat included on rep. species list)</i>				Mammal	Muskrat	<i>Ondatra zibethicus</i>	I	A		
Wetlands	Herbaceous Marsh				Mammal	Mink	<i>Mustela vison</i>	I	O		
Wetlands	Herbaceous Marsh				Mammal	<u>River Otter</u>	<u><i>Lutra canadensis</i></u>	I	R		SC

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Herbaceous Marsh				Mammal	<u>Star-Nosed Mole</u>	<i>Condylura cristata</i>	NE	R		SC
Wetlands	Herbaceous Marsh				Reptile	Banded Water Snake	<i>Nerodia sipedon</i>	I	A		
Wetlands	Herbaceous Marsh				Reptile	<u>Blanding's Turtle</u>	<i>Emydoidea blandingii</i>	N	O		SC
Wetlands	Herbaceous Marsh				Reptile	Eastern Ribbon Snake	<i>Thamnophis sauritus</i>	I	O		
Wetlands	Herbaceous Marsh				Reptile	<u>Copperbelly Water Snake</u>	<i>Nerodia erythrogaster</i>	SW, NE, SC	O		ST, FC
Wetlands	Herbaceous Marsh				Reptile	Plains Garter Snake	<i>Thamnophis radix</i>	NW	O		
Wetlands	Herbaceous Marsh				Reptile	<u>Spotted Turtle</u>	<i>Clemmys guttata</i>	N	O		ST
Wetlands	Herbaceous Marsh				Reptile	<u>Western Ribbon Snake</u>	<i>Thamnophis proximus</i>	NW, SW	O		SC
Wetlands	Herbaceous Marsh				Reptile	<u>Butler's Garter Snake</u>	<i>Thamnophis butleri</i>	NE, C	R		ST
Wetlands	Herbaceous Marsh				Reptile	<u>Cottonmouth</u>	<i>Agkistrodon piscivorus</i>	S	R		ST
Wetlands	Herbaceous Marsh				Reptile	<u>Eastern Massasauga</u>	<i>Sistrurus catenatus</i>	N	R		ST, FC

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Mudflats <i>Other</i>	<i>Mudflats</i>			Bird	Killdeer	<i>Charadrius vociferus</i>	I	C	R*	
Wetlands	Mudflats				Bird	American Golden-Plover	<i>Pluvialis dominica</i>	I	O	M	
Wetlands	Mudflats				Bird	Black-Bellied Plover	<i>Pluvialis squatarola</i>	I	O	M	
Wetlands	Mudflats				Bird	Dunlin	<i>Calidris alpina</i>	I	O	M	
Wetlands	Mudflats				Bird	Greater Yellowlegs	<i>Tringa melanoleuca</i>	I	O	M	
Wetlands	Mudflats				Bird	Lesser Yellowlegs	<i>Tringa flavipes</i>	I	O	M	
Wetlands	Mudflats				Bird	Long-Billed Dowitcher	<i>Limnodromus scolopaceus</i>	I	O	M	
Wetlands	Mudflats				Bird	Pectoral Sandpiper	<i>Calidris melanotos</i>	I	O	M	
Wetlands	Mudflats				Bird	Semipalmated Plover	<i>Charadrius semipalmatus</i>	I	O	M	
Wetlands	Mudflats				Bird	Semipalmated Sandpiper	<i>Calidris pusilla</i>	I	O	M	

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Mudflats				Bird	Short-Billed Dowitcher	<i>Limnodromus griseus</i>	I	O	M	
Wetlands	Mudflats				Bird	Solitary Sandpiper	<i>Tringa solitaria</i>	I	O	M	
Wetlands	Mudflats				Bird	Spotted Sandpiper	<i>Actitis macularia</i>	I	O	S*	
Wetlands	Mudflats				Bird	Western Sandpiper	<i>Calidris mauri</i>	I	O	M	
Wetlands	Mudflats				Bird	Wilson's Snipe	<i>Gallinago delicata</i>	I	O	R*	
Wetlands	Mudflats <i>Other</i>	<i>Mudflats</i>			Bird	Least Sandpiper	<i>Calidris minutilla</i>	I	O	M	
Wetlands	Mudflats				Bird	American Avocet	<i>Recurvirostra americana</i>	I	R	M(*)	
Wetlands	Mudflats				Bird	Baird's Sandpiper	<i>Calidris bairdii</i>	I	R	M	
Wetlands	Mudflats				Bird	Black-Necked Stilt	<i>Himantopus mexicanus</i>	I	R	A	
Wetlands	Mudflats				Bird	Buff-Breasted Sandpiper	<i>Tryngites subruficollis</i>	I	R	M	
Wetlands	Mudflats				Bird	Curlew Sandpiper	<i>Calidris ferruginea</i>	I	R	A	

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<u>Habitat Type Level I</u>	<u>Habitat Type Level II</u>	<u>Habitat Type Level III</u>	<u>Habitat Type Level IV</u>	<u>Habitat Type Level V</u>	<u>Species Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Mudflats				Bird	Purple Sandpiper	<i>Calidris maritima</i>	I	R	W	
Wetlands	Mudflats				Bird	Ruff	<i>Philomachus pugnax</i>	I	R	A	
Wetlands	Mudflats				Bird	Sharp-Tailed Sandpiper	<i>Calidris acuminata</i>	I	R	A	
Wetlands	Mudflats				Bird	Stilt Sandpiper	<i>Calidris himantopus</i>	I	R	M	
Wetlands	Mudflats				Bird	White-Rumped Sandpiper	<i>Calidris fuscicollis</i>	I	R	M	
Wetlands	Mudflats				Bird	Willet	<i>Catoptrophorus semipalmatus</i>	I	R	M	
Wetlands	Mudflats				Bird	Wilson's Plover	<i>Charadrius wilsonia</i>	I	R	A	
<i>Wetlands</i>	<i>Other</i>	<i>Potholes</i>			<i>Bird</i>	<i>Mallard</i>	<i>Anas platyrhynchos</i>	<i>I</i>	<i>C</i>	<i>R*</i>	
<i>Wetlands</i>	<i>Permanent</i>	<i>Emergent</i>			<i>Bird</i>	<i>Common Yellowthroat</i>	<i>Geothlypis trichas</i>	<i>I</i>	<i>C</i>	<i>S*</i>	
<i>Wetlands</i>	<i>Permanent</i>	<i>Emergent</i>			<i>Bird</i>	<i>Mallard</i>	<i>Anas platyrhynchos</i>	<i>I</i>	<i>C</i>	<i>R*</i>	

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Permanent	Emergent			Bird	Sora	<i>Porzana carolina</i>	I	O	S*	
Wetlands	Permanent	Forested			Bird	Yellow-Throated Warbler	<i>Dendroica dominica</i>	I	O	S*	
Wetlands	Permanent	Forested			Mammal	Bobcat	<i>Lynx rufus</i>	I	R		SE
Wetlands	Permanent	Shrub/Scrub			Bird	Green Heron	<i>Butorides virescens</i>	I	C	S*	
Wetlands	Permanent	Shrub/Scrub			Bird	Willow Flycatcher	<i>Empidonax traillii</i>	I	O	S*	
Wetlands	Permanent	Shrub/Scrub			Mammal	Bobcat	<i>Lynx rufus</i>	I	R		SE
Wetlands	Permanent				Amphibian	Bullfrog	<i>Rana catesbeiana</i>	I	A		
Wetlands	Permanent				Amphibian	Cope's Gray Treefrog	<i>Hyla chrysoscelis</i>	I	A		
Wetlands	Permanent				Amphibian	Eastern Gray Treefrog	<i>Hyla versicolor</i>	I	A		
Wetlands	Permanent				Amphibian	Western Chorus Frog	<i>Pseudacris triseriata</i>	I	A		
Wetlands	Permanent				Amphibian	American Toad	<i>Bufo americanus</i>	N, C,SE	C		
Wetlands	Permanent				Amphibian	Cricket Frog	<i>Acris crepitans</i>	I	C		

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<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Permanent				Amphibian	Fowler's Toad	<i>Bufo fowleri</i>	I	C		
Wetlands	Permanent				Amphibian	Green Frog	<i>Rana clamitans</i>	I	C		
Wetlands	Permanent				Amphibian	<u>Northern Leopard Frog</u>	<i>Rana pipiens</i>	N, E	C		SC
Wetlands	Permanent				Amphibian	Southern Leopard Frog	<i>Rana utricularia</i>	S, C	C		
Wetlands	Permanent				Amphibian	Spring Peeper	<i>Pseudacris crucifer</i>	I	C		
Wetlands	Permanent				Amphibian	Eastern Newt	<i>Notophthalmus viridescens</i>	I	O		
Wetlands	Permanent				Amphibian	Eastern Spadefoot	<i>Scaphiopus holbrookii</i>	S	O		
Wetlands	Permanent				Amphibian	Lesser Siren	<i>Siren intermedia</i>	W	O		
Wetlands	Permanent				Amphibian	Wood Frog	<i>Rana sylvatica</i>	I	O		
Wetlands	Permanent				Amphibian	<u>Four-Toed Salamander</u>	<i>Hemidactylum scutatum</i>	N, C	R		ST
Wetlands	Permanent				Amphibian	<u>Plains Leopard Frog</u>	<i>Rana blairi</i>	W	R		SC

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Permanent				Amphibian	*Mole Salamander	<i>Ambystoma talpoideum</i>				
Wetlands	Permanent				Amphibian	Green Treefrog	<i>Hyla cinerea</i>				
Wetlands	Permanent				Mammal	Muskrat	<i>Ondatra zibethicus</i>	I	A		
Wetlands	Permanent				Mammal	Mink	<i>Mustela vison</i>	I	O		
Wetlands	Permanent				Mammal	<u>River Otter</u>	<i>Lutra canadensis</i>	I	R		SC
Wetlands	Permanent				Mammal	<u>Star-Nosed Mole</u>	<i>Condylura cristata</i>	NE	R		SC
Wetlands	Permanent				Mammal	<u>Swamp Rabbit</u>	<i>Sylvilagus aquaticus</i>	SW	R		SE
Wetlands	Permanent				Reptile	Banded Water Snake	<i>Nerodia sipedon</i>	I	A		
Wetlands	Permanent				Reptile	Painted Turtle	<i>Chrysemys picta</i>	I	A		
Wetlands	Permanent				Reptile	<u>Blanding's Turtle</u>	<i>Emydoidea blandingii</i>	N	O		SC
Wetlands	Permanent				Reptile	Diamondback Water Snake	<i>Nerodia rhombifer</i>	SW	O		

Appendix C: Guilds by Habitat and Sub-habitat

<u>Habitat Type</u> <u>Level I</u>	<u>Habitat Type</u> <u>Level II</u>	<u>Habitat Type</u> <u>Level III</u>	<u>Habitat Type</u> <u>Level IV</u>	<u>Habitat Type</u> <u>Level V</u>	<u>Species</u> <u>Group</u>	<u>Species</u>	<u>Scientific Name</u>	<u>Range</u>	<u>Relative</u> <u>Abundance</u>	<u>Season</u>	<u>Status</u>
Wetlands	Permanent				Reptile	<u>Copperbelly Water Snake</u>	<i>Nerodia erythrogaster</i>	SW, NE, SC	O		ST, FC
Wetlands	Permanent				Reptile	<u>Cottonmouth</u>	<i>Agkistrodon piscivorus</i>	S	R		ST
Wetlands	Permanent				Reptile	<u>Eastern Massasauga</u>	<i>Sistrurus catenatus</i>	N	R		ST, FC
<i>Wetlands</i>	<i>Permanent</i>				<i>Reptile</i>	<i><u>Copperbelly Water Snake</u></i>	<i><u>Nerodia erythrogaster</u></i>	<i>SW, NE, SC</i>	<i>O</i>		<i>ST, FC</i>
Wetlands	Shrub/Scrub				Bird	Alder Flycatcher	<i>Empidonax alnorum</i>	N	R	S*	
Wetlands	Shrub/Scrub				Bird	<u>Golden-Winged Warbler</u>	<i>Verminvora chrysoptera</i>	I	R	S*	SE
Wetlands	Shrub/Scrub Ephemeral	<i>Shrub/Scrub</i>			Bird	Green Heron	<i>Butorides virescens</i>	I	C	S*	
Wetlands	Shrub/Scrub Ephemeral	<i>Shrub/Scrub</i>			Bird	Willow Flycatcher	<i>Empidonax traillii</i>	I	O	S*	



Welcome to the INCWS Questionnaire

Habitats and Species

Managing wildlife resources in a state that has experienced intense land use from agriculture, and more recently urban development, is a real challenge. Invasive species are radically changing the vast inland seas of the Great Lakes, including Lake Michigan and its tributaries. We're doing a lot of cutting edge work to keep our options open for the future, both ecologically and economically.

We are restoring a selection of species that were part of our natural and cultural history, including river otters, bald eagles, and osprey. These species uniquely lend themselves to restoration techniques because their populations had declined, but adequate habitat still existed in some parts of Indiana. Once the habitat is gone, restoration of associated wildlife species is no longer possible.

Restoring many of the other 550 species of nongame and endangered animals one at a time would be a daunting task. Therefore, we've chosen to manage for the habitat that they need to thrive. By using this strategy, we can be sure that all species will continue to have a place in the Indiana landscape. This is especially crucial for species that are so rare or unusual that we do not know much about their life history or survival requirements.

Habitat Identification

Over 100 specific habitat types have been identified in Indiana, and Indiana State University (ISU) has been contracted to research and compile data on these habitats using GIS databases. Specifically, ISU will be compiling quantitative or index information on the total acreage, geographic distribution, patch size, native vs. non-native, vegetation diversity and relative abundance, ownership, and relative condition of the habitats. Additionally, ISU is compiling historical trends in wildlife species occurrences for each of the habitat types in 1800, 1900, and 2000.

Wildlife Guilds and Representative Species

Using the "Indiana Academy of Science Revised Checklist of the Vertebrates of Indiana" as a guide, technical experts listed all vertebrate wildlife species with their associated habitats, forming habitat guilds. Wildlife professionals then selected wildlife species to serve as representatives of each guild. The selected species were identified, in part, to "paint a reasonable mental picture" of the associated habitat type to diverse user groups. One to three representative species were selected for each habitat. Through this process, a total of 210 representative species have been identified.

Items 1 through 5

The survey will begin with a request for basic information of name, organization and email. Then you will be asked to select the major taxonomic group of your expertise (e.g. Amphibians, Birds, Fish, Mammals, Mussels or Reptiles). Next you will select both a species and a habitat (to view these lists visit <http://www.djcase.com/incws/habitats-species.htm>). It is pertaining to this specific species/habitat that you complete the following questions:

Specialized reproductive behavior or low reproductive rates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Genetic pollution (hybridization)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify below)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Other threats to the _____ SPECIES in the _____ HABITAT in Indiana.

9. Please briefly describe the top two threats to the _____ SPECIES in the _____ HABITAT in Indiana.

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Note: Until the Next button is clicked, your answers to this page are not saved and will be lost if you click the Back button.

11. Other threats to the _____ HABITAT as it pertains to the _____ SPECIES in Indiana.

12. Please briefly describe the top two threats to the _____ HABITAT as it pertains to the _____ SPECIES in Indiana.

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Current Species Monitoring Efforts in Indiana

13. What current monitoring efforts by state agencies are you aware of for the _____ SPECIES in the _____ HABITAT in Indiana.

	Yes, these efforts occur	Not aware of these efforts occurring
Statewide year-round monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Statewide once a year monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local year-round monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local once a year monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>

14. What current monitoring efforts by other organizations are you aware of for the _____ SPECIES in the _____ HABITAT in Indiana.

	Yes, these efforts occur	Not aware of these efforts occurring
Statewide year-round monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Statewide once a year monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local year-round monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local once a year monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>

15. How crucial are these monitoring efforts by state agencies for the conservation of _____ SPECIES in the _____ HABITAT in Indiana.

	Very Crucial	Somewhat Crucial	Slightly Crucial	Not Crucial	Unknown
Statewide year-round monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Statewide once a year monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local year-round monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local once a year monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. How crucial are these monitoring efforts by other organizations for the conservation of _____ SPECIES in the _____ HABITAT in Indiana.

	Very Crucial	Somewhat Crucial	Slightly Crucial	Not Crucial	Unknown
Statewide year-round monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Statewide once a year monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local year-round monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local once a year monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please list where the following efforts occur in Indiana:

17. Regional or local state agency monitoring for _____ SPECIES in _____ HABITAT in Indiana.

**18. Regional or local monitoring by other organizations for _____ SPECIES in
_____ HABITAT in Indiana.**

**19. Please list organizations that are monitoring the _____ SPECIES in
_____ HABITAT in Indiana.**

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Note: Until the Next button is clicked, your answers to this page are not saved and will be lost if you click the Back button.

21. Other monitoring techniques for the _____ SPECIES in the _____ HABITAT in Indiana.

22. What one or two monitoring techniques would you recommend for effective conservation of _____ SPECIES in the _____ HABITAT in Indiana?

Suggest both intensive and less intensive sampling methods, especially any methods that are nationally or regionally accepted or funded. Please describe and explain why. Provide a reference or resource for further information.

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Note: Until the Next button is clicked, your answers to this page are not saved and will be lost if you click the Back button.

Current Habitat Inventory and Assessment Efforts

23. What current inventory and assessment efforts or activities by state agencies are you aware of for the _____ HABITAT as it pertains to the _____ SPECIES in Indiana?

	Yes, these efforts occur	No effort that I'm aware of
Statewide annual inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Statewide once a year inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local year-round inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local once a year inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>

24. What current inventory and assessment efforts or activities by state agencies are you aware of for the _____ HABITAT as it pertains to the _____ SPECIES in Indiana?

	Yes, these efforts occur	No effort that I'm aware of
Statewide annual inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Statewide once a year inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local year-round inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local once a year inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>

**25. How crucial are these efforts by state agencies for the conservation of the _____
HABITAT as it pertains to the _____ SPECIES in Indiana?**

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown
Statewide annual inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Statewide once a year inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local year-round inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local once a year inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**26. How crucial are these efforts by other organizations for the conservation _____
HABITAT as it pertains to the _____ SPECIES in Indiana?**

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown
Statewide annual inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Statewide once a year inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local year-round inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regional or local once a year inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please list where the following efforts occur in Indiana:

27. Regional or local state agency inventory and assessment for the _____ HABITAT as it pertains to the _____ SPECIES in Indiana?

28. Regional or local inventory and assessment by other organizations for the _____ HABITAT as it pertains to the _____ SPECIES in Indiana?

29. Please list organizations that are monitoring the _____ HABITAT as it pertains to the _____ SPECIES in Indiana?

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Current Habitat Inventory & Assessment Techniques

30. What are the current inventory and/or assessment techniques for the _____
HABITAT as it pertains to the _____ SPECIES in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown
GIS mapping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aerial photography and analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Systematic sampling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Property tax estimates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
State revenue data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regulatory information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Participation in landuse programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Modeling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Voluntary landowner reporting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify below)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

31. Other inventory and assessment techniques for the _____ HABITAT as it pertains to
the _____ SPECIES in Indiana.

32. What one or two inventory and assessment techniques would you recommend for effective conservation of the _____ HABITAT as it pertains to the _____ SPECIES in Indiana?

Suggest both intensive and less intensive sampling methods, especially any methods that are nationally or regionally accepted or funded. Please describe and explain why. Provide a reference or resource for further information.

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Note: Until the Next button is clicked, your answers to this page are not saved and will be lost if you click the Back button.

Current Body of Science for Species in Indiana

33. What is the current body of science for the _____ SPECIES in the _____ HABITAT in Indiana?

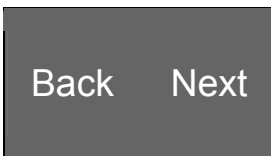
- Complete, up to date and extensive
- Adequate
- Inadequate
- Nonexistent
- Other (please explain below)

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the _____ SPECIES in the _____ HABITAT in Indiana, if available. These resources may be used if further detail is needed.

Title	<input type="text"/>
Author	<input type="text"/>
Date	<input type="text"/>
Publisher	<input type="text"/>

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the _____ SPECIES in the _____ HABITAT in Indiana, if available. These resources may be used if further detail is needed.

Title	<input type="text"/>
Author	<input type="text"/>
Date	<input type="text"/>
Publisher	<input type="text"/>



Note: Until the Next button is clicked, your answers to this page are not saved and will be lost if you click the Back button.

Current Body of Science for Habitat in Indiana

36. What is the current body of science for the _____ HABITAT as it pertains to the _____ SPECIES in Indiana?

- Complete, up to date and extensive
- Adequate
- Inadequate
- Nonexistent
- Other (please explain below)

37. Please provide a citation (title, author, date, publisher) that would give the best overview of the _____ HABITAT as it pertains to the _____ SPECIES in Indiana, if available. These resources may be used if further detail is needed.

Title

Author

Date

Publisher

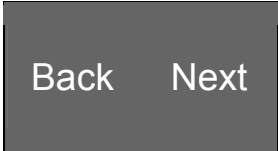
38. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the _____ HABITAT as it pertains to the _____ SPECIES in Indiana, if available. These resources may be used if further detail is needed.

Title

Author

Date

Publisher



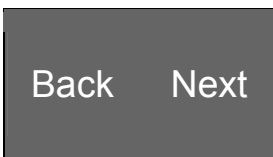
Note: Until the Next button is clicked, your answers to this page are not saved and will be lost if you click the Back button.

Species Research Needs in Indiana

39. What are the research needs for the _____ SPECIES in the _____ HABITAT in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not Needed	Unknown
Life cycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Distribution and abundance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Limiting factors (food, shelter, water, breeding sites)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Threats (predators/competition, contamination)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Relationship/dependence on specific habitats	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Population health (genetic and physical)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify below)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

40. Other research needs for the _____ SPECIES in the _____ HABITAT in Indiana?



Note: Until the Next button is clicked, your answers to this page are not saved and will be lost if you click the Back button.

Habitat Research Needs in Indiana

41. What are the research needs for the _____ HABITAT as it pertains to the _____ SPECIES in Indiana.

	Urgently needed	Greatly needed	Needed	Slightly needed	Not Needed	Unknown
Successional changes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Distribution and abundance (fragmentation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Threats (land use change/competition, contamination/global warming)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Relationship/dependence on specific site conditions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Growth and development of individual components of the habitat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify below)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

42. Other research needs for the _____ HABITAT as it pertains to the _____ SPECIES in Indiana.

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Note: Until the Next button is clicked, your answers to this page are not saved and will be lost if you click the Back button.

Current Species Conservation Practices in Indiana

43. How well do the following conservation efforts address the threats to the _____
SPECIES in the _____ HABITAT in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown
Habitat protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Population management (hunting, trapping)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Population enhancement (captive breeding and release)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reintroduction (restoration)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food plots	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Threats reduction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Native predator control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Exotic/invasive species control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regulation of collecting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Disease/parasite management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Translocation to new geographic range	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Protection of migration routes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Limiting contact with pollutants/contaminants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public education to reduce human disturbance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Culling/selective removal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stocking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify below)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

44. Other current conservation practices for the _____ SPECIES in the _____ HABITAT in Indiana?

45. What one or two specific practices would you recommend for more effective conservation of the _____ SPECIES in the _____ HABITAT in Indiana?

Suggest both intensive and less intensive practices, especially any methods that are nationally or regionally accepted or funded. Please describe and explain why. Provide a reference or resource for further information.

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Note: Until the Next button is clicked, your answers to this page are not saved and will be lost if you click the Back button.

Current Habitat Conservation Practices in Indiana

46. How well do the following conservation efforts address the threats to the _____
HABITAT as it pertains to the _____ SPECIES in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown
Habitat protection through regulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Habitat protection on public lands	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Habitat protection incentives (financial)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Habitat restoration through regulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Habitat restoration on public lands	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Habitat restoration incentives (financial)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Artificial habitat creation (artificial reefs, nesting platforms)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Selective use of functionally equivalent exotic species in place of extirpated natives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Succession control (fire, mowing)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Corridor development/protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Managing water regimes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pollution reduction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Protection of adjacent buffer zone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Restrict public access and disturbance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Land use planning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Technical assistance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cooperative land management agreements (conservation easements)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify below)					

47. Other current conservation practices for the _____ HABITAT as it pertains to the _____ SPECIES in Indiana.

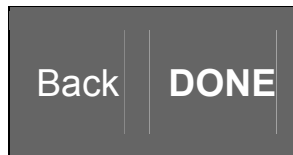
48. What one or two specific practices would you recommend for more effective conservation of the _____ HABITAT as it pertains to the _____ SPECIES in Indiana?

Suggest both intensive and less intensive practices, especially any methods that are nationally or regionally accepted or funded. Please describe and explain why. Provide a reference or resource for further information.

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Note: Until the Next button is clicked, your answers to this page are not saved and will be lost if you click the Back button.

49. Do you have any additional comments or information on the species that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?



Survey completed

Appendix E-1: Agriculture

7. Please also rank these threats to the Wildlife in Agricultural Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3
Habitat loss (feeding/foraging areas)	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	2
Small native range (high endemism)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	3
Near limits of natural geographic range	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	3
Large home range requirements	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Viable reproductive population size or availability	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Specialized reproductive behavior or low reproductive rates	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Other (please specify below)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
							Total Respondents 27

8. Other threats to the Wildlife in Agricultural Habitats in Indiana.

sporadic occurrence of early and mid successional fields is the greatest deterrent to higher abundance

Total Respondents 1

(skipped this question) 1

9. Please briefly describe the top two threats to the Wildlife in Agricultural Habitats in Indiana identified above.

Loss of ephemeral & semipermanent wetlands

lack and distance apart of available patches of habitat
these habitats are ephemeral

Total Respondents 2

Appendix E-1: Agriculture

10. Please rank the following threats to the HABITAT of the Wildlife in Agricultural Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total	
Commercial or residential development (sprawl)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3	
Counterproductive financial incentives or regulations	0% (0)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3	
Invasive/non-native species	0% (0)	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3	
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3	
Habitat fragmentation	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3	
Successional change	0% (0)	33% (1)	0% (0)	0% (0)	33% (1)	33% (1)	3	
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3	
Habitat degradation	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	0% (0)	3	
Climate change	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3	
Stream channelization	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3	
Impoundment of water/flow regulation	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3	
Agricultural/forestry practices	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3	
Residual contamination (persistent toxins)	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3	
Point source pollution (continuing)	0% (0)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3	
Mining/acidification	0% (0)	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	3	
Drainage practices (stormwater runoff)	0% (0)	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3	
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1	
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	
							Total Respondents	49

11. Other HABITAT threats to the Wildlife in Agricultural Habitats in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

Appendix E-1: Agriculture

12. Please briefly describe the top two HABITAT threats to the Wildlife in Agricultural Habitats in Indiana identified above.

Habitat loss & degradation

farming practices and succession
suitable habitat is ephemeral and spread out

Ephemeral Wetland loss and fragmentation

Total Respondents 3

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Agricultural Habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (3)	3
Statewide once a year monitoring conducted by state agencies	33% (1)	67% (2)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (3)	3
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (3)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
		Total Respondents	24

Appendix E-1: Agriculture

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Agricultural Habitats in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (3)	3
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (3)	3
Regional or local once a year monitoring conducted by other organizations	67% (2)	33% (1)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	67% (2)	33% (1)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	100% (3)	0% (0)	3
		Total Respondents	24

Appendix E-1: Agriculture

16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Agricultural Habitats in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Regional or local once a year monitoring conducted by other organizations	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	100% (3)	0% (0)	0% (0)	3
						Total Respondents
						19

17. Regional or local state agency monitoring for the Wildlife in Agricultural Habitats in Indiana.

IDNR has a NAAMP frog call program

Total Respondents **1**

(skipped this question) 1

18. Regional or local monitoring by other organizations for the Wildlife in Agricultural Habitats in Indiana.

Robert Brodman, Saint Joseph's College

monitored twice, 1975 by Ford, and 1998 by Leibacher and Whitaker

1. Chicago Wilderness

Robert Brodman, Saint Joseph's College

Total Respondents **3**

Appendix E-1: Agriculture

19. Please list organizations that are monitoring the Wildlife in Agricultural Habitats in Indiana.

ISU

Chicago Wilderness
Robert Brodman, Saint Joseph's College

Total Respondents **2**

(skipped this question) **1**

20. What are the current monitoring techniques for the Wildlife in Agricultural Habitats in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Modeling	0% (0)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Coverboard routes	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	0% (0)	3
Spot mapping	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Driving a survey route	33% (1)	0% (0)	0% (0)	67% (2)	0% (0)	0% (0)	3
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	3
Mark and recapture	0% (0)	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Professional survey/census	67% (2)	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	3
Volunteer survey/census	33% (1)	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	3
Trapping (by any technique)	67% (2)	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	3
Representative sites	67% (2)	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	3
Probabilistic sites	67% (2)	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
							Total Respondents 36

Appendix E-1: Agriculture

21. Other monitoring techniques for the Wildlife in Agricultural Habitats in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Agricultural Habitats in Indiana?

Aquatic surveys for eggs & larva, trapping during breeding migration

trap periphery of known range in Indiana

Frog call surveys and tadpole surveys

Total Respondents 3

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Agricultural Habitats in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
Statewide once a year inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
Regional or local year-round inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
Regional or local once a year inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	67% (2)	33% (1)	3
	Total Respondents		24

Appendix E-1: Agriculture

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Agricultural Habitats in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (2)	2
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (2)	2
Regional or local year-round inventory and assessment conducted by other organizations	33% (1)	67% (2)	3
Regional or local once a year inventory and assessment conducted by other organizations	33% (1)	67% (2)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	67% (2)	33% (1)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	100% (3)	0% (0)	3
		Total Respondents	22

Appendix E-1: Agriculture

- 27.** Regional or local state agency HABITAT inventory and assessment for the Wildlife in Agricultural Habitats in Indiana.

Frog call surveys include rural and agricultural areas throughout the state.

Total Respondents 1

- 28.** Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Agricultural Habitats in Indiana.

Brodman in NW Indiana

twice assessed; SurveyAnswerTextNull

Chicago Wilderness & Saint Joseph's College have frog call monitoring programs in NW IN.

Total Respondents 3

- 29.** Please list organizations that are monitoring this HABITAT for the Wildlife in Agricultural Habitats in Indiana.

ISU; 1975 by Ford, 1998 by Leibacher and Whitaker; I have already done this page twice, and had to do one other page twice when it jumped back when I hit "next"

ISU twice- 1995 by Ford. 1998 by Leibacher and Whitaker

Total Respondents 1

Appendix E-1: Agriculture

30. What are the current HABITAT inventory and/or assessment techniques for Wildlife in Agricultural Habitats in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Aerial photography and analysis	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Systematic sampling	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	2
Property tax estimates	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	2
State revenue data	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	2
Regulatory information	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	2
Participation in landuse programs	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	2
Modeling	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Total Respondents							18

31. Other HABITAT inventory and assessment techniques for the Wildlife in Agricultural Habitats in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-1: Agriculture

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Agricultural Habitats in Indiana?

systematic sampling and GIS

same as used

Frog call surveys include rural and agricultural areas throughout the state.

Total Respondents 3

33. What is the current body of science for the Wildlife in Agricultural Habitats in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		2	67%
Inadequate		1	33%
Nonexistent		0	0%
Other (please explain below)		0	0%
Total Respondents		3	

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Agricultural Habitats in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title	Amphibians and reptiles from 23 counties of Indiana. Distribution of the western harvest mouse in Indiana	2	100%
Author	Robert Brodman Leibacher and Whitaker	2	100%
Date	2003 1998	2	100%
Publisher	Proceedings of the Indiana Academy of Science, 112: 43-54. Ind, Acad. Sci. 107:167-170	2	100%
Total Respondents		2	

Appendix E-1: Agriculture

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Agricultural Habitats in Indiana. This resource may also be used if further detail is needed.

		Response Total	Response Percent
Title	Multivariate analyses of the influences of water chemistry and habitat parameters on the abundances of pond-breeding amphibians.	2	100%
Author	see above for more Robert Brodman et al	1	50%
Date	2003	1	50%
Publisher	Journal of Freshwater Ecology 18: 425-436.	1	50%
Total Respondents		2	

36. What is the current HABITAT body of science for the Wildlife in Agricultural Habitats in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		0	0%
Inadequate		2	100%
Nonexistent		0	0%
Other (please explain below)		0	0%
Total Respondents		2	

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Agricultural Habitats in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title		0	0%
Author		0	0%
Date		0	0%
Publisher		0	0%
Total Respondents		0	

Appendix E-1: Agriculture

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Agricultural Habitats in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	

39. What are the research needs for the Wildlife in Agricultural Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	3
Distribution and abundance	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3
Limiting factors (food, shelter, water, breeding sites)	67% (2)	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	3
Threats (predators/competition, contamination)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	0% (0)	2
Relationship/dependence on specific habitats	67% (2)	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	3
Population health (genetic and physical)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Total Respondents							17

40. Other research needs for the Wildlife in Agricultural Habitats in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-1: Agriculture

43. How well do the following conservation efforts address the threats to the Wildlife in Agricultural Habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	67% (2)	0% (0)	33% (1)	0% (0)	0% (0)	3
Population management (hunting, trapping)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Population enhancement (captive breeding and release)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Reintroduction (restoration)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Food plots	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Threats reduction	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Native predator control	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Exotic/invasive species control	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3
Regulation of collecting	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Disease/parasite management	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Translocation to new geographic range	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Protection of migration routes	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Limiting contact with pollutants/contaminants	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Public education to reduce human disturbance	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	3
Culling/selective removal	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Stocking	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
						Total Respondents 49

44. Other current conservation practices for the Wildlife in Agricultural Habitats in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

Appendix E-1: Agriculture

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Agricultural Habitats in Indiana?

Protection of fishless breeding habitat, wetland restoration

about the only one that would be effective would be to manage succession such that proper habitat was more abundant and closer together

Protection of ephemeral wetlands and control of purple loosesrife

Total Respondents 3

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Agricultural Habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Habitat protection on public lands	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Habitat protection incentives (financial)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Habitat restoration through regulation	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Habitat restoration on public lands	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Habitat restoration incentives (financial)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Corridor development/protection	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Managing water regimes	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Pollution reduction	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Protection of adjacent buffer zone	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Restrict public access and disturbance	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Land use planning	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Technical assistance	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Cooperative land management agreements (conservation easements)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
						Total Respondents 34

Appendix E-1: Agriculture

47. Other current HABITAT conservation practices for the Wildlife in Agricultural Habitats in Indiana.

none for this species

Total Respondents **1**

(skipped this question) 1

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Agricultural Habitats in Indiana?

Habitat protection & restoration

see above

Ephemeral wetland protection and restoration

Total Respondents **3**

49. Do you have any additional comments or information on the Wildlife in Agricultural Habitats that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

1. Research on metapopulation dynamics and colonization of new breeding habitat is needed.

This species entered Indiana by range expansion from Illinois about 1969 in or near Newton County (Willow Slough) and has continued to sprad since then until it occured in at least 18 counties. We can always learn more about it, but and we could attempt to learn more about how it spreads and what deters it from spreading (the latter seems to be larger rivers).

Total Respondents **2**

Appendix E-2: Aggregated Aquatic Systems

7. Please also rank these threats to ALL wildlife in all Aquatic Systems Habitats in Indiana.							
	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	24% (16)	29% (20)	24% (16)	9% (6)	7% (5)	7% (5)	68
Habitat loss (feeding/foraging areas)	21% (14)	34% (23)	24% (16)	10% (7)	6% (4)	6% (4)	68
Small native range (high endemism)	1% (1)	7% (5)	10% (7)	13% (9)	63% (42)	4% (3)	67
Near limits of natural geographic range	7% (5)	14% (3)	6% (4)	7% (5)	76% (53)	0% (0)	70
Large home range requirements	0% (0)	0% (0)	3% (2)	9% (6)	71% (46)	17% (11)	65
Viable reproductive population size or availability	13% (9)	15% (10)	12% (8)	21% (14)	32% (22)	7% (5)	68
Specialized reproductive behavior or low reproductive rates	13% (9)	16% (11)	18% (12)	10% (7)	34% (23)	9% (6)	68
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	10% (7)	21% (14)	21% (14)	7% (5)	21% (14)	21% (14)	68
Genetic pollution (hybridization)	0% (0)	0% (0)	4% (3)	18% (12)	58% (39)	19% (13)	67
Unknown	0% (0)	0% (0)	10% (3)	0% (0)	7% (2)	83% (24)	29
Other (please specify below)	0% (0)	15% (3)	0% (0)	5% (1)	5% (1)	75% (15)	20
						Total Respondents	659

Appendix E-2: Aggregated Aquatic Systems

8. Other threats to ALL wildlife in all Aquatic Systems Habitats in Indiana.

- None that I can think of. As adjacent states initiate harvest seasons for otters, there might be added pressure to take otters accidentally trapped in Indiana across state lines to market fur. However, I wouldn't expect this to have a significant impact at a statewide or even regional scale.
- Disturbance by recreational boating.
- Commercial over exploitation resulting in low spawner stock abundance.
- Egg predators predation, nutritional requirements, early mortality syndrome
- Stream channelizing.
- My area of expertise is effects of contamination on biological organisms, especially aquatic. This makes filling out the survey difficult. My knowledge is applicable to aquatic habitats rather than specific species in this survey.
- Threats to the Orangethroat Darter are related to threats to the habitat. It prefers high-functioning, high quality riffle habitat in headwater streams. Headwater streams, are not always given as much protection or value as larger rivers downstream. Threats to the species colonization, such as aquatic passage problems through culverts are one threat. Threats to the species watersheds, such as pollution, clearing of the riparian vegetation, creek gravel mining, and channelization are also threats to the habitat of this species.; Threats to the Orangethroat Darter are related to threats to the habitat. It prefers high-functioning, high quality riffle habitat in headwater streams. Headwater streams, are not always given as much protection or value as larger rivers downstream. Threats to the species colonization, such as aquatic passage problems through culverts are one threat. Threats to the species watersheds, such as pollution, clearing of the riparian vegetation, creek gravel mining, and channelization are also threats to the habitat of this species.; Threats to the Orangethroat Darter are related to threats to the habitat. It prefers high-functioning, high quality riffle habitat in headwater streams. Headwater streams, are not always given as much protection or value as larger rivers downstream. Threats to the species colonization, such as aquatic passage problems through culverts are one threat. Threats to the species watersheds, such as pollution, clearing of the riparian vegetation, creek gravel mining, and channelization are also threats to the habitat of this species.
- High stream flows for a few months following spawning can seriously reduce year class strength.
- High stream flows following spawning can seriously reduce year class strength. This threat can be reduced by reducing ditching in headwaters, installing grass waterways and WASCOS, maintaining riparian corridors. All of these measures will slow stream flows and reduce siltation.

Total Respondents

9

Appendix E-2: Aggregated Aquatic Systems

9. Please briefly describe the top two threats to ALL wildlife in all Aquatic Systems Habitats in Indiana identified above.

- Wetland loss and degradation
- Habitat loss mostly related to urban sprawl. Degradation of migration routes, also often related to urban sprawl and other development.
- Urbanization.
- Pollution/degradation of aquatic systems: reproductive performance of otters can be compromised by high levels of
- PCBs, heavy metals, etc. that bio-accumulate in the aquatic food chain. Direct loss of aquatic habitats such as wetlands, marshes, etc. also impact otters... but not to the extent pollutants could.
- Human disturbance.
- Modification/degradation of habitats.
- Over-population.
- Habitat loss (feeding areas) - many reservoirs are getting very old and the once abundant standing timber is now diminishing which is reducing cover for white crappie.
- Dependence on irregular sources - in many reservoirs, shad is the dominant forage base for crappie. If shad are growing extremely fast, crappie can only utilize shad for a short period of time before the shad outgrow the size crappie can consume.
- Competition with invasives, namely gizzard shad.
- Water level control regimes at impoundments.
- Loss or degradation of nesting habitat. Loss or degradation of brood-rearing and foraging areas.
- Habitat loss-urbanization and habitat loss-breeding, feeding, and foraging.
- Habitat loss.
- Degradation of movement/migration routes.
- Year class failure related to low spawner stock abundance. Competition with non native species for limited available food resources.
- Lack of successful spawning, possibly related to bioenergetics. Too much egg predation.
- Long-term declines in water quality associated with lake eutrophication.
- Annual and seasonal variations in habitat availability.
- Cold, clear water is critical for cisco survival; increased runoff and nutrient loading have degraded the habitat for this species in many of the 50+ lakes it once occurred in. Few lakes still have the species, and there is apparently little to no reproduction.
- The deliberate stocking of predator fish in cisco lakes has been a threat to this species for years; if this hasn't been stopped, it needs to.
- Loss of habitat (reproductive/feeding) that is essential for northern pike survival.
- Over harvest and illegal harvest (This doesn't seem to be a major threat as of now)

Appendix E-2: Aggregated Aquatic Systems

- Loss of undisturbed natural lake habitat.
- Habitat loss & habitat degradation.
- Sediment deposition.
- Habitat loss (loss of large nesting trees).
- Loss of brood rearing habitat.
- Loss of high quality nesting habitat.
- Habitat loss.
- Degradation of movement/migration routes.
- Although not habitat specific, the inability to responsibly and proactively manage mink according to the wildlife conservation model, as opposed to reactive measures through nuisance practices, is a concern regarding the conservation of mink. This concern applies across the landscape, not just in urban and suburban environments.
- Past pollution problems and dams on rivers block migration.
- Exotic species competition, specifically the round goby.
- Habitat degradation, non-point sources runoff resulting from loss of riparian buffers due to development.
- High sediment loads during spring rains.
- The acute effects of toxicants are recognized as a threat to organisms, but there is little knowledge on ecosystems or regional effects on chronic insults. Toxicants are more destructive to the embrolarva stages, but these are poorly documented. Pollution controls do not have definite focus on chronic effects.
- Habitat loss and pollution.
- Siltation- hornyhead chub are sight-feeders and mound builders for spawning; thus, muddy water will hamper their chances of survival and if the silt covers gravel and their nest, chances for successful reproduction will be limited.
Competition from other species better adapted to muddy and silty stream conditions.
- Runoff, mostly agricultural.
- In-stream modifications.
- Pike have suffered a major loss of spawning habitat due to the prevalence of dredging within the watershed. This practice along with levee construction has resulted in the near elimination of in-stream and emergent wetland vegetation throughout the majority of the watershed.
- Habitat loss - requires shallow clear water with little current in weedy areas over gravel, sand, and silt to feed on insects and lay reproduce
- Dredging (removal of aquatic vegetation and increasing depth of ditch).
- Habitat loss/unintentional take-'cleaning' and dredging of streams of the Kankakee drainage can result in a large amount of creek heelsplitters being lost.
- Dependence on other species-require fish host to reproduce; if fish populations decrease for any of a variety of reasons, then creek heelsplitter reproduction could decrease substantially.
- Habitat loss - requires shallow clear water with little current in weedy areas over gravel, sand, and silt to feed on insects and lay reproduce.

Appendix E-2: Aggregated Aquatic Systems

- Dredging of headwater streams.
- Alterations of hydrology from land-use changes.
- Runoff.
Habitat modification.
- The top two threats for the species are threats to migration (aquatic passage problems through stream crossing structures) and threats to the breeding habitat (high quality riffles). Threats to riffle habitat result from water quality degradation and loss of stream channel stability due to land management activities such as dredging, channelization, roads, and clearing of riparian vegetation.; The top two threats for the species are threats to migration (aquatic passage problems through stream crossing structures) and threats to the breeding habitat (high quality riffles). Threats to riffle habitat result from water quality degradation and loss of stream channel stability due to land management activities such as dredging, channelization, roads, and clearing of riparian vegetation.; The top two threats for the species are threats to migration (aquatic passage problems through stream crossing structures) and threats to the breeding habitat (high quality riffles). Threats to riffle habitat result from water quality degradation and loss of stream channel stability due to land management activities such as dredging, channelization, roads, and clearing of riparian vegetation.
- Habitat loss (breeding and foraging/feeding areas): Siltation of small headwater streams is limiting the population of southern redbelly dace because the species spawn over gravel substrates. Also, the removal of vegetation could decrease food availability to the herbivorous species. They occupy streams that have a permanent flow of clear water; thus siltation or alterations in flow regimes could also affect the species.
- Hellbenders have a small geographic range and population sizes in Indiana. In many locations there is concern about low reproductive rates, but this is unknown in Indiana populations.
- Runoff.
- Habitat modification.
- Runoff introducing sediments, even if only temporary.
- In-stream modifications.
- Pollution within the Tippecanoe River system in Indiana.
Any factor which reduces the reproductive population size.
- Pollution.
- Habitat loss - siltation of spawning areas and pools, loss of in-stream cover, riparian destruction, channelization.
- Point source pollution, which triggers fish kills or repels rock bass from the area.
- Habitat loss and degradation are serious threats to rock bass. They prefer silt free streams to reproduce and thrive. They also relate closely to structure/cover therefore any habitat loss is a threat.
- Habitat Loss - The Eastern Sand darter requires sandy bottoms in fast flowing streams to bury eggs, hide from predators, ambush prey, conserve energy, and maintain position in unstable/shifting sandbars. Low reproductive rates/small populations - reach maturity at age 1, but only lives a few years.
- Breeding and feeding/foraging habitat loss due to sedimentation from farm fields and stream banks as well as the removal of natural riparian vegetation; breeding and feeding/foraging habitat loss due to sedimentation from farm fields and stream banks as well as the removal of natural riparian vegetation.

Appendix E-2: Aggregated Aquatic Systems

- Habitat loss - siltation which reduces spawning areas and fills pools, loss of in-stream cover (snagging and log removal), riparian destruction which allows water to warm and will reduce opportunity for logs and woody debris to enter stream, channelization.
- Pollution which triggers fish kills or repels smallmouth from the area.
- Zebra mussels.
- Instream dredging.
- Zebra mussels.
- In-stream modifications.
- Pollution.
- Possible lack of reproductive success as indicated by poor length frequency distribution.
- Possible sensitivity to pollution as indicated by its rarity in the Ohio River reach in Indiana.
- Habitat loss and pollution.
- Degradation of nesting and staging sites- pools or riffles with slow current beneath flat rocks.
- Low reproductive rates-Males reach sexual maturity at 2 while females can reproduce at 1 and they only have a life span of about 3 years.
- Commercial type fishing devices - trot lines, branch lines, big nets, other passive fishing
- Extreme depredation by overabundant raccoons (on eggs) - maybe by coyotes, too.
- Extant population (if any) far below level for unassisted recovery.
- Nest depredation mainly by raccoons = very low recruitment.
- Nest/embryo/hatchling loss associated with attraction to row crop land for nesting.
- Potential loss of adults to road kill and to rogue raccoons (kill adults for their eggs)
- Insuring that populations maintain critical larva-host connections.
- Habitat loss for both breeding and feeding/foraging areas. The slough darter prefers a mud or silt bottom with little current velocity and vegetation to deposit eggs on. They also spawn few eggs so reproduction is lower in places where vegetation is lacking. They also compete with other darters for insects and have a high mortality due to stagnation and freezing in the pools they desire to live in.

Total Respondents

60

Appendix E-2: Aggregated Aquatic Systems

10. Please rank the following threats to the HABITAT of ALL wildlife in all Aquatic Systems Habitats in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Commercial or residential development (sprawl)	13% (8)	36% (23)	30% (19)	13% (8)	9% (6)	0% (0)	64
Counterproductive financial incentives or regulations	2% (1)	9% (6)	13% (8)	3% (2)	20% (13)	53% (34)	64
Invasive/non-native species	9% (6)	6% (4)	20% (13)	28% (18)	15% (10)	22% (14)	65
Nonpoint source pollution (sedimentation and nutrients)	21% (14)	29% (20)	31% (21)	12% (8)	1% (1)	6% (4)	68
Habitat fragmentation	8% (5)	31% (20)	28% (18)	11% (7)	11% (7)	11% (7)	64
Successional change	2% (1)	11% (7)	11% (7)	16% (10)	36% (23)	25% (16)	64
Diseases (of plants that create habitat)	0% (0)	0% (0)	3% (2)	14% (9)	37% (23)	46% (29)	63
Habitat degradation	31% (21)	40% (27)	21% (14)	4% (3)	1% (1)	1% (1)	67
Climate change	2% (1)	0% (0)	11% (7)	15% (10)	40% (26)	32% (21)	65
Stream channelization	38% (25)	30% (20)	18% (12)	6% (4)	3% (2)	5% (3)	66
Impoundment of water/flow regulation	13% (8)	22% (14)	29% (18)	17% (11)	29% (8)	6% (4)	63
Agricultural/forestry practices	13% (8)	36% (23)	28% (18)	14% (9)	6% (4)	3% (2)	64
Residual contamination (persistent toxins)	3% (2)	14% (9)	29% (19)	24% (16)	3% (2)	27% (18)	66
Point source pollution (continuing)	12% (8)	24% (16)	26% (17)	21% (14)	2% (1)	15% (10)	66
Mining/acidification	2% (1)	17% (11)	19% (12)	20% (13)	22% (14)	20% (13)	64
Drainage practices (stormwater runoff)	8% (5)	32% (21)	30% (20)	15% (10)	8% (5)	8% (5)	66
Unknown	0% (0)	0% (0)	0% (0)	4% (1)	0% (0)	96% (23)	24
Other (please specify below)	0% (0)	0% (0)	0% (0)	4% (1)	0% (0)	94% (17)	18
Total Respondents							1,081

11. Other HABITAT threats to ALL wildlife in all Aquatic Systems Habitats in Indiana.

- Competition with round goby for near-shore habitat.
- Riparian corridor destruction. Loss of shading and sedimentation.
- Sand and gravel operations could destroy preferred habitat.

Appendix E-2: Aggregated Aquatic Systems

Total Respondents

3

12. Please briefly describe the top two HABITAT threats to ALL wildlife in all Aquatic Systems Habitats in Indiana identified above.

- Habitat degradation & fragmentation.
- Urban sprawl and regulations that allow loss of habitat. The human/beaver interface usually results with either the habitat being eliminated or the beaver being eradicated.
- Urbanization.
- Water pollution not only impacts otter reproduction (see previous section), but may also impact the quantity/quality of aquatic prey for otters. Loss of wetland habitats reduces amount of suitable habitat for otters.
- Factors that affect food availability.
- Modification of stream shoreline habitats.
- Regulation of impounded water - extreme water fluctuations in mainly the Army Corps reservoirs can negatively effect crappie populations especially if the water fluctuations occur during spawning.
- Habitat degradation - the natural decomposition of flooded timber and woody debris is lessening the available cover for crappie. Also, siltation covers root wads left in the bottom of an impoundment, which eliminates useable crappie cover.
- Habitat loss/degradation due to a variety of circumstances.
- Residential development around lake shorelines. Degradation of aquatic plants and wetlands around lake shorelines.
- Commercial and or residential development.
- Habitat fragmentation.
- Agricultural practices.
- Urban development.
- Competition with non-native species for habitat. Need a quality place to live that is not in competition with round goby.
- Identification of habitat along Indiana's near-shore area.
- Habitat degradation.
- Successional change.
- Water quality degradation that leads to cloudy water is the key threat.
- Emergent bulrush and wetland habitat loss. It has been well documented in northern states that northern pike prefer flooded vegetation for spawning during the spring. Loss of this habitat from boating and wildlife (waterfowl and muskrat feeding) may reduce reproductive habitat for northern pike in some natural lakes.
- Bulkhead seawall development reduces emergent vegetation used by northern pike for reproduction and for cover during feeding.
- Shoreline and labeled alterations.

Appendix E-2: Aggregated Aquatic Systems

- Habitat loss & degradation.
- Stream channelization removing nesting sites and destroying brood habitat. Soil runoff caused by poor agricultural practices and urban development.
- Channelization removes and/or changes the vegetative and invertebrate communities. Channelization also alters the natural water flow which results in a much degraded habitat.
- The loss of bottomland hardwoods continues to be a threat. These areas provide a high quality food source and nesting sites for woodies.
- Drainage Practices.
- Stream channelization.
- The participant is forced to speculate about the meaning of successional and climate change. Agriculture/Forestry practices have different effects. Grouping these practices as a single category does not appropriately represent the individual practice. Point and non-point pollution may have a positive or negative impact.
- Sedimentation and dams fragmenting habitat.
- Invasive species competition, specifically round goby interactions. Stream channelization resulting in loss of habitat.
- Invasive species, non-point source pollution
- Sedimentation and loss of habitat due to development in headwater areas
- Habitat degradation and non-point source pollution
- Non-point source pollution- sedimentation and agricultural practices- again sedimentation.
- Loss of riparian corridor and runoff.
- The channelization of many streams in the upper Kankakee watershed and the associated fragmentation of wetland habitat has severely altered the state of the aquatic habitat in general.
- Non-point source pollution (sedimentation resulting in smothering of substrates and turbidity).
- Habitat degradation (removal of vegetation and shallow water).
- Stream channelization (straightening the channels to move water faster) and Habitat degradation (removal of debris in the stream to speed up the transfer of water off of the land and into the receiving stream).
- Habitat degradation, stream channelization-cause temporary loss of habitat and impact the mussels directly by killing them or taking them out of the habitat
- Non-point source pollution (sedimentation resulting in smothering of substrates and turbidity).
- Habitat degradation (removal of vegetation and shallow water).
- Stream channelization (straightening the channels to move water faster) and Habitat degradation (removal of debris in the stream to speed up the transfer of water off of the land and into the receiving stream).
- Runoff, mostly agricultural.
- Channelization.

Appendix E-2: Aggregated Aquatic Systems

- Top two threats from the list up above are habitat degradation and stream channelization
- Non-point source pollution in the form of sedimentation.
- Destruction of clear shaded waters by forestry/agricultural practices or stream channelization.
- Habitat degradation of streams.
- Instream modifications, runoff, both agricultural and residential, agricultural runoff.
- Impoundment.
- Any significant sedimentation into the stream can become a major threat.
Any toxins or pollutants are a critical threat.
- Any channelization which reduces the shallow (less than 1.5 feet) sand/gravel substrate can critically reduce or fragment habitat.
- Habitat degradation - sedimentation, channelization, cover removal, riparian removal.
- Point source pollution - waste water treatment plants and confined feeding operations.
- Any practices that create more erosion/sediment deposition and eliminates instream cover is a serious threat.
Therefore, I'd have to say nonpoint source pollution and habitat degradation are the most serious threats.
- Habitat degradation and stream channelization because this will directly affect the sediment transfer within the stream and microhabitat of the Eastern Sand Darter.
- Breeding and feeding/foraging habitat loss due to sedimentation from farm fields and stream banks as well as the removal of natural riparian vegetation especially thru drainage maintenance activities.
- Habitat degradation by sedimentation, channelization, cover removal, riparian removal.
- Point source pollution - these eco-regions have major threats from large cities causing fish kills from waste water treatment plans. Also, confined feeding operations in the rural areas are a major threat to the stream fish communities.
- Impoundment, in-stream modifications.
- Dredging (mining, COE).
- Impoundment.
- Stream channelization.
- Non-point source pollution.
- Loss of high quality riffles and outside bend deep fast runs, loss of riparian zone and siltation.
- Habitat degradation in terms of removal of substrate for spawning and sedimentation for covering the substrate needed to spawn.
- Channelization.
- Drain/cut off oxbow ponds.
- Trample sandbars or remove other nesting areas along banks.
- Habitat loss through channelization and draining of oxbow ponds and elimination of flows that create point bars on rivers.

Appendix E-2: Aggregated Aquatic Systems

- Rowcrop practices: crushing nests during ground insect/weed control; crushing overwinter hatchlings during harvest & early spring plowing
- Pollutants and toxins are major threats.

Habitat degradation may be a factor, since there are large expanses in the Wabash and East Fork White River where relic valves are common, but the living species is absent.

- Habitat degradation and stream channelization as development continues in the Ohio River Drainage Habitat.

Total Respondents

56

Appendix E-2: Aggregated Aquatic Systems

13.	What current monitoring efforts by state agencies are you aware of for ALL wildlife in all Aquatic Systems Habitats in Indiana?	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
	Statewide year-round monitoring conducted by state agencies	11% (7)	89% (57)	64
	Statewide once a year monitoring conducted by state agencies	8% (5)	92% (57)	62
	Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	13% (8)	87% (53)	61
	Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	28% (17)	72% (43)	60
	Regional or local year-round monitoring conducted by state agencies	8% (5)	92% (58)	63
	Regional or local once a year monitoring conducted by state agencies	23% (13)	79% (48)	61
	Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	45% (28)	55% (34)	62
	Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	70% (43)	30% (18)	61
			Total Respondents	494

Appendix E-2: Aggregated Aquatic Systems

14. What current monitoring efforts by other organizations are you aware of for ALL wildlife in all Aquatic Systems Habitats in Indiana?			
	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	2% (1)	98% (62)	63
Statewide once a year monitoring conducted by other organizations	8% (5)	92% (59)	64
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (62)	62
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	2% (1)	98% (61)	62
Regional or local year-round monitoring conducted by other organizations	8% (5)	94% (58)	63
Regional or local once a year monitoring conducted by other organizations	23% (14)	79% (49)	63
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	18% (11)	84% (52)	63
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	32% (20)	68% (42)	62
		Total Respondents	502

15. How crucial are these monitoring efforts by state agencies for the conservation of ALL wildlife in all Aquatic Systems Habitats in Indiana?						
	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	11% (7)	3% (2)	11% (7)	53% (34)	22% (14)	64
Statewide once a year monitoring conducted by state agencies	10% (6)	3% (2)	11% (7)	51% (31)	25% (15)	61
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	7% (4)	13% (8)	18% (11)	36% (22)	26% (16)	61
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	3% (2)	16% (10)	10% (6)	44% (27)	26% (16)	61
Regional or local year-round monitoring conducted by state agencies	3% (2)	13% (8)	13% (8)	45% (28)	26% (16)	62
Regional or local once a year monitoring conducted by state agencies	1% (6)	22% (13)	22% (13)	23% (14)	23% (14)	60
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	18% (11)	34% (21)	19% (12)	15% (9)	15% (9)	62
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	26% (16)	24% (15)	13% (8)	15% (9)	23% (14)	62

Appendix E-2: Aggregated Aquatic Systems

monitoring conducted by state agencies

Total Respondents 493

16. How crucial are these monitoring efforts by other organizations for the conservation of ALL wildlife in all Aquatic Systems Habitats in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	3% (2)	5% (3)	11% (7)	47% (29)	34% (21)	62
Statewide once a year monitoring conducted by other organizations	6% (4)	2% (1)	15% (9)	44% (27)	34% (21)	62
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	3% (2)	5% (3)	13% (8)	44% (27)	34% (21)	61
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	3% (2)	3% (2)	13% (8)	47% (28)	33% (20)	60
Regional or local year-round monitoring conducted by other organizations	2% (1)	7% (4)	13% (8)	44% (27)	34% (21)	61
Regional or local once a year monitoring conducted by other organizations	8% (5)	8% (5)	19% (12)	37% (23)	27% (17)	62
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	5% (3)	11% (7)	15% (9)	36% (22)	33% (20)	61
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	7% (4)	11% (7)	20% (12)	31% (19)	31% (19)	61
				Total Respondents		490

Appendix E-2: Aggregated Aquatic Systems

17. Regional or local state agency monitoring for ALL wildlife in all Aquatic Systems Habitats in Indiana.

- State and county highway dept. monitor beaver activity only as flooding of roadways occur. IDNR property monitor and attempt to eliminate problems associated with flooding of adjacent private property. State Furbearer Biologist tracks and monitors trapping harvest data.
- IDNR personnel monitor otter mortality (road-kills, trap-related, etc.) at a statewide level. Also, IDNR personnel conduct winter bridge/stream surveys for otter sign. These are conducted on a county basis at a statewide level.
- Breeding Bird Atlas statewide every 20 years.
- Patoka Lake
Hovey Lake
Dogwood Lake
Lake Sullivan
Many other lakes
- IDNR - Division of Fish and Wildlife
- Many impoundments throughout the state have general fisheries survey conducted on them and crappie are caught during these.
- Fish and Wildlife properties in northern Indiana
- Tri-County Fish and Wildlife Area, Division of Fish and Wildlife.
- Lake Michigan proper out of Michigan City.
- Spring assessment out of Michigan City. Fall spawning assessment, Indiana waters of Lake Michigan. 9 month creel survey for harvest information. These efforts are conducted by the IDNR-Fish and Wildlife division.
- Division of Fish and Wildlife at cisco lakes.
- Department of Environmental Management water quality monitoring.
- NE Indiana by DFW (Jed Pearson).
- Northern Pike are monitored via general fish surveys conducted to update lake status. There is now monitoring of northern pike on a general schedule.
- There was a tracking study conducted in two Indiana natural lakes in the late 1990's by the IDNR to better understand reproductive habitat of northern pike.
- Division of Fish and Wildlife standardized largemouth bass sampling protocol.
- Tournament fishing monitoring by the Division of Fish and Wildlife.
- None.
- Patoka River watershed.
- State monitoring- banding and nest box surveys.
- Several Fish & Wildlife Areas across the state perform annual wood duck banding. These properties include Hovey Lake FWA, Glendale FWA, Minnihaha FWA, Willow Slough FWA, Jasper-Pulaski FWA, LaSalle FWA, Pigeon River FWA, Tri-County FWA, and there may be others.
Many of these properties also conduct nest box monitoring activities on an annual basis.

Appendix E-2: Aggregated Aquatic Systems

Additionally, Indiana participates in the Harvest Information Program which can provide information about migration, population index and/or trends, as well as information about the amount of hunting pressure.

- Hovey Lake
Tri-county
Jasper Pulaski
Pigeon River
Winimac
Willow Slough
LaSalle
- IDEM annual eco-region sampling.
- IDNR-Fish and Wildlife, Lake Michigan Fisheries office.
- Headwater streams surveys were conducted in 2001 through 2004 by IDNR-Fish and Wildlife, Lake Michigan Fisheries Office.
- IDEM eco-region sampling.
- IDNR periodically conducts fish stream surveys. IDEM conducts stream health surveys using fish and invertebrates.
- IDEM monitors the Great Lakes Drainage once every five years; thus, they may have data available for hornyhead chub captured in the basin as part of the fish community assessments. IDNR may also sample fish communities in this area and have data on the hornyhead chub.
- Maumee system.
- DNR fishery surveys are occasionally conducted on the Iroquois River, the Yellow River, and the Kankakee River. IDEM occasionally samples fish for contaminants analysis for the annual Fish Consumption Advisory.
- IDEM and IDNR collect fish community samples in this area; thus, they may have data on the distribution of Least darters.
- IDEM monitors the Kankakee River basin once every five years to determine if the stream are supporting a well-balanced warmwater aquatic community. Tadpole madtoms may have been captured while sampling headwater streams.
- Random locations within the Kankakee drainage.
- IDEM and IDNR collect fish community samples in this area; thus, they may have data on the distribution of Least darters.
- IDNR non-game biologist does mussel surveys. But, he is only one person and there are thousands of miles of streams in state.
- Wabash system.
- IDEM and the DNR Nongame program also conduct monitoring during the field season, once a year for fish. These above fish surveys are not specific to the Orangethroat Darter, but would include the Orangethroat Darter.; IDEM and the DNR Nongame program also conduct fish monitoring during the field season. These above fish surveys are not specific to the Orangethroat Darter, but would include the Orangethroat Darter.
- IDEM monitors the health of major river basins every 5 years by looking at chemical, physical, and biological data collected at random locations within the watershed. Southern redbelly dace have been captured in the Ohio River Drainage Habitat; however, specific monitoring for the species has not occurred to my knowledge by anyone state or other organization.

Appendix E-2: Aggregated Aquatic Systems

- IDNR Fish & Wildlife Division.
- Wabash system.
- Tippecanoe River, Maumee system.
- Periodic (usually annual) monitoring in the Tippecanoe River by IDNR.
- Blue River (Harrison County)
Sugar Creek (Shelby County)
Indian Creek (Greene County)
- IN early to mid 1990's, Division of Fish and Wildlife conducted fish community inventories on the major streams throughout the state.
- Game fish population estimates (including rock bass) have been conducted on 5 streams every other year from 1998 through 2004.
- Various streams throughout the region, some are sampled more regularly than others IDEM probabilistic sampling.
- Indiana DNR Special Studies on T&E species- IDNR, Brant Fisher, did a study on the population of Eastern Sand Darters in Indiana over the past five years. IDNR- regional fish collection surveys may have collected some specimens of the Eastern Sand Darter. Indiana Department of Environmental Management (IDEM) occasionally collected Eastern Sand Darters as part of their Surface Water Quality Monitoring Strategy evaluating fish community structure in certain watersheds every 5 years.
- See IDEM OWO's Surface Water Quality Monitoring Strategy and project work plans and IDNR Fisheries Section Work Plans.
- Blue River (Harrison County).
- In early to mid 1990's the Division of Fish and Wildlife conducted a smallmouth bass inventory.
- 5 streams have been sampled every other year from 1998 to 2004 to estimate smallmouth bass populations to determine the effect of smallmouth bass population changes due to the imposition of a 12-inch black bass size limit in 1998.
- Ohio River, Wabash system.
- Ohio River, Wabash.
- Wabash River
West Fork White River
East Fork White River
Ohio River
- Ohio, White and Wabash rivers.
- Occasional stream surveys.
- INDFW, 1999 Wabash River, 2003 East Fork White River, 2004 West Fork White River, 2004 Main Stem White River, 1993 Patoka River, 2004 Ohio River Cannelton Pool, annual commercial fish harvest monitoring.
- Ohio River, Newburgh and McApline Tailwater fall/winter annual monitoring, occasional stream surveys
- IDNR I believe has conducted special studies on some wildlife species IDEM has record of some wildlife species being caught in that area.
- I'm unaware of any. Perhaps some occur coincident with large fish survey.

Appendix E-2: Aggregated Aquatic Systems

- Ask Zack Walker, I believe there was an accidental capture near Shoals.
- IDNR non-game biologist continually monitors fishes and mussels throughout the state, including Yellow Sandshell habitat. Two surveys have been done- ten years apart, completed last year - by IDNR biologists in the Wabash, Tippecanoe, and East Fork White Rivers; results are pending. This is in prime Yellow Sandshell habitat.
- Blue River (Harrison County)
East Fork White River
West Fork White River

Total Respondents

60

Appendix E-2: Aggregated Aquatic Systems

18. Regional or local monitoring by other organizations for ALL wildlife in all Aquatic Systems Habitats in Indiana.

- Brodman, Saint Joseph's College.
- Cortwright, IUN.
- None that I am aware of.
- Federal Breeding Bird Survey, state May Day counts, Summer Bird Counts.
- None.
- None known.
- Not aware of any.
- F&W properties in northern Indiana, natural lakes, nature preserves.
- Unknown.
- Out of Michgian City and near Gary by Ball State University.
- USFWS and Illinois natural history survey egg and fry assessments at the Port of Indiana. This is part of a Fish and Wildlife Restoration Grant.
- Newton, Jasper, Pulaski, Starke, Lake & Porter Counties.
- Muskatatuck NWR also perform wood duck banding operations.
- Muscatatuck NWR.
- City of Elkhart-Elkhart & St. Joseph counties.
- In some cities stream health is also assessed by fish and invertebrate surveys.
- Elkhart Public Works and Utilities has a fisheries biologist on staff that actively collects fish community samples from the Great Lakes Basin (1-2 times in the summer). He may have data on the hornyhead chub as well.
- Maumee system.
- None.
- Commonwealth Biomonitoring frequently does habitat evaluations in small streams as part of watershed studies. If I happen to see a shell, I make a note of it in field notes. These are NOT official mussel surveys.
- Wabash system.
- The Hoosier National Forest conducts yearly fish surveys within two or more 5th level HUCs that encompass the Hoosier National Forest, which includes the Ohio River Drainage, Eastern Corn Belt/Interior Plateau Ecoregions. These above fish surveys are not specific to the Orangethroat Darter, but would include the Orangethroat Darter; The Hoosier National Forest conducts yearly fish surveys within two or more 5th level HUCs that encompass the Hoosier National Forest, which includes the Ohio River Drainage, Eastern Corn Belt/Interior Plateau Ecoregions. These above fish surveys are not specific to the Orangethroat Darter, but would include the Orangethroat Darter.
- Wabash system.
- Tippecanoe River, Maumee system.

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- Uncertain.
- None known to occur that specifically target rock bass.
- West Fork White River & tributaries(Muncie area).
- Ball State University fish sampling.
- While collecting fish community samples to evaluate the community structure and ability of the stream to support a healthy fish community, these organizations may have collected Eastern Sand Darters: Soil and Water Conservation Districts within those Ecoregions, Purdue University, Wildcat Creek Watershed Alliance? I would check with the Scientific Collectors Permit office for a list of organizations collecting in those ecoregions and also check with the IDEM Section 319 webpage for project summaries where fish or habitat in those ecoregions were studied.
- US Environmental Protection Agency; USGS Water Resources Division; Ohio River Valley Water Sanitation Commission; Midwest Biodiversity Institute, US Army Corps of Engineers; Muncie Bureau of Water Quality; City of Elkhart Water Quality; various universities; various consulting firms.
- None known to occur that specifically target smallmouth bass.
- Ohio River.
- Ohio River, Wabash.
- Ohio, White and Wabash rivers.
- I'm unaware of any.
- None.

Total Respondents

35

Appendix E-2: Aggregated Aquatic Systems

19. Please list organizations that are monitoring ALL wildlife in all Aquatic Systems Habitats in Indiana.

- Brodman, Saint Joseph's College.
- Cortwright, IUN.
- IDNR.
- USGS (Breeding Bird Survey) and volunteers with Indiana Audubon Society.
- DNR/DFW.
- None known.
- Not known.
- Audubon Society, Ducks Unlimited, Indiana Division of Fish and Wildlife.
- Unknown.
- BBS.
- IDNR-Fish and Wildlife, Ball State University, University of Michigan through a coastal program grant. USFWS
- Indiana DNR, Division of Fish and Wildlife. Illinois Natural History Survey, USFWS.
- Bass fishing clubs who hold tournaments on Lake Wawasee and Syracuse Lake.
- Robert Brodman, Saint Joseph's College.
- DNR/DFW.
- IDNR.
- USFW.
- USFWS.
- Indiana Division of Fish and Wildlife. Population monitoring efforts at the state, regional and local scales are to monitor annual trends. Monitoring programs are not limited to river and stream habitats for mink.
- City of Elkhart - Elkhart and St. Joseph counties.
- IDNR-Fish and Wildlife.
- IDNR, IDEM, City of Elkhart and South Bend.
- TNC.
- DNR and IDEM.
- None.
- None than I know of. Most mussel surveys are on bigger rivers. I was contacted by a college prof. interested in taking a class out to a small stream to learn about mussels. I discouraged him from doing so unless he followed DNR regulations concerning collectors' permits. I haven't heard any more from him.
- Consultants, perhaps TNC.

Appendix E-2: Aggregated Aquatic Systems

- USDA Forest Service, Hoosier National Forest; USDI Fish and Wildlife Service; IDEM; IDNR; USDA Forest Service, Hoosier National Forest; USDI Fish and Wildlife Service; IDEM; IDNR.
- Consultant.
- TNC.
- TNC, USFWS.
- Uncertain.
- DNR/DFW.
- None known that specifically target rock bass.
- Muncie Bureau of Water Quality.
- DNR/DFW.
- None known that are specifically targeting smallmouth bass.
- USFWS.
- USFWS.
- Consultants.
- DNR/DFW.
- Electric utilities, Ball State University, Purdue University.
- None.
- IDEM monitors fish communities not particular species; however, the Slough darter has been captured by electrofishing in the Ohio River Drainage Habitat.
- DNR/DFW.

Total Respondents

40

Appendix E-2: Aggregated Aquatic Systems

20. What are the current monitoring techniques for ALL wildlife in all Aquatic Systems Habitats in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	7% (4)	52% (29)	5% (3)	20% (11)	16% (9)	56
Modeling	5% (3)	17% (10)	26% (15)	22% (13)	5% (3)	24% (14)	58
Coverboard routes	0% (0)	5% (2)	5% (2)	11% (4)	3% (1)	76% (28)	37
Spot mapping	5% (2)	20% (8)	25% (10)	0% (0)	3% (1)	48% (19)	40
Driving a survey route	13% (5)	5% (2)	8% (3)	23% (9)	10% (4)	41% (16)	39
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	27% (14)	15% (8)	6% (3)	29% (15)	8% (4)	15% (8)	52
Mark and recapture	17% (10)	34% (20)	27% (16)	2% (1)	5% (3)	15% (9)	59
Professional survey/census	51% (31)	38% (23)	5% (3)	0% (0)	0% (0)	7% (4)	61
Volunteer survey/census	2% (1)	37% (17)	24% (11)	2% (1)	2% (1)	33% (15)	46
Trapping (by any technique)	32% (15)	13% (6)	15% (7)	4% (2)	4% (2)	32% (15)	47
Representative sites	31% (16)	40% (21)	12% (6)	0% (0)	0% (0)	17% (9)	52
Probabilistic sites	19% (9)	17% (8)	32% (15)	0% (0)	0% (0)	32% (15)	47
Other (please specify below)	19% (4)	0% (0)	0% (0)	0% (0)	0% (0)	81% (17)	21
						Total Respondents	615

Appendix E-2: Aggregated Aquatic Systems

21. Other monitoring techniques for ALL wildlife in all Aquatic Systems Habitats in Indiana.

- Techniques currently in use in Indiana appear to be covered by the selections above.
- Unknown.
- Aerial surveys.
- Long term monitoring through gillnets, trawling has been conducted at 3 sites along the lake michigan lakefront since the mid 70's by Ball State University during the summer season. Creel census has been conducted by IDNR-Fish and Wildlife division for approximately 20 years. Commercial monitoring was conducted until the halt of the commercial fishing industry in 1996.
- Nest box survey.
- Nest box surveys.
- Electro-fishing and seining are appropriate methods for monitoring the Orangethroat darter.; Electro-fishing and seining are appropriate methods for monitoring the Orangethroat darter.; Electro-fishing and seining are appropriate monitoring techniques for the Orangethroat Darter.
- Unintentional take could be monitored from fish kill cadaver counts if the officers could be trained to identify norther hog suckers instead of not counting them or just lumping them into the generic class of "round bodied suckers"
- Larval sampling to check for reproduction.

Total Respondents

9

Appendix E-2: Aggregated Aquatic Systems

22. What one or two monitoring techniques would you recommend for effective conservation of ALL wildlife in all Aquatic Systems Habitats in Indiana?

- Aquatic surveys and minnow traps.
- Regulated trapping.
- Stream surveys for otter sign.
- Reporting (number, location, etc.) of unintentional take and biological data obtained from recovered specimens (reproductive parameters).

REFERENCE: Melquist, W.E., P.J. Polechla, Jr., and D. Toweill. 2003. River Otter. Pages 708-734 in *Wild Mammals of North America: biology, management, and conservation*. 2nd edition. G.A. Feldhamer, B.C. Thompson, and J.A. Chapman (eds.), John Hopkins University Press, Baltimore, MD, 1216 pages.

- Directed surveys (canoe surveys, migration counts) most intensive.
- General breeding bird surveys less intensive.
- Electrofishing survey.
- Trap netting survey.
- Gill netting surveys.
- Angler creel surveys.
- Population estimates.
- Reporting from harvest(angler creel surveys) - This survey will show angler exploitation.
- Professional survey (fish management surveys) - This survey will show size structure, relative abundance, and provide age and growth information.
- Professional surveys or counts on F&W areas during migration periods (tracks annual migration trends and is index to population levels). Harvest surveys on F&W areas (tracks annual numbers taken) "Wildlife Investigational Techniques" by The Wildlife Society.
- Mark/Recapture-Banding (intensive), Ducks, Geese & Swans of North America, Frank C. Bellrose.
- Harvest data collection (less intensive) Wildlife Management Vol 2, Reuben Edwin Trippensee.
- Banding.
- Brood surveys.
- Fall trawl sampling for young of the year production. Possible incorporation of hydroacoustic models for the near shore area.
- I would like to see all the lake trout stocked in Lake Michigan to be coded wire tagged. That will allow for better understanding of survival after stocking and movement of the fish. It will also allow for better understanding of spawning site fidelity.
- Occasional gill-netting to verify presence followed by intensive netting to confirm low levels or absence.
- Large fyke-nets are used in Lake Webster (Kosciusko Co.) to collect brood stock for muskellunge. These nets would be useful in capturing northern pike as well. This would allow biologist to capture enough fish to get a representative sample of adult fish. There is still no effective method of sampling young esocids without mortality.
- Springtime dc electrofishing according to DFW standard protocol.

Appendix E-2: Aggregated Aquatic Systems

- Standard DFW creel survey procedures.
- Tournament monitoring by the DFW and bass clubs.
- Minnow trapping and either mark recapture or telemetry.
- Electrofishing.
- Trap nets.
- Brood surveys.
- Continued participation in HIP is perhaps the most cost effective method for monitoring the flyway population.
- Banding operations help in determining the status of populations on a local or statewide level.
- Brood counts.
- Increased banding efforts.
- Radio telemetry or mark & recapture.
- Stream sampling using electrofishing techniques and seining. This should be done every 5 years to get a clear picture of changes that occur to habitat, water quality and invasive species introductions and distribution.
- Rotational sampling at reference sites along the headwaters. Historical comparisons from the early 80's will be compared with the sampling that was completed 2001-2004.
- Professional Fish Surveys and Creel Surveys.
- IDEM, IDNR, and Elkhart use electrofishing equipment to sample fish communities; however, a seine could probably be used as well as tagging and radio telemetry to track the species movement.
- Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.
- Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of some the clubshell. See same for protocols.
- Periodic electrofishing surveys and mark recapture techniques probably provide the best information about the pike populations.
- Representative sites or look for sites where the habitat is suitable for the least darter and seine in the vegetation over rocky substrate.
- Seining or kick net.
- Electrofishing.
- Professional surveys using timed searches, systematic sampling (Strayer and Smith 2003)-A guide to sampling freshwater mussel populations. American Fisheries Society Monograph 8. American Fisheries Society. Bethesda, Maryland. 103 pp.
- Representative sites or look for sites where the habitat is suitable for the least darter and seine in the vegetation over rocky substrate.
- Seining or kick net.
- Electrofishing.

Appendix E-2: Aggregated Aquatic Systems

- Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.
- Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of some wildlife species. See same for protocols.
- Electro-fishing streams. Take a random sampling of streams within a watershed (5th or 6th level HUC) and standardize the stream reach length for the survey...usually 15 times the stream width. Seining is also an appropriate method for sampling, especially in the riffle habitats.; Electro-fishing streams..take a random sampling of streams within a watershed (5th or 6th level HUC) and standardize the stream reach length for the survey...usually 15 times the stream width. Seining is also an appropriate method for sampling, especially in the riffle habitats.; Electro-fishing can be used to sample stream habitats. I suggest designing a random sample of all streams within a watershed (5th or 6th level HUC). The size of the stream reach sampled would be 15 times the stream width. Seining would also be an appropriate method for sampling.
- Target the habitat with seining equipment or electrofishing.
- Professional Survey.
- Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.
- Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of some wildlife species. See same for protocols.
- Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.
- Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of some wildlife species. See same for protocols.
- State DNR or professional census at representative or probabilistic sites.

Development of trained, select volunteer core to undertake surveys at probabilistic sites, particularly where the species should, or could occur and has not been documented in recent years.
- Stream fish community surveys.
- Rock bass population estimates.
- Electrofishing surveys.
- See where populations of the darter have been captured in the past and then with seines or electrofishing equipment mark and recapture the darter to document habitat characteristics, water quality information, and land use characterization where the darters occur. You will need to target the habitat and not the exact location since the sandbars will probably shift over time. Look on the web for mark and recapture surveys as well as other eastern sand darter publications. I found many by just searching the web for Eastern Sand Darter.
- Electrofishing results from probabilistic and representative sites.
- Electrofishing catch rate data.
- Population estimates.
- Angler creel surveys.
- Stream fish community surveys - To determine smallmouth bass distribution and abundance. There may be a correlation of smallmouth abundance to the species richness to the overall fish community.

Appendix E-2: Aggregated Aquatic Systems

- Smallmouth bass population estimates.
- Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.
- Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of the clubshell. See same for protocols.
- Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.
- Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of the clubshell. See same for protocols.
- Electrofishing swift water habitat.
- Hoop nets.
- Electrofishing river wide.
- Hoop-netting by scientists and commercial fishermen.
- Periodic stream surveys.
- Fall/winter Ohio River tailwater sampling and occasional stream surveys.
- Seining at representative sites.
- Occasional censusing with very large, heavily baited hoop nets left out overnight. Do not set during rising waters. Check within 12 hours.
- Search for nests in June (after determining any adults present at all) methods used in FL and LA for nests, in AR and LA for capturing adults.
- Looking for basking individuals with a spotting scope.
- Perhaps use of fyke nets with big leads, or basking traps to estimate numbers after visual spotting determines presence.
- Systematic monitoring of probabilistic sites (professional).
Use of volunteer census/monitoring.
- Seining or electrofishing representative sites using professionals.
- ELECTROFISHING CATCH RATES.
- POPULATION ESTIMATES.

Appendix E-2: Aggregated Aquatic Systems

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for ALL wildlife in all Aquatic Systems Habitats in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	3% (2)	97% (61)	63
Statewide once a year inventory and assessment conducted by state agencies	2% (1)	98% (62)	63
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	3% (2)	97% (61)	63
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	13% (8)	87% (54)	62
Regional or local year-round inventory and assessment conducted by state agencies	3% (2)	97% (61)	63
Regional or local once a year inventory and assessment conducted by state agencies	10% (6)	90% (57)	63
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	29% (18)	71% (45)	63
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	43% (27)	57% (36)	63
	Total Respondents		503

Appendix E-2: Aggregated Aquatic Systems

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for ALL wildlife in all Aquatic Systems Habitats in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	2% (1)	98% (61)	62
Statewide once a year inventory and assessment conducted by other organizations	2% (1)	98% (61)	62
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	3% (2)	97% (61)	63
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	3% (2)	97% (61)	63
Regional or local year-round inventory and assessment conducted by other organizations	8% (5)	92% (58)	63
Regional or local once a year inventory and assessment conducted by other organizations	15% (9)	85% (53)	62
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	17% (11)	83% (52)	63
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	31% (20)	69% (45)	65
	Total Respondents		503

Appendix E-2: Aggregated Aquatic Systems

25.	How crucial are these HABITAT efforts by state agencies for the conservation of ALL wildlife in all Aquatic Systems Habitats in Indiana?	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
	Statewide annual inventory and assessment conducted by state agencies	3% (2)	5% (3)	11% (7)	43% (26)	38% (23)	61
	Statewide once a year inventory and assessment conducted by state agencies	10% (6)	5% (3)	10% (6)	39% (24)	37% (23)	62
	Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	10% (6)	10% (6)	10% (6)	32% (19)	37% (22)	59
	Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	7% (4)	14% (8)	11% (6)	30% (17)	38% (21)	56
	Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	7% (4)	21% (12)	35% (20)	37% (21)	57
	Regional or local once a year inventory and assessment conducted by state agencies	3% (2)	7% (4)	31% (18)	24% (14)	34% (20)	58
	Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	14% (8)	29% (17)	17% (10)	14% (8)	27% (16)	59
	Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	14% (8)	22% (13)	15% (9)	19% (11)	31% (18)	59
					Total Respondents		471

Appendix E-2: Aggregated Aquatic Systems

27. Regional or local state agency HABITAT inventory and assessment for ALL wildlife in all Aquatic Systems Habitats in Indiana.

- I suspect some state agencies monitor and assess aquatic habitats at a statewide level ... maybe not on an annual basis, but perhaps every few years. No agency comes to mind though that does it. Nonetheless, this is an important component of inventorying otter habitat in Indiana.
- Unknown.
- None.
- None known to occur.
- Not familiar with habitat assessments that occur on impoundments.
- Natural lakes in northern Indiana.
- Unknown.
- Lake Michigan proper along the shoreline in nearshore area less than 30 feet in depth.
- Habitat mapping and shoreline aerial imagery.
- NE IN, DFW, Jed Pearson.
- Recently the IDNR has begun sampling/mapping emergent plant species in some Indiana natural lakes. These plants may be used as reproductive habitat for northern pike.
- Not aware of any.
- None.
- Nearly all of the river and stream habitats in Indiana fall under state and/or federal jurisdiction, so obtaining and maintaining accurate and current information on these habitats is always occurring on a statewide basis.
- Trail Creek, East Branch of Little Calumet river, Reynolds Creek, Salt Creek, West Branch of Little Calumet River, Deep River.
- IDEM ecoregion surveys.
- In all major tributaries of Lake Michigan.
- Like I mentioned in my survey for the Eastern Sand Darter, IDEM, IDNR, and Elkhart use the QHEI (Qualitative Habitat Evaluation Index) to assess habitat in streams.
- Maumee system.
- Habitat evaluations are conducted as part of general stream surveys by DNR biologists. Such surveys have been conducted on the Iroquois River, the Yellow River, and the Kankakee River.
- As I stated in previous surveys, the QHEI would provide a habitat assessment for sites where least darters were collected.
- IDEM conducts a habitat assessment while sampling stream for fish community assessments using the QHEI (Qualitative Habitat Evaluation Index).
- None.
- As I stated in previous surveys, the QHEI would provide a habitat assessment for sites where least darters were collected.

Appendix E-2: Aggregated Aquatic Systems

- IDEM conducts a habitat assessment while sampling stream for fish community assessments using the QHEI (Qualitative Habitat Evaluation Index).
- Wabash system.
- Wabash system.
- Tippecanoe River and Maumee system.
- (Usually species inventories are made, with relevant habitat information)
- Blue River (Harrison County)
Sugar Creek (Shelby County)
Indian Creek (Greene County)
- Indiana Department of Natural Resources - Division of Fish and Wildlife.
- Indiana Department of Environmental Management
- IDEM - statewide QHEI.
- I don't know of any Habitat Inventory or Assessment done specifically for the Eastern Sand Darter in the habitat you list; however, I do know that IDEM as well as IDNR and other organizations use the Qualitative Habitat Evaluation Index to document the habitat quality of the streams sampled for aquatic communities.
- IDEM/OWQ/BSS; IDNR/FWD/FS; ORSANCO.
- Blue River (Harrison County).
- Indiana Dept of Natural Resources - Division of Fish and Wildlife.
- Indiana Department of Environmental Management.
- Ohio River, Wabash system.
- Ohio River, Wabash.
- West Fork White River.
- East Fork White River
Wabash River
- Unknown.
- If any inventory is occurring, it's for water quality or fish contamination.
- I am assuming that the governmental division responsible for water pollution control conducts some sampling regarding organic and heavy metal toxins in the water.
- I'm unclear as to whether there is any survey on silting in or natural changes in river channels
- IDNR primarily monitors mussel species, making habitat notations. No real habit monitors made. However, Indiana Department of Environmental Management, IDNR Division of Water do monitor water quality (as a component of habitat).
- BLUE RIVER (HARRISON COUNTY)

Appendix E-2: Aggregated Aquatic Systems

28. Regional or local HABITAT inventory and assessment by other organizations for ALL wildlife in all Aquatic Systems Habitats in Indiana.

- Brodman, Saint Joseph's College in NW Indiana.
- Cortwright, IUN in Brown County
- Unknown.
- None.
- None known.
- Unknown.
- Lake Michigan proper along the shoreline in nearshore area less than 30 feet in depth.
- Not aware of any.
- Newton, Jasper, Starke, Pulaski, Lake & Porter counties.
- Many local zoning boards, planning commissions and drainage boards also keep and maintain their own records in regard to land use patterns within these habitats.
- City of Elkhart
- St. Joseph River
- Maumee system.
- None.
- We (Commonwealth Biomonitoring) do habitat evaluations on small streams as part of watershed studies. These evaluations are not specific to mussels, but are Ohio EPA QHEI methods.
- Wabash system.
- Two or more 5th level HUC watersheds a year that encompass the Hoosier National Forest are sampled; a random sampling of streams found within these 5th level HUCs occurs.
- Wabash system.
- Tippecanoe River and Maumee system.
- None known.
- Muncie BWQ - WFWR and tributaries in the Muncie area.
- None.
- None known.
- Ohio River.
- Ohio River, Wabash.
- West Fork White River
East Fork White River
Wabash River

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- Unknown.
- USACOE Ohio River.
- USACOE Ohio River.
- If any inventory is occurring, it's for water quality or fish contamination.
- Occasional grants to universities?
- NONE

Total Respondents 31

29. Please list organizations that are monitoring this HABITAT for ALL wildlife in all Aquatic Systems Habitats in Indiana.

- Unknown.
- None.
- None known.
- Indiana Division of Fish and Wildlife.
- Unknown.
- IDNR, USFSW, Ball State, University of Michigan.
- Indiana DNR- Fish and Wildlife division. USFWS/GLFC.
- Not aware of any.
- Robert Brodman, Saint Joseph's College.
- None that I am aware of.
- IDNR
USFWS
USDA
IDEM
USACE
EPA
Local government entities (area plan commissions, zoning boards etc...)
- IDNR-Fish and Wildlife, USFWS
- IDNR-Fish and Wildlife, Lake Michigan Fisheries Office.
- IDNR, IDEM, City of Elkhart and South Bend.
- TNC.
- DNR division of Fish and Wildlife.
- None.
- Consultants, perhaps TNC.

Appendix E-2: Aggregated Aquatic Systems

- IDEM, IDNR, USDA Forest Service, USDI Fish and Wildlife Service.
- IDEM- Qualitative Habitat Evaluations completed at sites where southern redbelly dace may have been captured as part of the fish community sampling program.
- Consultants.
- TNC.
- TNC, USFWS.
- DNR/DFW.
- None known.
- Muncie; Elkhart; USGS/WRD.
- DNR/DFW.
- None known.
- USFWS
- USFWS
- Consultants.
- DNR/DFW.
- Unknown.
- USACOE Ohio River
- USACOE Ohio River
- IDEM performs habitat assessments in this area whoever samples for state water pollution control.
- Fish quality? State board of health??
- IDEM makes assessments of the habitat while doing fish community surveys in the Ohio River Drainage Habitat.
- DNR/DFW

Total Respondents

38

Appendix E-2: Aggregated Aquatic Systems

30.	What are the current HABITAT inventory and/or assessment techniques for ALL wildlife in all Aquatic Systems Habitats in Indiana?							Response Total
	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total	
GIS mapping	7% (4)	32% (19)	27% (16)	8% (5)	2% (1)	25% (15)	60	
Aerial photography and analysis	3% (2)	24% (14)	17% (10)	10% (6)	2% (1)	43% (25)	58	
Systematic sampling	20% (11)	33% (18)	11% (6)	2% (1)	0% (0)	35% (19)	55	
Property tax estimates	2% (1)	0% (0)	0% (0)	19% (9)	10% (5)	69% (33)	48	
State revenue data	0% (0)	0% (0)	0% (0)	19% (9)	11% (5)	70% (33)	47	
Regulatory information	2% (1)	10% (5)	2% (1)	12% (6)	6% (3)	67% (33)	49	
Participation in landuse programs	2% (1)	20% (10)	16% (8)	6% (3)	6% (3)	50% (25)	50	
Modeling	2% (1)	30% (16)	22% (12)	0% (0)	4% (2)	43% (23)	54	
Voluntary landowner reporting	0% (0)	19% (9)	6% (3)	6% (3)	11% (5)	57% (27)	47	
Other (please specify below)	7% (2)	7% (2)	0% (0)	0% (0)	0% (0)	85% (23)	27	
					Total Respondents	495		

Appendix E-2: Aggregated Aquatic Systems

31. Other HABITAT inventory and assessment techniques for ALL wildlife in all Aquatic Systems Habitats in Indiana.

- None
- Unknown
- Bottom mapping of habitat
- IBI, and QHEI for representative sites.
- Qualitative Habitat Evaluation Index(QHEI); REMAP protocols for Northern Forested Streams; stream channel cross-sections and longitudinal profiles; substrate analysis; descriptions of riparian vegetation; water quality parameters are measured using probes and Hydro-labs
- Water quality monitoring
- QHEI
- QHEI
- QHEI.

Total Respondents 9

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of ALL wildlife in all Aquatic Systems Habitats in Indiana?

- Systematic sampling & GIS.
- GIS technology appears to be the most feasible means for inventory and assessment of otter habitat at a statewide scale. I suspect analysis of aerial photos could be useful also, perhaps at a local scale. Unfortunately, I do not have any references.
- Aerial imagery to identify and quantify habitat.
- Systematic sampling would probably be best to determine the abundance of cover that is available, but could be very difficult as most of the habitat is hidden under the surface of the water.
- GIS mapping(electronic data base of current habitat) Aerial photography and analysis (examine changes in habitat)
- "Wildlife Investigational Techniques" by The Wildlife Society.
- G.I.S. (intensive) Wildlife Management Techniques Manual, Fourth Edition, Sanford D. Schemnitz
- Aerial (less intensive) same.
- Spring counts- aerial.
- Lidar mapping would help identify spawning areas within the nearshore zone along Indiana's coastline.
- Digital satellite imagery to conduct bottom contour mapping in nearshore spawning areas.
- Emergent bulrush and wetland monitoring and protection via ecozones.
- Evaluate land and water use practices to reduce in lake and upstream degradation of vegetation and shoreline.

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- Unknown.
 - Suvery (intensive) and GIS (less intensive).
 - GIS mapping.aerial photo. and analysis.
 - Developing and maintaining accurate GIS data sets on the habitat is very important.
 - Spring, summer, fall and winter surveys.
 - GIS mapping and aerial photography.
 - Sampling.
 - Sampling using electrofishing and seining in headwater areas. Completing IBI and QHEI and water quality analysis for these sites.
 - Assessment using the Qualitative Habitat Evaluation Index.
 - Assess riparian corridor and water quality.
 - Systematic sampling of the habitat along the length of the stream to provide baseline data for comparison across time.
 - GIS mapping of restored, fully connected wetland to provide an inventory of available spawning habitat.
 - Don't really think that a habitat inventory of any kind is necessary for creek heelsplitter habitat in the Kankakee drainage.
 - Assess riparian corridor presence.
 - Water quality.
 - Two protocols that I recommend for reference include the following:
Harrelson, C.C., C.L. Rawlins, and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. USDA Forest Service. General Technical Report RM-245.
The above reference offers useful guidance on measuring stream channel cross-sections and substrate within the stream. This information can be used to determine if a stream channel is stable and if the substrate is available within riffle habitats, which are the preferred habitat of the Orangethroat Darter.
Simon, T. P. and P.M. Stewart. 1998. Standard Operating Procedures For Development of Watershed Indicators In REMAP: Northern Lakes and Forest Streams.
The above reference is very useful for developing a watershed level sampling design and includes useful methods for measuring stream channel and stream habitat parameters.
- The Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA is a useful qualitative field method that can be used to prioritize sites within a watershed for stream habitat or water quality improvement.
- Systematic survey & GIS.
 - Assess riparian corridor.
 - Water quality monitoring.
 - CREP, farmer incentives for no-till, riparian corridors, etc.
 - Strictly control instream modifications: mining, snagging, etc.
 - More extensive use of GIS- modeled habitat probabilities.
 - QHEI.

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- QHEI.
- More habitat inventories and assessments.
- QHEI.
- GIS.
- Qualitative Habitat Evaluation Index (QHEI) in conjunction with a stream community survey or sampling specifically for smallmouth bass. This can show which habitat components most strongly correlate with smallmouth bass abundance and or size structure.
- Assess zebra mussel infestations. Contact P. Morrison, USFWS, Parkersburg, WV.
- Zebra mussel assessment. Contact P. Morrison, USFWS, Parkersburg, WV.
- QHEI.
- Recording GIS information.
- Record habitat when the species is collected during a survey.
- GIS mapping and aerial photography and analysis.
- GIS mapping and aerial photography and analysis.
- High resolution aerial photography DURING LOW WATER - digitized for GIS. locate:
 - 1) Deep river holes with woody debris (favored by adults)
 - 2) health/permanence of oxbow ponds
 - 3) nesting habitat
- High resolution aerial photography during low water periods – digitize and use in GIS - re. how lasting are oxbow ponds during droughts.
- Occasional site visits to assess vegetation quality for this herbivorous turtle.
- To look at saturation of potential habitat: with GIS construction of existing potential habitat(based upon known factors)and overlaying the current distribution of the Yellow Sandshell.
- QHEI.

Total Respondents

43

33. What is the current body of science for ALL wildlife in all Aquatic Systems Habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	1	2%
Adequate	23	36%
Inadequate	32	50%
Nonexistent	5	8%
Other (please explain below) Unknown in the larger scale	3	5%
	Total Respondents	64

Appendix E-2: Aggregated Aquatic Systems

- 34.** Please provide a citation (title, author, date, publisher) that would give the best overview of ALL wildlife in all Aquatic Systems Habitats in Indiana, if available. This resource may be used if further detail is needed.

Title = Amphibians and reptiles from 23 counties of Indiana.;

Author = Robert Brodman;

Date = 2003;

Publisher = Proceedings of the Indiana Academy of Science, 112: 43-54.

Title = Ten- to eleven-year population trends of two pond-breeding amphibian species, red-spotted newts and green frogs. In Status & Conservation of Midwestern;

Author = Spencer Cortwright;

Date = 1998;

Publisher = University of Iowa Press, Iowa City

Title = Mammals of Indiana;

Author = Russell E. Mumford/ John Whitaker, Jr.;

Date = 1982;

Publisher = Bloomington Indiana University Press

Title = Indiana River Otter Reintroduction Program, 2000-2001;

Author = Scott A. Johnson;

Date = November 2001;

Publisher = Internal report, Indiana Department of Natural Resources, Bloomington, IN

Title = Restoring river otters in Indiana;

Author = Scott A. Johnson and Kim A. Berkley;

Date = 1999;

Publisher = Wildlife Society Bulletin 27:419-427.

Title = Atlas of Breeding Birds in Indiana

Author = Castrale, J.S., E. Hopkins, C.E. Keller

Date = 1998

Publisher = IDNR

Title = Many in AFS journal of fish management and transactions of AFS
Impoundments Strategic Plan

Author = IDNR - Fish and Wildlife

Date = 1997

Publisher = IDNR - Fish and Wildlife

Title = Ducks, Geese & Swans of North America

Author = Frank C. Bellrose

Date = 1976

Publisher = Stackpole Books

Title = Preliminary Results of 2004 Ball State University Yellow Perch Research in Indiana Waters of Lake Michigan;

Author = Paul Allen and Thomas Lauer;

Date = October 2004;

Publisher = Ball State University

Title = Yellow Perch Research and Management in Lake Michigan, Evaluating Progress in a Cooperative Effort, 1997-2001;

Author = David Clapp and John Dettmers;

Date = November 2004;

Publisher = American Fisheries Society, Fisheries

Title = Lake Trout Restoration Plan;

Date = In progress

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Title = Lake Trout Impediments Document;
Author = Numerous,;
Date = 2003;
Publisher = Lake Trout Task group/LMTC

Title = Cisco population status and management in Indiana
Author = Jed Pearson
Date = 2001
Publisher = Division of Fish and Wildlife

Title = Northern Pike Spawning Habitat Investigations At Two Natural Lake In Indiana
Author = Cwalinski, Tim A.
Date = September 2001
Publisher = Indiana Department of Natural Resources

Title = DFW largemouth bass database
Author = Jed Pearson
Date = unpublished
Publisher = unpublished

Title = Amphibians and reptiles from 23 counties of Indiana.
Author = Robert Brodman
Date = 2003
Publisher = Proceedings of the Indiana Academy of Science, 112: 43-54

Title = Ecology and Management of the Wood Duck
Author = Bellrose and Holm
Date = 1994
Publisher = Stackpole Books

Title = Fisheries Survey of the East Branch of the Little Calumet River Watershed
Author = Neil Ledet
Date = 1978
Publisher = IDNR Fisheries Section

Title = Naiades of Pennsylvania
Author = Ortmann
Date = 1919
Publisher = Carnegie Museum

Title = Fishery, Habitat, and Recreational Use Surveys for the Kankakee River
Author = Price and Robertson
Date = 2005
Publisher = DNR - Division of Fish and Wildlife (in review)

Title = Occurrence and distribution of freshwater mussels in the small streams of Tippecanoe County, Indiana
Author = Myers-Kinzie, M., S. Wentz, & A. Spacie
Date = 2001
Publisher = Proc. Ind. Acad. Sci.

Title = Naiades of Pennsylvania
Author = Ortmann
Date = 1919
Publisher = Carnegie Museum

Title = Amphibians and reptiles from 23 counties of Indiana.
Author = Robert Brodman
Date = 2003
Publisher = Proceedings of the Indiana Academy of Science, 112: 43-54.

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Title = Naiades of Pennsylvania
Author = Ortmann
Date = 1919
Publisher = Carnegie Museum

Title = Federal Recovery Plan
Author = USFWS
Date = 1993
Publisher = USFWS

Title = 'Clubshell'
Author = USFW, Division of Endangered Species
Date = 12/1997
Publisher = Online

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance
Author = Stuart T. Shipman
Date = December 1997
Publisher = DNR fisheries section

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance.
Author = Stuart T. Shipman
Date = December 1997
Publisher = DNR fisheries section

Title = The Fishes of Missouri
Author = William L. Plieger
Date = 1997
Publisher = Missouri Conservation Commission

Title = Handbook of freshwater fishery biology
Author = Kenneth D. Carlander
Date = 1997
Publisher = Iowa University Press

Title = Fishes of Ohio
Author = Milt Troutman
Date = 12/1997
Publisher = OSU Press

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance
Author = Stuart Shipman
Date = December 1997
Publisher = DNR/Fisheries section

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance
Author = Stuart Shipman
Date = December 1997
Publisher = IDNR

Title = Federal Recovery Plan
Author = USFWS
Date = 1991
Publisher = USFWS

Title = Freshwater mussels of Tennessee

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Author = Parmalee & Bogan

Date = 1998

Publisher = U of Tennessee Press

Title = Wabash River Catfish Reports

Author = Rob Columbo

Date = 2002,2003,2004,2005

Publisher = SIU/INDFW

Title = GIS mapping and aerial photography and analysis

Author = ORFMT

Date = annually since 1999

Publisher = ORFMT

Title =

Author = Minton

Date = 2001

Publisher =

Title = (Numerous internet sites, including USF&W)

Author =

Date =

Publisher =

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance

Author = Stuart Shipman

Date = 12/1997

Publisher = DNR/Fisheries section

Appendix E-2: Aggregated Aquatic Systems

- 35.** If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of ALL wildlife in all Aquatic Systems Habitats in Indiana. This resource may also be used if further detail is needed.

Title = Waterfowl & Wetlands an Intergarted review
Author = Theodore A. Bookout
Date = 1979
Publisher = LaCrosse Printing

Title = Yellow Perch Research and Management in Lake Michgian, Evaluating Progress in a Cooperative Effort, 1997-2001
Author = David Clapp and John Dettmers
Date = November 2004
Publisher = American Fisheries Society, Fisheries

Title = Lake Trout Impediments Documents
Author = Numerous,
Date = 2003
Publisher = Lake Trout Task group/LMTC

Title = Largemouth bass size limits at Indiana natural lakes - a 30-year history
Author = Jed Pearson
Date = 2003
Publisher = unpublished

Title = Ducks, Geese and Swans of North America
Author = Bellrose
Date = 1976
Publisher = Stackpole Books

Title = Stream Survey of the East Arm of the Little Calumet River
Author = Edward Braun
Date = 1974
Publisher = IDNR Division of Fish and Wildlife

Title = Freshwater mussels of the Midwest
Author = Cummings & Mayer
Date = 1992
Publisher = INHS

Title = A fishery survey of the Kankakee River in Indiana
Author = Robertson and Ledet
Date = 1981
Publisher = DNR - Division of Fish and Wildlife

Title = Freshwater Mollusca of WI
Author = Baker
Date = 1919
Publisher = WI Geol. Nat. Hist. Surv.

Title = Freshwater mussels of the Midwets
Author = Cummings & Mayer
Date = 1992
Publisher = INHS

Title = Field guide to freshwater mussels of Midwest
Author = Cummings & Mayer
Date = 1992
Publisher = INHS

Appendix E-2: Aggregated Aquatic Systems

Title = Surveys of the fish communities and aquatic habitats in 16 small streams in Indiana from 1996 through 1997.
 Author = Douglas C. Keller
 Date = 1999
 Publisher = IDNR

Title = fishes of Tennessee
 Author = Etnire and Starnes
 Date =
 Publisher =

Title = FW fishes of Canada
 Author = Scott & Crossman
 Date =
 Publisher =

Title = Surveys of the fish communities and aquatic habitats in 16 small streams in Indiana from 1996 through 1997.
 Author = Douglas C. Keller
 Date = 1999
 Publisher = IDNR

Title = Life history and propagation...
 Author = Jones & Neves
 Date = 2002
 Publisher = JNABS

Title = Freshwater mussels of the Midwest
 Author = Cummings & Mayer
 Date = 1992
 Publisher = INHS

Title = numerous INDFW FMR's
 Author = Numerous
 Date = numerous
 Publisher = INDFW

Title = various INDFW FMR's
 Author = various
 Date = various
 Publisher = INDFW

Title = Freshwater Mussels of the Midwest
 Author = Cummings & Mayer
 Date = 1992
 Publisher = Illinois Natural History Survey

36. What is the current HABITAT body of science for ALL wildlife in all Aquatic Systems Habitats in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive		
Adequate	12	20%
Inadequate	34	56%

Appendix E-2: Aggregated Aquatic Systems

Nonexistent		10	16%
	The body of science is better than adequate, it is quite extensive and up to date, but by no means is it complete.		
Other (please explain below)	Unknown on the larger scale	5	8%
	not my expertise - look for historical geography/hydrology		
		Total Respondents	61

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of ALL wildlife in all Aquatic Systems Habitats in Indiana, if available. This resource may be used if further detail is needed.

Title = Mammals of Indiana;
 Author = Russell E. Mumford;
 Date = 1982;
 Publisher = Bloomington Indiana University Press

Title = Soil Survey's of Indiana Counties
 Author = U.S. Dept. of Agriculture, SCS
 Date = 1990
 Publisher = U.S. Dept. of Agriculture

Title = Cisco population status and management in Indiana
 Author = Jed Pearson
 Date = 2001
 Publisher = Division of Fish and Wildlife

Title = Amphibians and reptiles from 23 counties of Indiana.
 Author = Robert Brodman
 Date = 2003
 Publisher = Proceedings of the Indiana Academy of Science, 112: 43-54

Title = Wetlands
 Author = Mitsch & Gosselink
 Date = 1993
 Publisher = Van Nostrand Rheinhold

Title = Fisheries Survey of the East Branch of the Little Calumet River Watershed
 Author = Neil Ledet
 Date = 1978
 Publisher = IDNR Fisheries Section

Title = Naiades of Pennsylvania
 Author = Ortmann
 Date = 1919
 Publisher = Carnegie Museum

Title = Fishery, Habitat, and Recreational Use Surveys for the Kankakee River
 Author = Price and Robertson
 Date = 2005
 Publisher = DNR - Division of Fish and Wildlife (in review)

Title = Naiades of Pennsylvania
 Author = Ortmann
 Date = 1919

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Publisher = Carnegie Museum

Title = Naiades of Pennsylvania

Author = Ortmann

Date = 1919

Publisher = Carnegie Museum

Title = Federal Recovery Plan

Author = USFWS

Date = 1993

Publisher = USFWS

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance.

Author = Stuart T. Shipman

Date = December 1997

Publisher = IDNR

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance

Author = Stuart T. Shipman

Date = 12/1997

Publisher = DNR/Fisheries section

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance

Author = Stuart T. Shipman

Date = December 1997

Publisher = IDNR

Title = Federal Recovery Plan

Author = USFWS

Date = 1991

Publisher = USFWS

Title = Freshwater Mollusca of WI

Author = Baker

Date = 1928

Publisher = WI Geol. Nat. Hist. Surv.

Title = Ohio River Mainstem Study

Author = USACOE

Date = 2000?

Publisher = USACOE

Title = Ohio River Mainstem Study

Author = USACOE

Date = 2000?

Publisher = USACOE

Title = ??? Sugar Creek???

Author = ?

Date = late 1970s/early 1980s

Publisher = PhD thesis IU Bloomington

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- 38.** If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of ALL wildlife in all Aquatic Systems Habitats in Indiana. This resource may also be used if further detail is needed.

Title = Management of Seasonally Flooded Impoundments
Author = Leigh H. Fredrickson, T. Scott Taylor
Date = 1982
Publisher = U.S. Fish and Wildlife Service

Title = Southern Forested Wetlands
Author = Messina & Conner
Date = 1998
Publisher = CRC Press LLC

Title = Stream Survey of the East Arm of the Little Calumet River
Author = Edward Braun
Date = 1974
Publisher = IDNR Division of Fish and Wildlife

Title = Freshwater Mollusca of WI
Author = Baker
Date = 1928
Publisher = WI Geol. Nat. Hist. Survey

Title = A fishery survey of the Kankakee River in Indiana
Author = Robertson and Ledet
Date = 1981
Publisher = DNR - Division of Fish and Wildlife

Title = Freshwater Mollusca of WI
Author = Baker
Date = 1919
Publisher = WI Geol. Nat. Hist. Surv.

Title = Freshwater Mollusca of WI
Author = Baker
Date = 1929
Publisher = WI Geol. Nat. Sci. Surv.

Title = Naiades of Pennsylvania
Author = Ortmann
Date = 1919
Publisher = Carnegie Museum

Title = Surveys of the fish communities and aquatic habitats in 16 small streams in Indiana from 1996 through 1997.
Author = Douglas C. Keller
Date = 1999
Publisher = IDNR

Title = Surveys of the fish communities and aquatic habitats in 16 small streams in Indiana from 1996 through 1997.
Author = Douglas C. Keller
Date = 1999
Publisher = IDNR

Title = Naiades of Pennsylvania
Author = Ortmann
Date = 1919
Publisher = Carnegie Museum

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- Whether genetic stock from northern Arkansas will suffice for re-introduction - or will farmed stock from AR or LA will suffice.

Total Respondents 11

41. What are the HABITAT research needs for ALL wildlife in all Aquatic Systems Habitats in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	6% (4)	24% (15)	17% (11)	37% (23)	16% (10)	63
Distribution and abundance (fragmentation)	14% (9)	16% (10)	33% (21)	16% (10)	14% (9)	6% (4)	63
Threats (land use change/competition, contamination/global warming)	22% (14)	31% (20)	23% (15)	14% (9)	6% (4)	3% (2)	64
Relationship/dependence on specific site conditions	15% (9)	23% (14)	27% (17)	18% (11)	11% (7)	6% (4)	62
Growth and development of individual components of the habitat	11% (7)	10% (6)	38% (23)	16% (10)	15% (9)	10% (6)	61
Other (please specify below)	0% (0)	8% (2)	4% (1)	4% (1)	8% (2)	76% (19)	25
							Total Respondents 338

42. Other HABITAT research needs for ALL wildlife in all Aquatic Systems Habitats in Indiana.

Unknown

Water quality variations and impacts of land us and shoreline alterations

Factors that limit the distribution of sirens in Indiana

Affects of channelization on streambank communities and the affects on adjacent oxbows, bottomland hardwoods and other riparian areas

Effects of roads and stream crossings on the some wildlife species; Is aquatic passage through culverts and other stream crossing structures adequate or are these crossings causing aquatic habitat fragmentation?

Water quality requirements

Same as on previous panel

Total Respondents 7

Appendix E-2: Aggregated Aquatic Systems

43. How well do the following conservation efforts address the threats to ALL wildlife in all Aquatic Systems Habitats in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	27% (16)	53% (31)	5% (3)	7% (4)	8% (5)	59
Population management (hunting, trapping)	20% (12)	31% (18)	2% (1)	39% (23)	8% (5)	59
Population enhancement (captive breeding and release)	2% (1)	8% (5)	2% (1)	83% (49)	5% (3)	59
Reintroduction (restoration)	10% (6)	14% (8)	3% (2)	68% (40)	5% (3)	59
Food plots	2% (1)	7% (4)	3% (2)	72% (42)	16% (9)	58
Threats reduction	7% (4)	25% (15)	5% (3)	46% (27)	17% (10)	59
Native predator control	2% (1)	7% (4)	5% (3)	80% (47)	7% (4)	59
Exotic/invasive species control	0% (0)	15% (9)	22% (13)	35% (21)	28% (17)	60
Regulation of collecting	7% (4)	37% (22)	20% (12)	24% (14)	12% (7)	59
Disease/parasite management	0% (0)	10% (6)	2% (1)	55% (32)	33% (19)	58
Translocation to new geographic range	5% (3)	8% (5)	2% (1)	75% (44)	10% (6)	59
Protection of migration routes	7% (4)	12% (7)	2% (1)	49% (29)	31% (18)	59
Limiting contact with pollutants/contaminants	9% (4)	49% (23)	6% (3)	30% (14)	6% (3)	47
Public education to reduce human disturbance	8% (5)	47% (28)	8% (5)	22% (13)	14% (8)	59
Culling/selective removal	3% (2)	10% (6)	3% (2)	69% (41)	14% (8)	59
Stocking	5% (3)	12% (7)	3% (2)	75% (44)	5% (3)	59
Other (please specify below)	0% (0)	0% (0)	4% (1)	9% (2)	87% (20)	23
				Total Respondents		954

44. Other current conservation practices for ALL wildlife in all Aquatic Systems Habitats in Indiana.

- Unknown
- Regulation of sport harvest. Closure of commercial fishery to allow spawning stock biomass to increase, thus allowing for the production of offspring that can eventually add to the spawning stock biomass.
- Habitat protection if it greatly reduced the turbidity in streams for hornyhead chub feeding and breeding behaviors. Also, exotic/invasive species control would help the hornyhead population. The hornyhead chub is sensitive to pollution so limiting contact with pollutants/contaminants would benefit the species. The hornyhead chub is also a popular bait fish, so regulation of collecting would be beneficial to the species.
- Habitat protection occurs in the form of the Clean Water Act, National Forest Management Act and other state and federal regulations that protect aquatic habitat and aquatic species. These regulations may or may not be enough for the sake of Orangethroat Darter conservation.
- Wildlife species listed as endangered are illegal to take/"collect." People need to be reminded of this.

Total Respondents

5

Appendix E-2: Aggregated Aquatic Systems

45. What one or two specific practices would you recommend for more effective conservation of ALL wildlife in all Aquatic Systems Habitats in Indiana?

- Habitat protection.
- Regulated trapping and nuisance animal control policies.
- Protection of aquatic and riverine habitats is essential. More programs or efforts to restore lost or degraded systems would be beneficial. Educational programs aimed to reduce incidental take would also benefit otters especially where population densities are lower.
- Prevention of stream channelization and other (pollution) habitat factors.
- Limit disturbance in nesting/migration habitat.
- Does not need conserving.
- Habitat protection - Actually, I mean habitat enhancement by adding more woody cover to the old impoundments where the former woody cover has decomposed.
- Habitat protection (without habitat the Mallard won't do well) Population management (makes use of surplus numbers and regulates take) "The Mallard" by John Madson Olin Mathieson Chemical Corporation.
- Habitat Protection (intensive) Reproduction and Protection, Ducks, Geese & Swans of North America, Bellrose Protection of Migrating Routes (intensive) Same
- Hen houses.
- Habitat conservation.
- Buffer zones.
- Completely eliminate commercial fishing. This appears to have reduced the spawning stock to a level that could not maintain a fishery.
- Habitat protection and education to reduce habitat disturbance.
- Assure there is no stocking of predator fish in cisco lakes.
- Greatly limit/mitigate any new development on cisco lakes, particularly addressing runoff from lawns and other water quality issues.
- Work to get any farmlands adjacent to cisco lakes into no-till.
- Implementation of ecozones in undeveloped areas to conserve that vegetation present.
- Implement a catch and release only regulation in lakes with low densities.
- Habitat management and harvest management.
- Habitat protection is the key, but we need to better understand factors that limit siren abundance & distribution.
- To best benefit the Wood Duck, one must first improve the habitat. This particular question seems redundant with #48.
- Therefore refer to my answer in box number 48.
- Habitat protection.

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- Nest boxes.
- See #43. In addition, although not habitat specific, outreach programs are needed to effectively and accurately educate citizens about wildlife (game and non-game), the wildlife conservation model (for game and non-game), and the need for effective mink management programs.
- Protection of migration routes.
- Land use planning and education.
- Habitat protection through land use regulation. Agricultural runoff protection through education and land use planning.
- Habitat protection and Public Education.
- Habitat protection - erosion controls.
- Exotic species - possession of exotic species illegal (must dispose of fish properly and not release back to stream).
- Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.
- Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of some wildlife species. See same for protocols.
- Restoring the connection between the streams and the wetlands that were formerly associated with them to allow pike access to spawning areas. Current water management regimes often rely on pumping to fill restored wetlands, thus, fish passage is still restricted.
- Habitat protection and the possible reintroduction of the least darter into suitable habitats that have been restored.
- Habitat protection.
- Protect habitat by limiting the amount of dredging that occurs in the Kankakee watershed.
- Habitat protection and the possible reintroduction of the least darter into suitable habitats that have been restored.
- Habitat protection.
- The following applies to all mussel species. Educate anglers that it is ILLEGAL to use mussels as fishing bait.
- CREP, other incentives for BMP's.
- Limit instream modifications.
- See Watters, 2000. Proc. 1st FMCS Symposium.
- Restoration of stream channels, restoring or protecting stream channel function so that riffle habitats are enhanced or protected.
- Restoration or enhancement of riparian vegetation to enhance or protect stream channels from runoff or impacts to the channel.
- Maintenance of roads and stream crossings so that stream channel function and aquatic passage are maintained.
- Habitat protection.

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- Habitat protection.
- Eliminate instream modifications, including impoundment.
- Restore riparian corridor.
- See Watters, 2000. Proc. 1st FMCS Symposium.
- Strict enforcement of laws regulating instream modification; incentives to farmers.
- Propagation.
- Protect the shallow sand/gravel habitat from siltation and channelization, and keep the waters free of pollutants and toxins.
- Pollution control.
- Habitat protection or enhancement.
- Rock bass appear to be doing very well with little to no intensive management in streams where there is ample instream cover and good water quality. Therefore, habitat protection and contaminant reduction would be my recommendations.
- I am not sure what you are asking in this question. The best way to conserve the eastern sand darter would be to reduce sedimentation covering the sand substrate which the darter needs to survive and reproduce. Current efforts to reduce sedimentation in streams is somewhat effective, but I'm not sure if it is enough to keep the eastern sand darter from disappearing.
- Declare moratorium on channel/drainage "improvement" projects that do not mitigate losses.
- Pollution control - from waste water treatment plants and confined feeding operations.
- Habitat protection and enhancement.
- Strictly limit instream modifications.
- Remove existing dams wherever possible.
- See Watters, 2000. Proc. 1st FMCS Symposium.
- Limit instream modification.
- Restore free-flowing systems.
- See Watters, 2000. Proc. 1st FMCS Symposium.
- Public education.
- Regulation of collecting.
- Habitat protection/restoration and pollution control.
- Habitat protection and threats reduction.
- Re-stock, as too few if any turtles remain.
- End use of commercial fishing equipment.
- Do periodic local removal of raccoons.

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- Protection of the habitat against pollutants and toxins.
- Expand and liberalize the taking of raccoons so as to greatly reduce numbers associated with river cooter habitat.
- Raccoon reduction used re. sea turtles in FL and endangered Illinois mud turtle in IA, proposed for alligators. in LA
- Cease any future channelization plans and restore existing oxbow ponds - provide landowner financial incentive.
- Local restocking where raccoons reduced should hasten delisting criteria.
- Habitat protection.
- Threats reduction.

Total Respondents

51

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46.	How well do the following conservation efforts address the HABITAT threats to ALL wildlife in all Aquatic Systems Habitats in Indiana?	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
	Habitat protection through regulation	14% (8)	58% (34)	12% (7)	3% (2)	14% (8)	59
	Habitat protection on public lands	20% (12)	53% (31)	5% (3)	12% (7)	10% (6)	59
	Habitat protection incentives (financial)	17% (10)	46% (27)	8% (5)	14% (8)	15% (9)	59
	Habitat restoration through regulation	16% (9)	40% (23)	5% (3)	17% (10)	22% (13)	58
	Habitat restoration on public lands	22% (13)	40% (27)	7% (4)	14% (8)	12% (7)	59
	Habitat restoration incentives (financial)	24% (13)	36% (20)	5% (3)	16% (9)	18% (10)	55
	Artificial habitat creation (artificial reefs, nesting platforms)	3% (2)	29% (17)	7% (4)	46% (27)	15% (9)	59
	Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	5% (3)	3% (2)	68% (41)	23% (14)	60
	Succession control (fire, mowing)	2% (1)	9% (5)	7% (4)	71% (41)	12% (7)	58
	Corridor development/protection	12% (7)	37% (22)	3% (2)	32% (19)	15% (9)	59
	Managing water regimes	14% (8)	41% (24)	2% (1)	17% (10)	27% (16)	59
	Pollution reduction	20% (12)	60% (36)	2% (1)	7% (4)	12% (7)	60
	Protection of adjacent buffer zone	28% (17)	48% (29)	2% (1)	10% (6)	12% (7)	60
	Restrict public access and disturbance	7% (4)	20% (12)	17% (10)	41% (24)	15% (9)	59
	Land use planning	14% (8)	59% (35)	3% (2)	8% (5)	15% (9)	59
	Technical assistance	0% (0)	53% (31)	2% (1)	22% (13)	24% (14)	59
	Cooperative land management agreements (conservation easements)	19% (11)	46% (26)	4% (2)	12% (7)	19% (11)	57
	Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (20)	20
Total Respondents							1,018

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47. Other current HABITAT conservation practices for ALL wildlife in all Aquatic Systems Habitats in Indiana.

- Unknown
- Limiting disturbance through the construction (DOW) permit process.
- Habitat protection and restoration on all lands by any means necessary would benefit all species (except those that are exotic and more tolerant than others) not just the hornyhead chub. Pollution reduction, protection of adjacent buffer zone, land use planning, and conservation easements would all be beneficial practices to the Hornyhead chub.
- I am not aware of any of the above for which I marked "not used."
- Again, I don't know if these practices are working well in Indiana, but the best way to conserve the critical habitat for the eastern sand darter would be habitat protection on all lands through whatever means necessary, habitat restoration of the floodplain would also be critical to the amount of sedimentation reaching the stream bed, managing water regimes may also impact the settling of sediments in stream (thus dam removal may be appropriate), protection of adjacent buffer zone is key to stopping deleterious effects of erosion and sedimentation in the stream, land use planning and conservation easements would also keep the runoff to a minimum.

Total Respondents

5

Appendix E-2: Aggregated Aquatic Systems

48. What one or two specific HABITAT practices would you recommend for more effective conservation of ALL wildlife in all Aquatic Systems Habitats in Indiana?

- Habitat protection.
- Proper land use planning, at a watershed scale, would not only benefit otters but other aquatic and riparian species. Strict enforcement of existing pollution regulations, and if needed, development of stricter laws would be beneficial.
- Water regime management for migration habitat.
- Protection of nesting habitat along streams.
- Improve land use practices in watershed will reduce sedimentation in impoundments and reduce nutrient inputs.
- Reducing nutrient inputs will allow a deeper thermocline which is important for crappie growth. Crappie growth suffers when water temperatures become too high.
- Habitat restoration in the form of woody debris.
- In Army Corps of Engineers impoundments alterations in water level control would likely benefit crappie.
- Habitat protection through regulation (only sure way to protect habitat without public ownership) Purchase more public land.
- Habitat protection through regulation, (less intensive)cover a large geographic area. Ducks, Geese & Swans of North America, Bellrose.
- Habitat Protection through incentives, (intensive), best landowner cooperation, same.
- Landowner programs.
- Buffers.
- Habitat conservation regulations.
- Habitat creation, ie. artificial structures during lake construction projects.
- Pollution reduction and land-use zoning.
- Implementation of ecozones in undeveloped areas to conserve that vegetation present.
- Reduce inlet and upstream degradation. Increase awareness and cooperation of landowners to create better shoreline and tributary habitat.
- Habitat protection and restoration through regulation.
- Habitat protection. However more research is needed to address the effectiveness of habitat restoration on siren conservation.
- Corridor protection.
- Elimination of, or at the very least, reducing, the amount of stream channelization that occurs.
Restoration of bottomland hardwoods through the farmbill and other incentive type programs is also very good.
- Elimination of ditches and stream channelization.
- Protection of habitat through land use planning. Currently most of the headwaters areas run through agricultural

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areas and need to maintain riparian buffer strips.

- Protection and restoration of buffer zones.
- Protection of adjacent buffer zone.
- Non-point Source Pollution reduction.
- Assess riparian corridor and water quality monitoring (see Watters, 2000. Proc. 1st FMCS Symposium).
- Wetland restoration projects with connectivity to the stream or "corridor" development that allows passage to wetlands already restored. We need to move toward natural regulation of water levels instead of artificial means.
- Habitat protection through regulation.
- Protection of adjacent buffer zone.
- Habitat protection.
- Restrict disturbance to habitat (dredging, removal of debris).
- Any type of habitat protection/restoration-eliminate dredging.
- Habitat protection through regulation.
- Protection of adjacent buffer zone.
- Habitat protection.
- Restrict disturbance to habitat (dredging, removal of debris).
- Treat small streams as biological resources and not just drainage ditches. At the very least, require that a mussel survey be done before dredging.
- Promote riparian corridor.
- Limit habitat modifications.
- Streambank stabilization or stream restoration (reconstructing the channel to reconnect it to its natural floodplain elevation).
- Culvert or stream crossing structure improvement (replace non-functioning culverts or other crossing structures and replace with ones that function and are at the right elevation/location within the stream's longitudinal profile).
- Restoration of riparian vegetative communities through tree planting, etc.
- Habitat protection and Protection of adjacent buffer zone.
- Habitat protection.
- CREP and other incentives for BMP's.
- Restrict instream modifications.
- See Watters, 2000. Proc. 1st FMCS Symposium.
- No instream modifications.
- Limit runoff through incentives or other means.

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- See Watters, 2000. Proc. 1st FMCS Symposium.
- Manage pollutants and toxins, maintain available habitat through regulation and buffer zones, increase habitat through incentives, technical assistance and restoration.
- Protection of adjacent buffer zones (riparian corridor).
- Buffer/riparian zone protection - leads to improved water quality and more instream cover.
- Pollution reduction - improved water quality and fewer fish kills.
- Habitat protection.
- Land use planning.
- Protection of adjacent buffer zones (riparian corridor). More participation would likely occur with financial incentives.
- Restrict instream modifications.
- Restore free-flowing systems.
- Eliminate habitat modifications (in-stream dredging, channelization, etc.).
- See Watters, 2000. Proc. 1st FMCS Symposium.
- Buffer strips.
- Bank stabilization.
- Non-point source pollution reduction.
- Riparian conservation easements.
- Restoration of riparian zones, riffle protection/restoration.
- Habitat restoration and protection.
- Encourage return to natural meander channel (within flood control).
- Let dead trees in river stay; perhaps add some.
- Rehabilitate drained oxbow ponds through conservation easement.
- Oxbow pond conservation easements and restoration - prime feeding habitat.
- Enhance natural river channel evolution including point bar development and snags (downed trees in the water) - provides basking sites and nesting.
- Habitat away from row crop agriculture.
- Manage water quality and pollutants.
- Protection of adjacent buffer zones.
- Habitat protection.

Appendix E-2: Aggregated Aquatic Systems

49. Do you have any additional comments or information on ALL wildlife in ALL Aquatic Systems Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?
- Newts have a spotty distribution in Indiana. We need to better understand the factors that lead to this.
 - The IDNR reintroduction program appears to have successfully restored otters in select watersheds throughout the state. Populations are established near release sites, have expanded to adjacent habitats, and colonized areas not originally targeted for restoration. Public interest in this species remains high and the otter can serve as a profile species for wetland and riverine protection.
 - No.
 - No.
 - Kettle Lakes are limited in number, although habitat surrounding them can be manipulated. No new Kettle Lakes can be created so it is critical to provide protection through, regulations, incentives and management.
 - Provide information on habitat creation and farming techniques.
 - Provide incentives to create/maintain such habitat.
 - Much research work has been done on the yellow perch by Ball State University since the mid 1970's. This work serves as the framework for the management of the population in Indiana's waters of Lake Michigan. It is critical that funding for this project continue to maintain the dataset. It is the largest and longest dataset for yellow perch on all of Lake Michigan and has served as the foundation for many management decisions on sport and commercial harvest decisions.
 - We need to learn a lot more about lesser sirens in order to develop a good conservation design.
 - It has been over 20 years since the surveys were conducted, prior to the 2001-2004 surveys. It is important that surveys be conducted every 5 years or so to document changes to water quality, habitat and riparian zone protection.
 - The overall smallmouth bass population in this area is somewhat poor aside from the St. Joseph River. I believe this is mostly due to the lack of habitat and loss of buffer zones. Buffer zones are vital to the health of smallmouth bass populations. They supply and protect habitat that is vital to the survival of the smallmouth bass.
 - IDEM has collected hornyhead chubs from the Elkhart River (Elkhart & Noble counties), St. Joseph River (DeKalb County), Cedar Creek (Allen Co.), Yellow Creek (Elkhart Co.), and Pigeon River (Lagrange Co.). If you would like the data, we can provide water chemistry, biological, and habitat data assessments.
 - N/A
 - IDEM has captured least darters at the following locations: Ringeisen Ditch, Trib of Carpenter Cr, Keefe Ditch, Claude May Ditch, and Howe Ditch in Jasper County, Singleton Ditch in Lake Co., Weiss Ditch in Newton Co., and Minier Lateral in Benton Co.
 - IDEM has collected tadpole madtoms on the following streams: West Creek and Singleton Ditch in Lake County, Dausman Ditch in Kosciusko Co., Bogus Run in Starke Co., and Slough Creek in Jasper Co.
 - IDEM has captured least darters at the following locations: Ringeisen Ditch, Trib of Carpenter Cr, Keefe Ditch, Claude May Ditch, and Howe Ditch in Jasper County, Singleton Ditch in Lake Co., Weiss Ditch in Newton Co., and Minier Lateral in Benton Co.
 - IDEM has collected tadpole madtoms on the following streams: West Creek and Singleton Ditch in Lake County, Dausman Ditch in Kosciusko Co., Bogus Run in Starke Co., and Slough Creek in Jasper Co.
 - N/A
 - IDEM has captured many southern redbelly dace in their random fish sampling program. Most of these

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specimens came from the Whitewater Basin in headwater streams <20 sq. miles with high gradient and high biological integrity.

- Too little is known about some wildlife species, especially Indiana populations.
- N/A
- N/A
- To find out just why the Clubshell depopulated so much of its former range, which once included much of the interior of Indiana. Knowing this "why" should disclose a critical limiting factor, and could lead to its future preservation.
- There is a great potential source for select avocational technical assistance (= volunteers) to undertake monitoring and survey where funding falls short.
- I would definitely search the internet for more information on specific studies done on the Eastern Sand Darter; however, I could not find much on the habitat itself in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage. IDEM has a list of sites of where Eastern Sand Darters have been collected with water chemistry and habitat (QHEI) assessments if interested.
- The length of this survey possibly destroys its usefulness as many/most experts will not have the time and or patience to do this for very many species; some may not even do it at all.
- No.
- N/A
- N/A
- No.
- The blue sucker population is doing well in the Wabash River and parts of the White River. Reintroduction into additional waterbodies is a possible option, but research is needed to determine why the population is healthy in the Wabash/White and not other Great Rivers.
- IDEM has collected spottail darters in Posey Co. on a tribe of Black River and Hawthorne Creek.
- Convince DNR that some restocking will be necessary (only known capture in Indiana in last 50 years died on DNR watch).
- Convince DNR that raccoon population reduction will be critical during early rehab (and important later on - increase recreational harvest).
- Put lower West Fork and Middle East Forks White River off limits to commercial fishing. Forget about Ohio R & lower Wabash (State cannot control).
- As with alligator snapping turtle, persuade DNR to take measures for significant raccoon reduction in/near river cooter habitat. Assuming cooter populations then increase, raccoon control remains desirable but less important. This species is herbivorous and thus not attracted to fish bait. Use of giant nets in oxbow ponds would trap cooters, which might then drown.
- This appears to be a resilient species that is relatively tolerant of some silt; it has expanded beyond rivers and streams and has taken up residence in reservoirs. If we afford it the broad protection (i.e., against pollutants and habitat destruction) that we attempt to give to mussels in general and to other components of our wildlife and environment, it should do well.
- IDEM has captured slough darters on the following streams: Turkey Cr (Clay Co.), Patoka R and N Fk Little Pigeon Cr (Dubois Co.), Patoka R and Yellow Cr as well as Smith Fk Pigeon Cr (Gibson Co.), Bruster Br and Flat Cr (Pike Co.), E Fk Crooked Cr (Spencer Co.), Busseron Cr (Sullivan Co.), and Lost Cr, Otter Cr, N Br Otter Cr in

Appendix E-2: Aggregated Aquatic Systems

Vigo Co.

- No.

Total Respondents

35

Appendix E-3: Aquatic Systems

12. Please briefly describe the top two HABITAT threats to the Wildlife in Aquatic Systems Habitat in Indiana identified above.

Habitat degradation & fragmentation

1. Urban sprawl and regulations that allow loss of habitat. The human/beaver interface usually results with either the habitat being eliminated or the beaver being eradicated.

2. urbanization

Water pollution not only impacts otter reproduction (see previous section), but may also impact the quantity/quality of aquatic prey for otters. Loss of wetland habitats reduces amount of suitable habitat for otters.

Total Respondents 4

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Aquatic Systems Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	50% (2)	50% (2)	4
Statewide once a year monitoring conducted by state agencies	25% (1)	75% (3)	4
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	25% (1)	75% (3)	4
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (4)	4
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (4)	4
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (4)	4
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (4)	4
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (4)	4
		Total Respondents	32

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14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Aquatic Systems Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (4)	4
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (4)	4
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (4)	4
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (4)	4
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (4)	4
Regional or local once a year monitoring conducted by other organizations	25% (1)	75% (3)	4
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	25% (1)	75% (3)	4
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	25% (1)	75% (3)	4
	Total Respondents		32

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Aquatic Systems Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	50% (2)	0% (0)	0% (0)	0% (0)	50% (2)	4
Statewide once a year monitoring conducted by state agencies	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	4
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	4
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Regional or local once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4

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monitoring conducted by state agencies

Total Respondents 32

16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Aquatic Systems Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Regional or local once a year monitoring conducted by other organizations	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	4
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	4
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	25% (1)	0% (0)	75% (3)	4
						Total Respondents 32

17. Regional or local state agency monitoring for the Wildlife in Aquatic Systems Habitat in Indiana.

State and county highway dept. monitor beaver activity only as flooding of roadways occur. IDNR property monitor and attempt to eliminate problems associated with flooding of adjacent private property. State Furbearer Biologist tracks and monitors trapping harvest data.

IDNR personnel monitor otter mortality (road-kills, trap-related, etc.) at a statewide level. Also, IDNR personnel conduct winter bridge/stream surveys for otter sign. These are conducted on a county basis at a statewide level.

Total Respondents 2

18. Regional or local monitoring by other organizations for the Wildlife in Aquatic Systems Habitat in Indiana.

Brodman, Saint Joseph's College
Cortwright, IUN

Appendix E-3: Aquatic Systems

None that I am aware of.

Total Respondents

2

Appendix E-3: Aquatic Systems

19. Please list organizations that are monitoring the Wildlife in Aquatic Systems Habitat in Indiana.

Brodman, Saint Joseph's College
Cortwright, IUN
IDNR

Total Respondents 2

20. What are the current monitoring techniques for the Wildlife in Aquatic Systems Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	50% (2)	25% (1)	0% (0)	25% (1)	4
Modeling	0% (0)	25% (1)	50% (2)	0% (0)	0% (0)	25% (1)	4
Coverboard routes	0% (0)	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3
Spot mapping	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
Driving a survey route	25% (1)	0% (0)	25% (1)	25% (1)	0% (0)	25% (1)	4
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	75% (3)	0% (0)	0% (0)	25% (1)	0% (0)	0% (0)	4
Mark and recapture	0% (0)	0% (0)	75% (3)	0% (0)	0% (0)	25% (1)	4
Professional survey/census	50% (2)	25% (1)	25% (1)	0% (0)	0% (0)	0% (0)	4
Volunteer survey/census	0% (0)	25% (1)	50% (2)	0% (0)	0% (0)	25% (1)	4
Trapping (by any technique)	50% (2)	25% (1)	25% (1)	0% (0)	0% (0)	0% (0)	4
Representative sites	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	33% (1)	3
Probabilistic sites	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	33% (1)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents 45

Appendix E-3: Aquatic Systems

21. Other monitoring techniques for the Wildlife in Aquatic Systems Habitat in Indiana.

Techniques currently in use in Indiana appear to be covered by the selections above.

Total Respondents 1

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Aquatic Systems Habitat in Indiana?

Aquatic surveys and minnow traps

Regulated trapping.

1. Stream surveys for otter sign.
2. Reporting (number, location, etc.) of unintentional take and biological data obtained from recovered specimens (reproductive parameters).

REFERENCE: Melquist, W.E., P.J. Polechla, Jr., and D. Towell. 2003. River Otter. Pages 708-734 in Wild Mammals of North America: biology, management, and conservation. 2nd edition. G.A. Feldhamer, B.C. Thompson, and J.A. Chapman (eds.), John Hopkins University Press, Baltimore, MD, 1216 pages.

Total Respondents 3

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Aquatic Systems Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	25% (1)	75% (3)	4
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
	Total Respondents		32

Appendix E-3: Aquatic Systems

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Aquatic Systems Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Regional or local once a year inventory and assessment conducted by other organizations	25% (1)	75% (3)	4
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	25% (1)	75% (3)	4
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	25% (1)	75% (3)	4
	Total Respondents		32

Appendix E-3: Aquatic Systems

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Aquatic Systems Habitat in Indiana.

1. Brodman, Saint Joseph's College in NW Indiana
Cortwright, IUN in Brown County

Total Respondents **1**

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Aquatic Systems Habitat in Indiana.

See #27.

Total Respondents **1**

30. What are the current HABITAT inventory and/or assessment techniques for the wildlife in Aquatic Systems Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	4
Aerial photography and analysis	0% (0)	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	4
Systematic sampling	25% (1)	0% (0)	0% (0)	0% (0)	0% (0)	75% (3)	4
Property tax estimates	0% (0)	0% (0)	0% (0)	25% (1)	25% (1)	50% (2)	4
State revenue data	0% (0)	0% (0)	0% (0)	25% (1)	25% (1)	50% (2)	4
Regulatory information	0% (0)	0% (0)	0% (0)	25% (1)	0% (0)	75% (3)	4
Participation in landuse programs	0% (0)	0% (0)	25% (1)	25% (1)	0% (0)	50% (2)	4
Modeling	0% (0)	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	4
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	25% (1)	0% (0)	75% (3)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents 37

Appendix E-3: Aquatic Systems

31. Other HABITAT inventory and assessment techniques for the Wildlife in Aquatic Systems Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Aquatic Systems Habitat in Indiana?

Systematic sampling & GIS

GIS technology appears to be the most feasible means for inventory and assessment of otter habitat at a statewide scale. I suspect analysis of aerial photos could be useful also, perhaps at a local scale. Unfortunately, I do not have any references.

Total Respondents 2

33. What is the current body of science for the Wildlife in Aquatic Systems Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		3	75%
Inadequate		1	25%
Nonexistent		0	0%
Other (please explain below)		0	0%
Total Respondents		4	

Appendix E-3: Aquatic Systems

- 34.** Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Aquatic Systems Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Amphibians and reptiles from 23 counties of Indiana.;

Author = Robert Brodman;

Date = 2003;

Publisher = Proceedings of the Indiana Academy of Science, 112: 43-54.

Title = Ten- to eleven-year population trends of two pond-breeding amphibian species, red-spotted newts and green frogs.
In Status & Conservation of Midwestern;

Author = Spencer Cortwright;

Date = 1998;

Publisher = University of Iowa Press, Iowa City

Title = Mammals of Indiana;

Author = Russell E. Mumford/ John Whitaker, Jr.;

Date = 1982;

Publisher = Bloomington Indiana University Press

Title = Indiana River Otter Reintroduction Program, 2000-2001;

Author = Scott A. Johnson;

Date = November 2001;

Publisher = Internal report, Indiana Department of Natural Resources, Bloomington, IN

Title = Restoring river otters in Indiana;

Author = Scott A. Johnson and Kim A. Berkley;



Date = 1999;

Publisher = Wildlife Society Bulletin 27:419-427.

- 35.** If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Aquatic Systems Habitat in Indiana. This resource may also be used if further detail is needed.

Appendix E-3: Aquatic Systems

36. What is the current HABITAT body of science for the Wildlife in Aquatic Systems Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		2	50%
Inadequate		1	25%
Nonexistent		0	0%
Other (please explain below)	Unknown - I suspect it exists, just not of aware of who or where!!	1	25%
Total Respondents		4	

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Aquatic Systems Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Mammals of Indiana;
 Author = Russell E. Mumford;
 Date = 1982;
 Publisher = Bloomington Indiana University Press

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Aquatic Systems Habitat in Indiana. This resource may also be used if further detail is needed.

		Response Total	Response Percent
Title		0	0%
Author		0	0%
Date		0	0%
Publisher		0	0%
Total Respondents		0	

Appendix E-3: Aquatic Systems

39. What are the research needs for the Wildlife in Aquatic Systems Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	25% (1)	25% (1)	25% (1)	25% (1)	4
Distribution and abundance	0% (0)	50% (2)	25% (1)	0% (0)	0% (0)	25% (1)	4
Limiting factors (food, shelter, water, breeding sites)	25% (1)	0% (0)	25% (1)	25% (1)	0% (0)	25% (1)	4
Threats (predators/competition, contamination)	25% (1)	25% (1)	0% (0)	25% (1)	0% (0)	25% (1)	4
Relationship/dependence on specific habitats	25% (1)	0% (0)	25% (1)	25% (1)	0% (0)	25% (1)	4
Population health (genetic and physical)	0% (0)	50% (2)	0% (0)	25% (1)	0% (0)	25% (1)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents
							25

40. Other research needs for the Wildlife in Aquatic Systems Habitat in Indiana.

Relationship(s) between population levels and population indices

Total Respondents **1**

41. What are the HABITAT research needs for the Wildlife in Aquatic Systems Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	0% (0)	25% (1)	25% (1)	25% (1)	25% (1)	4
Distribution and abundance (fragmentation)	25% (1)	0% (0)	25% (1)	25% (1)	0% (0)	25% (1)	4
Threats (land use change/competition, contamination/global warming)	25% (1)	25% (1)	0% (0)	25% (1)	0% (0)	25% (1)	4
Relationship/dependence on specific site conditions	0% (0)	25% (1)	0% (0)	50% (2)	0% (0)	25% (1)	4
Growth and development of individual components of the habitat	0% (0)	25% (1)	0% (0)	25% (1)	25% (1)	25% (1)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents
							21

42. Other HABITAT research needs for the Wildlife in Aquatic Systems Habitat in Indiana.

No responses were entered for this question.

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Total Respondents 0

43. How well do the following conservation efforts address the threats to the Wildlife in Aquatic Systems Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	4
Population management (hunting, trapping)	50% (2)	25% (1)	0% (0)	25% (1)	0% (0)	4
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Reintroduction (restoration)	25% (1)	0% (0)	0% (0)	50% (2)	25% (1)	4
Food plots	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Threats reduction	0% (0)	25% (1)	0% (0)	25% (1)	50% (2)	4
Native predator control	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Exotic/invasive species control	0% (0)	0% (0)	0% (0)	50% (2)	50% (2)	4
Regulation of collecting	0% (0)	25% (1)	0% (0)	25% (1)	50% (2)	4
Disease/parasite management	0% (0)	0% (0)	0% (0)	50% (2)	50% (2)	4
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Protection of migration routes	0% (0)	25% (1)	0% (0)	25% (1)	50% (2)	4
Limiting contact with pollutants/contaminants	0% (0)	50% (2)	0% (0)	25% (1)	25% (1)	4
Public education to reduce human disturbance	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	4
Culling/selective removal	25% (1)	0% (0)	0% (0)	50% (2)	25% (1)	4
Stocking	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
						Total Respondents 66

44. Other current conservation practices for the Wildlife in Aquatic Systems Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Aquatic Systems Habitat in Indiana?

Habitat protection

Regulated trapping and nuisance animal control policies

Protection of aquatic and riverine habitats is essential. More programs or efforts to restore lost or degraded systems would be beneficial. Educational programs aimed to reduce incidental take would also benefit others.

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systems would be beneficial. Educational programs aimed to reduce incidental take would also benefit otters especially where population densities are lower.

Total Respondents 3

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Aquatic Systems Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	75% (3)	0% (0)	0% (0)	25% (1)	4
Habitat protection on public lands	75% (3)	0% (0)	0% (0)	0% (0)	25% (1)	4
Habitat protection incentives (financial)	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	4
Habitat restoration through regulation	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	4
Habitat restoration on public lands	50% (2)	50% (2)	0% (0)	0% (0)	0% (0)	4
Habitat restoration incentives (financial)	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	4
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	0% (0)	0% (0)	50% (2)	50% (2)	4
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	50% (2)	50% (2)	4
Corridor development/protection	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	4
Managing water regimes	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	4
Pollution reduction	0% (0)	75% (3)	0% (0)	0% (0)	25% (1)	4
Protection of adjacent buffer zone	25% (1)	25% (1)	0% (0)	0% (0)	50% (2)	4
Restrict public access and disturbance	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	4
Land use planning	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	4
Technical assistance	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	4
Cooperative land management agreements (conservation easements)	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
						Total Respondents 69

47. Other current HABITAT conservation practices for the Wildlife in Aquatic Systems Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Aquatic Systems Habitat in Indiana?

Habitat protection

Appendix E-3: Aquatic Systems

Proper land use planning, at a watershed scale, would not only benefit otters but other aquatic and riparian species. Strict enforcement of existing pollution regulations, and if needed, development of stricter laws would be beneficial.

Total Respondents **2**

Appendix E-3: Aquatic Systems

- 49.** Do you have any additional comments or information on the Wildlife in Aquatic Systems Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

Newts have a spotty distribution in Indiana. We need to better understand the factors that lead to this.

The IDNR reintroduction program appears to have successfully restored otters in select watersheds throughout the state. Populations are established near release sites, have expanded to adjacent habitats, and colonized areas not originally targeted for restoration. Public interest in this species remains high and the otter can serve as a profile species for wetland and riverine protection.

Total Respondents 2

Appendix E-4: Dunes and Shorelines

7. Please also rank these threats to the Wildlife in Dunes and Shorelines Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Habitat loss (feeding/foraging areas)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Small native range (high endemism)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Near limits of natural geographic range	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Large home range requirements	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Viable reproductive population size or availability	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Specialized reproductive behavior or low reproductive rates	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
							Total Respondents
							9

8. Other threats to the Wildlife in Dunes and Shorelines Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) **1**

9. Please briefly describe the top two threats to the Wildlife in Dunes and Shorelines Habitat in Indiana identified above.

1. Human disturbance.
Modification/degradation of habitats.

Total Respondents **1**

Appendix E-4: Dunes and Shorelines

10. Please rank the following threats to the HABITAT of the Wildlife in Dunes and Shorelines Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Commercial or residential development (sprawl)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Counterproductive financial incentives or regulations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Invasive/non-native species	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Habitat fragmentation	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Successional change	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Habitat degradation	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Climate change	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Stream channelization	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Impoundment of water/flow regulation	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Agricultural/forestry practices	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Residual contamination (persistent toxins)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Point source pollution (continuing)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Mining/acidification	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Drainage practices (stormwater runoff)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Total Respondents							16

11. Other HABITAT threats to the Wildlife in Dunes and Shorelines Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) **1**

12. Please briefly describe the top two HABITAT threats to the Wildlife in Dunes and Shorelines Habitat in Indiana identified above.

- Factors that affect food availability
Modification of stream shoreline habitats.

Appendix E-4: Dunes and Shorelines

Total Respondents 1

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Dunes and Shorelines Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (1)	1
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	100% (1)	0% (0)	1
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (1)	1
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	1
		Total Respondents	8

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Dunes and Shorelines Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (1)	1
Statewide once a year monitoring conducted by other organizations	100% (1)	0% (0)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (1)	1
Regional or local once a year monitoring conducted by other organizations	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	100% (1)	0% (0)	1
Occasional regional or local (less than once a year and not			

Appendix E-4: Dunes and Shorelines

regularly scheduled) monitoring conducted by other organizations

Total Respondents 8

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Dunes and Shorelines Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
				Total Respondents		8

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16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Dunes and Shorelines Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total				
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1				
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1				
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1				
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1				
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1				
Regional or local once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1				
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1				
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1				
				Total Respondents		8				

17. Regional or local state agency monitoring for the Wildlife in Dunes and Shorelines Habitat in Indiana.

- Breeding Bird Atlas statewide every 20 years

Total Respondents 1

18. Regional or local monitoring by other organizations for the Wildlife in Dunes and Shorelines Habitat in Indiana.

- federal Breeding Bird Survey, state May Day counts, Summer Bird Counts

Total Respondents 1

19. Please list organizations that are monitoring the Wildlife in Dunes and Shorelines Habitat in Indiana.

- USGS (Breeding Bird Survey) and volunteers with Indiana Audubon Society

Total Respondents 1

Appendix E-4: Dunes and Shorelines

20. What are the current monitoring techniques for the Wildlife in Dunes and Shorelines Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total	
Radio telemetry and tracking	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1	
Modeling	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1	
Coverboard routes	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1	
Spot mapping	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1	
Driving a survey route	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1	
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1	
Mark and recapture	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1	
Professional survey/census	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1	
Volunteer survey/census	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1	
Trapping (by any technique)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1	
Representative sites	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1	
Probabilistic sites	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1	
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	
							Total Respondents	12

21. Other monitoring techniques for the Wildlife in Dunes and Shorelines Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Dunes and Shorelines Habitat in Indiana?

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Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
		Total Respondents	8

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Dunes and Shorelines Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
			Total Respondents			8

Appendix E-4: Dunes and Shorelines

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Dunes and Shorelines Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
						Total Respondents
						8

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Dunes and Shorelines Habitat in Indiana.

1. unknown

Total Respondents 1

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Dunes and Shorelines Habitat in Indiana.

1. unknown

Appendix E-4: Dunes and Shorelines

Total Respondents 1

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Dunes and Shorelines Habitat in Indiana.

1. unknown

Total Respondents 1

30. What are the current HABITAT inventory and/or assessment techniques for Wildlife in Dunes and Shorelines Habitat in Indiana.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Aerial photography and analysis	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Systematic sampling	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regulatory information	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Participation in landuse programs	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Modeling	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Voluntary landowner reporting	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
							Total Respondents 9

31. Other HABITAT inventory and assessment techniques for the Wildlife in Dunes and Shorelines Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

Appendix E-4: Dunes and Shorelines

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Dunes and Shorelines Habitat in Indiana?

1. aerial imagery to identify and quantify habitat.

Total Respondents 1

33. What is the current body of science for the Wildlife in Dunes and Shorelines Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	1	100%
Inadequate	0	0%
Nonexistent	0	0%
Other (please explain below)	0	0%
Total Respondents	1	

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Dunes and Shorelines Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title Atlas of Breeding Birds in Indiana
 Author Castrale, J.S., E. Hopkins, C.E. Keller
 Date 1998
 Publisher IDNR

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Dunes and Shorelines Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	
(skipped this question)		1

Appendix E-4: Dunes and Shorelines

36. What is the current HABITAT body of science for the Wildlife in Dunes and Shorelines Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		0	0%
Inadequate		1	100%
Nonexistent		0	0%
Other (please explain below)		0	0%
Total Respondents			1

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Dunes and Shorelines Habitat in Indiana, if available. This resource may be used if further detail is needed.

		Response Total	Response Percent
Title	see previous citation	1	100%
Author		0	0%
Date		0	0%
Publisher		0	0%
Total Respondents			1

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Dunes and Shorelines Habitat in Indiana. This resource may also be used if further detail is needed.

		Response Total	Response Percent
Title		0	0%
Author		0	0%
Date		0	0%
Publisher		0	0%
Total Respondents			0
(skipped this question)			1

Appendix E-4: Dunes and Shorelines

42. Other HABITAT research needs for the Wildlife in Dunes and Shorelines Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

43. How well do the following conservation efforts address the threats to the Wildlife in Dunes and Shorelines Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Population management (hunting, trapping)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Food plots	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Threats reduction	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Native predator control	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Exotic/invasive species control	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regulation of collecting	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Disease/parasite management	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Protection of migration routes	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Limiting contact with pollutants/contaminants	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Public education to reduce human disturbance	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Culling/selective removal	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Stocking	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
						Total Respondents 16

44. Other current conservation practices for the Wildlife in Dunes and Shorelines Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

Appendix E-4: Dunes and Shorelines

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Dunes and Shorelines Habitat in Indiana?

1. Prevention of stream channelization and other (pollution) habitat factors.
Limit disturbance in nesting/migration habitat.

Total Respondents **1**

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Dunes and Shorelines Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Habitat protection on public lands	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Habitat protection incentives (financial)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Habitat restoration through regulation	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Habitat restoration on public lands	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Habitat restoration incentives (financial)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Succession control (fire, mowing)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Corridor development/protection	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Managing water regimes	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Pollution reduction	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Protection of adjacent buffer zone	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Restrict public access and disturbance	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Land use planning	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Technical assistance	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Cooperative land management agreements (conservation easements)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
						Total Respondents
						17

47. Other current HABITAT conservation practices for the Wildlife in Dunes and Shorelines Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

Appendix E-4: Dunes and Shorelines

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Dunes and Shorelines Habitat in Indiana?

1. Water regime management for migration habitat.
Protection of nesting habitat along streams.

Total Respondents **1**

49. Do you have any additional comments or information on the Wildlife in Dunes and Shorelines Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

No responses were entered for this question.

Total Respondents **0**

(skipped this question) **1**

Appendix E-5: Impoundments

6. Please rank the following threats to the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Invasive/non-native species	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
High sensitivity to pollution	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	33% (1)	3
Bioaccumulation of contaminants	0% (0)	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3
Predators (native or domesticated)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3
Dependence on other species (mutualism, pollinators)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Diseases/parasites (of the species itself)	0% (0)	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	3
Regulated hunting/fishing pressure (too much)	0% (0)	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3
Species over population	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3
Unintentional take/ direct mortality (e.g., vehicle collisions, power line collisions, by-catch, harvesting equipment, land preparation machinery)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Unregulated collection pressure	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Dependence on irregular resources (cyclical annual variations) (e.g., food, water, habitat limited due to annual variations in availability)	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Total Respondents							33

Appendix E-5: Impoundments

7. Please also rank these threats to the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Habitat loss (feeding/foraging areas)	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	3
Small native range (high endemism)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Near limits of natural geographic range	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Large home range requirements	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Viable reproductive population size or availability	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Specialized reproductive behavior or low reproductive rates	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents
							29

8. Other threats to the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

9. Please briefly describe the top two threats to the Wildlife in Aquatic Systems Impoundments Habitat in Indiana identified above.

1. over population

2. (1) habitat loss (feeding areas) - many reservoirs are getting very old and the once abundant standing timber is now diminishing which is reducing cover for white crappie.

(2) dependence on irregular sources - in many reservoirs, shad is the dominant forage base for crappie. If shad are growing extremely fast, crappie can only utilize shad for a short period of time before the shad outgrow the size crappie can consume.

3. 1) competition with invasives, namely gizzard shad

2) water level control regimes at impoundments

Total Respondents **3**

Appendix E-5: Impoundments

10. Please rank the following threats to the HABITAT of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total													
Commercial or residential development (sprawl)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3													
Counterproductive financial incentives or regulations	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3													
Invasive/non-native species	0% (0)	33% (1)	0% (0)	33% (1)	0% (0)	33% (1)	3													
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	3													
Habitat fragmentation	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3													
Successional change	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3													
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3													
Habitat degradation	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3													
Climate change	0% (0)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3													
Stream channelization	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3													
Impoundment of water/flow regulation	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	0% (0)	3													
Agricultural/forestry practices	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	3													
Residual contamination (persistent toxins)	0% (0)	33% (1)	0% (0)	33% (1)	0% (0)	33% (1)	3													
Point source pollution (continuing)	33% (1)	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	3													
Mining/acidification	0% (0)	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3													
Drainage practices (stormwater runoff)	0% (0)	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3													
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1													
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1													
Total Respondents							50													

11. Other HABITAT threats to the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-5: Impoundments

12. Please briefly describe the top two HABITAT threats to the Wildlife in Aquatic Systems Impoundments Habitat in Indiana identified above.

1. (1) regulation of impounded water - extreme water fluctuations in mainly the Army Corps reservoirs can negatively effect crappie populations especially if the water fluctuations occur during spawning
 (2) habitat degradation - the natural decomposition of flooded timber and woody debris is lessening the available cover for crappie. Also, siltation covers root wads left in the bottom of an impoundment which eliminates useable crappie cover.

2. habitat loss/degradation due to a variety of circumstances

Total Respondents 2

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (3)	3
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (3)	3
Regional or local once a year monitoring conducted by state agencies	67% (2)	33% (1)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	100% (3)	0% (0)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	100% (3)	0% (0)	3
		Total Respondents	24

Appendix E-5: Impoundments

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (3)	3
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (3)	3
Regional or local once a year monitoring conducted by other organizations	0% (0)	100% (3)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Total Respondents			24

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	3
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Regional or local once a year monitoring conducted by state agencies	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3

Appendix E-5: Impoundments

monitoring conducted by state agencies

Total Respondents 24

16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Regional or local once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
				Total Respondents		24

17. Regional or local state agency monitoring for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

1. Patoka Lake
Hovey Lake
Dogwood Lake
Lake Sullivan
Many other lakes

2. IDNR - Division of Fish and Wildlife

3. many impoundments throughout the state have general fisheries survey conducted on them and crappie are caught during these

Total Respondents 3

Appendix E-5: Impoundments

18. Regional or local monitoring by other organizations for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

1. none
2. none known
3. not aware of any

Total Respondents 3

19. Please list organizations that are monitoring the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

1. DNR/DFW
2. none known
3. NA

Total Respondents 3

Appendix E-5: Impoundments

20. What are the current monitoring techniques for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Modeling	0% (0)	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Spot mapping	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Driving a survey route	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	3
Mark and recapture	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	3
Professional survey/census	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	3
Volunteer survey/census	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Trapping (by any technique)	100% (2)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	2
Representative sites	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	33% (1)	3
Probabilistic sites	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
						Total Respondents	30

21. Other monitoring techniques for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-5: Impoundments

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

1. Electrofishing surveys
 Trap netting surveys
 Gill netting surveys
 Angler creel surveys
 Population estimates

2. (1) Reporting from harvest(angler creel surveys) - This survey will show angler exploitation.
 (2) Professional survey (fish management surveys) - This survey will show size structure, relative abundance, and provide age and growth information.

Total Respondents 2

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
		Total Respondents	24

Appendix E-5: Impoundments

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
		Total Respondents	24

Appendix E-5: Impoundments

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3
				Total Respondents		24

Appendix E-5: Impoundments

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
				Total Respondents		24

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

1. None
2. None known to occur.
3. not familiar with habitat assessments that occur on impoundments

Total Respondents 3

Appendix E-5: Impoundments

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

1. None
2. none known

Total Respondents 2

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

1. None
2. none known

Total Respondents 2

30. What are the current monitoring techniques for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?
If a technique is not applicable to the Wildlife in Aquatic Systems Impoundments Habitat do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
Aerial photography and analysis	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
Systematic sampling	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Regulatory information	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Participation in landuse programs	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Modeling	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents 24

Appendix E-5: Impoundments

31. Other HABITAT inventory and assessment techniques for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

none

Total Respondents 1

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

Systematic sampling would probably be best to determine the abundance of cover that is available, but could be very difficult as most of the habitat is hidden under the surface of the water.

Total Respondents 1

33. What is the current body of science for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	3	100%
Inadequate	0	0%
Nonexistent	0	0%
Other (please explain below)	0	0%
Total Respondents	3	

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title Many in AFS journal of fish management and transactions of AFS
 Impoundments Strategic Plan
 Author IDNR - Fish and Wildlife
 Date 1997
 Publisher IDNR - Fish and Wildlife

Appendix E-5: Impoundments

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	0

36. What is the current HABITAT body of science for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	2	67%
Nonexistent	1	33%
Other (please explain below)	0	0%
Total Respondents	3	3

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana, if available. This resource may be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	0

Appendix E-5: Impoundments

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	

39. What are the research needs for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Distribution and abundance	0% (0)	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Limiting factors (food, shelter, water, breeding sites)	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Threats (predators/competition, contamination)	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	3
Relationship/dependence on specific habitats	0% (0)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Population health (genetic and physical)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3
Other (please specify below)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Total Respondents							19

40. Other research needs for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

How to produce more, larger crappie

Total Respondents 1

Appendix E-5: Impoundments

43. How well do the following conservation efforts address the threats to the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	3
Population management (hunting, trapping)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Reintroduction (restoration)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Food plots	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Threats reduction	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Native predator control	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Exotic/invasive species control	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Regulation of collecting	33% (1)	0% (0)	33% (1)	33% (1)	0% (0)	3
Disease/parasite management	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Translocation to new geographic range	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	3
Protection of migration routes	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Limiting contact with pollutants/contaminants	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Public education to reduce human disturbance	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Culling/selective removal	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Stocking	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
				Total Respondents		49

44. Other current conservation practices for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

1. does not need conserving

2. Habitat protection - Actually, I mean habitat enhancement by adding more woody cover to the old impoundments where the former woody cover has decomposed.

Total Respondents 2

Appendix E-5: Impoundments

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3
Habitat protection on public lands	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3
Habitat protection incentives (financial)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Habitat restoration through regulation	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Habitat restoration on public lands	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Habitat restoration incentives (financial)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Succession control (fire, mowing)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Corridor development/protection	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	3
Managing water regimes	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	3
Pollution reduction	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Protection of adjacent buffer zone	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Restrict public access and disturbance	0% (0)	0% (0)	67% (2)	33% (1)	0% (0)	3
Land use planning	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Technical assistance	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
Cooperative land management agreements (conservation easements)	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
				Total Respondents		52

47. Other current HABITAT conservation practices for the Wildlife in Aquatic Systems Impoundments Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Aquatic Systems Impoundments Habitat in Indiana?

1. (1) Improve land use practices in watershed will reduce sedimentation in impoundments and reduce nutrient inputs. Reducing nutrient inputs will allow a deeper thermocline which is important for crappie growth. Crappie growth suffers when water temperatures become too high.

(2) Habitat restoration in the form of woody debris.

2. in Army Corps of Engineers impoundments alterations in water level control would likely benefit crappie

Appendix E-5: Impoundments

Total Respondents **2**

49. Do you have any additional comments or information on the Wildlife in Aquatic Systems Impoundments Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

no

Total Respondents **1**

Appendix E-6: Kettle Lakes

7. Please also rank these threats to the Wildlife in Kettle Lakes Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	0% (0)	3
Habitat loss (feeding/foraging areas)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	3
Small native range (high endemism)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Near limits of natural geographic range	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Large home range requirements	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Viable reproductive population size or availability	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3
Specialized reproductive behavior or low reproductive rates	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	3
Genetic pollution (hybridization)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	3
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Total Respondents							31

8. Other threats to the Wildlife in Kettle Lakes Habitat in Indiana.

Disturbance by recreational boating.

Total Respondents 1

9. Please briefly describe the top two threats to the Wildlife in Kettle Lakes Habitat in Indiana identified above.

1. Loss or degradation of nesting habitat. Loss or degradation of brood-rearing and foraging areas.

2. Habitat Loss-Urbanization
Habitat Loss-Breeding, feeding, foraging

3. Habitat loss
Degradation of movement/migration routes

Total Respondents 3

Appendix E-6: Kettle Lakes

12. Please briefly describe the top two HABITAT threats to the Wildlife in Kettle Lakes Habitat in Indiana identified above.

1. Residential development around lake shorelines. Degradation of aquatic plants and wetlands around lake shorelines.
2. Commerical and or residential development
Habitat fragmentation
3. Agricultureal Practices
Urban Development

Total Respondents 3

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Kettle Lakes Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	33% (1)	67% (2)	3
Statewide once a year monitoring conducted by state agencies	50% (1)	50% (1)	2
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	50% (1)	50% (1)	2
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	100% (2)	0% (0)	2
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (2)	2
Regional or local once a year monitoring conducted by state agencies	50% (1)	50% (1)	2
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	50% (1)	50% (1)	2
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	100% (2)	0% (0)	2
		Total Respondents	17

Appendix E-6: Kettle Lakes

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Kettle Lakes Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (2)	2
Statewide once a year monitoring conducted by other organizations	67% (2)	33% (1)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (2)	2
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	50% (1)	50% (1)	2
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (2)	2
Regional or local once a year monitoring conducted by other organizations	50% (1)	50% (1)	2
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (2)	2
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	50% (1)	50% (1)	2
		Total Respondents	17

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	33% (1)	0% (0)	33% (1)	0% (0)	33% (1)	3
Statewide once a year monitoring conducted by state agencies	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	2
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	2
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Regional or local once a year monitoring conducted by state agencies	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	2
Occasional regional or local (less than						

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once a year and not regularly scheduled)
monitoring conducted by state agencies

Total Respondents 17

16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Statewide once a year monitoring conducted by other organizations	33% (1)	0% (0)	33% (1)	0% (0)	33% (1)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	2
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Regional or local once a year monitoring conducted by other organizations	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	2
						Total Respondents 17

17. Regional or local state agency monitoring for the Wildlife in Kettle Lakes Habitat in Indiana.

1. Fish and Wildlife properties in northern Indiana
2. Tri-County Fish and Wildlife Area, Division of Fish and Wildlife.

Total Respondents 2

18. Regional or local monitoring by other organizations for the Wildlife in Kettle Lakes Habitat in Indiana.

1. F&W properties in northern Indiana, natural lakes, nature preserves.
2. Unknown

Total Respondents 2

Appendix E-6: Kettle Lakes

Appendix E-6: Kettle Lakes

19. Please list organizations that are monitoring the Wildlife in Kettle Lakes Habitat in Indiana.

1. Audubon Society, Ducks Unlimited, Indiana Division of Fish and Wildlife
2. Unknown
3. BBS

Total Respondents 3

20. What are the current monitoring techniques for the Wildlife in Kettle Lakes Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Modeling	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	0% (0)	3
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Spot mapping	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Driving a survey route	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	0% (0)	3
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	3
Mark and recapture	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	3
Professional survey/census	100% (2)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	2
Volunteer survey/census	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Trapping (by any technique)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3
Representative sites	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Probabilistic sites	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
							Total Respondents 28

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21. Other monitoring techniques for the Wildlife in Kettle Lakes Habitat in Indiana.

- 1. Unknown
- 2. aerial surveys

Total Respondents 2

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

- 1. Professional surveys or counts on F&W areas during migration periods (tracks annual migration trends and is index to population levels). Harvest surveys on F&W areas (tracks annual numbers taken) "Wildlife Investigational Techniques" by The Wildlife Society.
- 2. Mark/Recapture-Banding (intensive), Ducks, Geese & Swans of North America, Frank C. Bellrose
Harvest data collection (less intensive) Wildlife Management Vol 2, Reuben Edwin Trippensee
- 3. Banding
Brood surveys

Total Respondents 3

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Kettle Lakes Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
	Total Respondents		24

Appendix E-6: Kettle Lakes

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Kettle Lakes Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
		Total Respondents	24

Appendix E-6: Kettle Lakes

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Statewide once a year inventory and assessment conducted by state agencies	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
					Total Respondents	17

Appendix E-6: Kettle Lakes

Unknown

Total Respondents 1

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Kettle Lakes Habitat in Indiana.

1. Indiana Division of Fish and Wildlife
2. Unknown

Total Respondents 2

30. What are the current monitoring techniques for the Wildlife in Kettle Lakes Habitat in Indiana?
If a technique is not applicable to the Wildlife in Kettle Lakes Habitat, do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Aerial photography and analysis	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Systematic sampling	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Regulatory information	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Participation in landuse programs	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Modeling	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Voluntary landowner reporting	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
							Total Respondents 25

31. Other HABITAT inventory and assessment techniques for the Wildlife in Kettle Lakes Habitat in Indiana.

Unknown

Total Respondents 1

Appendix E-6: Kettle Lakes

Appendix E-6: Kettle Lakes

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

1. GIS mapping(electronic data base of current habitat) Aerial photography and analysis (examine changes in habitat) "Wildlife Investigational Techniques" by The Wildlife Society.

2. G.I.S. (intensive) Wildlife Management Techniques Manual, Fourth Edition, Sanford D. Schemnitz
Aerial (less intensive) Same

3. Spring counts- aerial

Total Respondents 3

33. What is the current body of science for the Wildlife in Kettle Lakes Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		1	33%
Inadequate		1	33%
Nonexistent		1	33%
Other (please explain below)		0	0%
		Total Respondents	3

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Kettle Lakes Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title Ducks, Geese & Swans of North America
Author Frank C. Bellrose
Date 1976
Publisher Stackpole Books

Appendix E-6: Kettle Lakes

- 35.** If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Kettle Lakes Habitat in Indiana. This resource may also be used if further detail is needed.

Title Waterfowl & Wetlands an Intergarted review
 Author Theodore A. Bookout
 Date 1979
 Publisher LaCrosse Printing

- 36.** What is the current HABITAT body of science for the Wildlife in Kettle Lakes Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		0	0%
Inadequate		2	67%
Nonexistent		1	33%
Other (please explain below)		0	0%
Total Respondents		3	

- 37.** Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Kettle Lakes Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title Soil Survey's of Indiana Counties
 Author U.S. Dept. of Agriculture, SCS
 Date 1990
 Publisher U.S. Dept. of Agriculture

- 38.** If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Kettle Lakes Habitat in Indiana. This resource may also be used if further detail is needed.

Title Management of Seasonally Flooded Impoundments
 Author Leigh H. Fredrickson, T. Scott Taylor
 Date 1982
 Publisher U.S. Fish and Wildlife Service

Appendix E-6: Kettle Lakes

39. What are the research needs for the Wildlife in Kettle Lakes Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	3
Distribution and abundance	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	0% (0)	3
Limiting factors (food, shelter, water, breeding sites)	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	0% (0)	3
Threats (predators/competition, contamination)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3
Relationship/dependence on specific habitats	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Population health (genetic and physical)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
						Total Respondents	20

40. Other research needs for the Wildlife in Kettle Lakes Habitat in Indiana.

1. Unknown

2. harvest survival/nest success

Total Respondents 2

41. What are the HABITAT research needs for the Wildlife in Kettle Lakes Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Distribution and abundance (fragmentation)	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	0% (0)	3
Threats (land use change/competition, contamination/global warming)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3
Relationship/dependence on specific site conditions	33% (1)	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	3
Growth and development of individual components of the habitat	33% (1)	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2

Appendix E-6: Kettle Lakes

Total Respondents 17

42. Other HABITAT research needs for the Wildlife in Kettle Lakes Habitat in Indiana.

Unknown

Total Respondents 1

43. How well do the following conservation efforts address the threats to the Wildlife in Kettle Lakes Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Population management (hunting, trapping)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Food plots	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Threats reduction	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	3
Native predator control	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Exotic/invasive species control	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Regulation of collecting	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3
Disease/parasite management	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Protection of migration routes	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Limiting contact with pollutants/contaminants	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Public education to reduce human disturbance	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Culling/selective removal	33% (1)	0% (0)	0% (0)	67% (2)	0% (0)	3
Stocking	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
						Total Respondents 50

44. Other current conservation practices for the Wildlife in Kettle Lakes Habitat in Indiana.

Unknown

Total Respondents 1

Appendix E-6: Kettle Lakes

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

1. Habitat protection (without habitat the Mallard won't do well) Population management (makes use of surplus numbers and regulates take) "The Mallard" by John Madson Olin Mathieson Chemical Corporation.
2. Habitat Protection (intensive) Reproduction and Protection, Ducks, Geese & Swans of North America, Bellrose Protection of Migrating Routes (intensive) Same
3. Hen houses
habitat conservation
buffer zones

Total Respondents 3

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Kettle Lakes Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Habitat protection on public lands	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	3
Habitat protection incentives (financial)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Habitat restoration through regulation	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Habitat restoration on public lands	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Habitat restoration incentives (financial)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Artificial habitat creation (artificial reefs, nesting platforms)	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	3
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Succession control (fire, mowing)	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	3
Corridor development/protection	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	3
Managing water regimes	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3
Pollution reduction	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Protection of adjacent buffer zone	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Restrict public access and disturbance	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	3
Land use planning	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Technical assistance	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Cooperative land management agreements (conservation easements)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
						Total Respondents 53

47. Other current HABITAT conservation practices for the Wildlife in Kettle Lakes Habitat in Indiana.

Appendix E-6: Kettle Lakes

Unknown

Total Respondents 1

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Kettle Lakes Habitat in Indiana?

1. Habitat protection through regulation (only sure way to protect habitat without public ownership) Purchase more public land.
2. Habitat protection through regulation, (less intensive)cover a large geographic area. Ducks, Geese & Swans of North America, Bellrose
Habitat Protection through incentives, (intensive), best landowner cooperation, Same
3. Landowner programs
buffers
habitat conservation regulations

Total Respondents 3

49. Do you have any additional comments or information on the Wildlife in Kettle Lakes Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

1. No
2. Kettle Lakes are limited in number, although habitat surrounding them can be manipulated. No new Kettle Lakes can be created so it is critical to provide protection through, regulations, incentives and management.
3. Provide information on habitat creation and farming techniques.
Provide incentives to create/maintain such habitat

Total Respondents 3

Appendix E-7: Lake Michigan

10. Please rank the following threats to the HABITAT of the Wildlife in Lake Michigan Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Commercial or residential development (sprawl)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Counterproductive financial incentives or regulations	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Invasive/non-native species	100% (2)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	2
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	2
Habitat fragmentation	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	2
Successional change	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Habitat degradation	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	2
Climate change	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Stream channelization	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Impoundment of water/flow regulation	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Agricultural/forestry practices	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Residual contamination (persistent toxins)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	2
Point source pollution (continuing)	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	2
Mining/acidification	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Drainage practices (stormwater runoff)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	2
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
					Total Respondents		32

11. Other HABITAT threats to the Wildlife in Lake Michigan Habitat in Indiana.

Competition with round goby for nearshore habitat.

Total Respondents 1

12. Please briefly describe the top two HABITAT threats to the Wildlife in Lake Michigan Habitat in Indiana identified above.

Competition with non native species for habitat. Need a quality place to live that is not in competition with round goby.

Identification of habitat along Indiana's nearshore area.

Appendix E-7: Lake Michigan

Total Respondents

2

Appendix E-7: Lake Michigan

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Lake Michigan Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	0
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0
Regional or local year-round monitoring conducted by state agencies	100% (1)	0% (0)	1
Regional or local once a year monitoring conducted by state agencies	100% (1)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	100% (1)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0
		Total Respondents	3

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Lake Michigan Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0
Regional or local year-round monitoring conducted by other organizations	100% (1)	0% (0)	1
Regional or local once a year monitoring conducted by other organizations	100% (1)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	100% (1)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other	0% (0)	0% (0)	0

Appendix E-7: Lake Michigan

organizations

Total Respondents

3



Appendix E-7: Lake Michigan

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Lake Michigan Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total				
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1				
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1				
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1				
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1				
Regional or local year-round monitoring conducted by state agencies	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	2				
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1				
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1				
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1				
				Total Respondents		9				

Appendix E-7: Lake Michigan

16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Lake Michigan Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Regional or local once a year monitoring conducted by other organizations	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	2
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
						Total Respondents
						9

17. Regional or local state agency monitoring for the Wildlife in Lake Michigan Habitat in Indiana.

Lake Michigan proper out of Michigan City.

Spring assessment out of Michigan City. Fall spawning assessment, Indiana waters of Lake Michigan. 9 month creel survey for harvest information. These efforts are conducted by the IDNR-Fish and Wildlife division.

Total Respondents **2**

18. Regional or local monitoring by other organizations for the Wildlife in Lake Michigan Habitat in Indiana.

Out of Michigan City and near Gary by Ball State University.

USFWS and Illinois natural history survey egg and fry assessments at the Port of Indiana. THIS is part of a Fish and Wildlife Restoration Grant.

Total Respondents **2**

Appendix E-7: Lake Michigan

Appendix E-7: Lake Michigan

19. Please list organizations that are monitoring the Wildlife in Lake Michigan Habitat in Indiana.

IDNR-Fish and Wildlife, Ball State University, University of Michigan through a coastal program grant. USFWS Indiana DNR, Division of Fish and Wildlife. Illinois Natural History Survey, USFWS>

Total Respondents 2

20. What are the current monitoring techniques for the Wildlife in Lake Michigan Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Modeling	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Spot mapping	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Driving a survey route	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Mark and recapture	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	2
Professional survey/census	100% (2)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	2
Volunteer survey/census	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Trapping (by any technique)	100% (2)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	2
Representative sites	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Probabilistic sites	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
							Total Respondents 14

Appendix E-7: Lake Michigan

21. Other monitoring techniques for the Wildlife in Lake Michigan Habitat in Indiana.

Long term monitoring through gillnets, trawling has been conducted at 3 sites along the lake michigan lakefront since the mid 70's by Ball State University during the summer season. Creel census has been conducted by IDNR-Fish and Wildlife division for approximately 20 years. Commerical monitoring was conducted until the halt of the commercial fishing industry in 1996.

Total Respondents 1

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Lake Michigan Habitat in Indiana?

Fall trawl sampling for young of the year production. Possible incorporation of hydracoustic models for the near shore area.

I would like to see all the lake trout stocked in Lake Michigan to be coded wire tagged. That will allow for better understanding of survival after stocking and movement of the fish. It will also allow for better understanding of spawning site fidelity.

Total Respondents 2

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Lake Michigan Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Regional or local once a year inventory and assessment conducted by state agencies	100% (1)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	100% (2)	0% (0)	2
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	100% (1)	0% (0)	1
			Total Respondents 9

Appendix E-7: Lake Michigan

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Lake Michigan Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment conducted by other organizations	100% (1)	0% (0)	1
Regional or local once a year inventory and assessment conducted by other organizations	100% (1)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	50% (1)	50% (1)	2
		Total Respondents	9

Appendix E-7: Lake Michigan

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Lake Michigan Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
				Total Respondents		9

Appendix E-7: Lake Michigan

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Lake Michigan Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
						Total Respondents
						9

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Lake Michigan Habitat in Indiana.

Lake Michigan proper along the shoreline in nearshore area less than 30 feet in depth.

Habitat mapping and shoreline aerial imagery.

Total Respondents **2**

Appendix E-7: Lake Michigan

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Lake Michigan Habitat in Indiana.

Lake Michigan proper along the shoreline in nearshore area less than 30 feet in depth.

Total Respondents 1

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Lake Michigan Habitat in Indiana.

IDNR, USFSW, Ball State, University of Michigan

Indiana DNR- Fish and Wildlife division. USFWS/GLFC

Total Respondents 2

30. What are the current monitoring techniques for the Wildlife in Lake Michigan Habitat in Indiana?

If a technique is not applicable to the Wildlife in Lake Michigan Habitat do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	2
Aerial photography and analysis	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	2
Systematic sampling	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	2
Property tax estimates	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
State revenue data	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Regulatory information	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Participation in landuse programs	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Modeling	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	0% (0)	2
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
							Total Respondents 13

Appendix E-7: Lake Michigan

31. Other HABITAT inventory and assessment techniques for the Wildlife in Lake Michigan Habitat in Indiana.

Bottom mapping of habitat.

Total Respondents 1

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Lake Michigan Habitat in Indiana?

Lidar mapping would help identify spawning areas within the nearshore zone along Indiana's coastline.

Digital satellite imagery to conduct bottom contour mapping in nearshore spawning areas.

Total Respondents 2

33. What is the current body of science for the Wildlife in Lake Michigan Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		1	50%
Inadequate		1	50%
Nonexistent		0	0%
Other (please explain below)		0	0%
		Total Respondents	2

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Lake Michigan Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Preliminary Results of 2004 Ball State University Yellow Perch Research in Indiana Waters of Lake Michigan;

Author = Paul Allen and Thomas Lauer;

Date = October 2004;

Publisher = Ball State University

Title = Yellow Perch Research and Management in Lake Michigan, Evaluating Progress in a Cooperative Effort, 1997-2001;

Author = David Clapp and John Dettmers;

Date = November 2004;

Publisher = American Fisheries Society, Fisheries

Title = Lake Trout Restoration Plan;

Date = In progress

Title = Lake Trout Impediments Document;

Author = Numerous,;

Date = 2003;

Publisher = Lake Trout Task group/LMTC

Appendix E-7: Lake Michigan

Appendix E-7: Lake Michigan

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Lake Michigan Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Yellow Perch Research and Management in Lake Michigan, Evaluating Progress in a Cooperative Effort, 1997-2001

Author = David Clapp and John Dettmers

Date = November 2004

Publisher = American Fisheries Society, Fisheries

Title = Lake Trout Impediments Documents

Author = Numerous,

Date = 2003

Publisher = Lake Trout Task group/LMTC

36. What is the current HABITAT body of science for the Wildlife in Lake Michigan Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	2	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
Total Respondents	2	

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Lake Michigan Habitat in Indiana, if available. This resource may be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	
(skipped this question)		1

Appendix E-7: Lake Michigan

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Lake Michigan Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
	Total Respondents	0
	(skipped this question)	1

39. What are the research needs for the Wildlife in Lake Michigan Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Distribution and abundance	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Limiting factors (food, shelter, water, breeding sites)	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Threats (predators/competition, contamination)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	2
Relationship/dependence on specific habitats	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Population health (genetic and physical)	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
	Total Respondents						12

40. Other research needs for the Wildlife in Lake Michigan Habitat in Indiana.

No responses were entered for this question.

Total Respondents	0
(skipped this question)	1

Appendix E-7: Lake Michigan

43. How well do the following conservation efforts address the threats to the Wildlife in Lake Michigan Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Population management (hunting, trapping)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Population enhancement (captive breeding and release)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Reintroduction (restoration)	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	2
Food plots	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Threats reduction	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Native predator control	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Exotic/invasive species control	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	2
Regulation of collecting	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Disease/parasite management	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Protection of migration routes	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Limiting contact with pollutants/contaminants	0% (0)	50% (1)	50% (0)	0% (0)	0% (0)	2
Public education to reduce human disturbance	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Culling/selective removal	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Stocking	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
				Total Respondents		32

44. Other current conservation practices for the Wildlife in Lake Michigan Habitat in Indiana.

Regulation of sport harvest. Closure of commercial fishery to allow spawning stock biomass to increase, thus allowing for the production of offspring that can eventually add to the spawning stock biomass.

Total Respondents 1

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Lake Michigan Habitat in Indiana?

Completely eliminate commercial fishing. This appears to have reduced the spawning stock to a level that could not maintain a fishery.

Total Respondents 1

Appendix E-7: Lake Michigan

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Lake Michigan Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Habitat protection on public lands	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Habitat protection incentives (financial)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Habitat restoration through regulation	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Habitat restoration on public lands	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Habitat restoration incentives (financial)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Corridor development/protection	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Managing water regimes	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Pollution reduction	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	2
Protection of adjacent buffer zone	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Restrict public access and disturbance	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Land use planning	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Technical assistance	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Cooperative land management agreements (conservation easements)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
				Total Respondents		33

47. Other current HABITAT conservation practices for the Wildlife in Lake Michigan Habitat in Indiana.

Limiting disturbance through the construction(DOW) permit process.

Total Respondents 1

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Lake Michigan Habitat in Indiana?

Habitat creation, ie. artificial structures during lake construction projects

Total Respondents 1

Appendix E-7: Lake Michigan

- 49.** Do you have any additional comments or information on the Wildlife in Lake Michigan Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

Much research work has been done on the the yellow perch by Ball State University since the mid 1970's. This works serves as the framework for the management of the population in Indiana's waters of Lake Michigan. It is critical that funding for this project continue to maintain the dataset. It is the largest and longest dataset for yellow perch on all of Lake Michigan and has served as the foundation for many management decisions on sport and commerical harvest decisions.

Total Respondents 1

Appendix E-8: Natural Lakes

7. Please also rank these threats to the Wildlife in Natural Lakes Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	25% (1)	25% (1)	25% (1)	0% (0)	0% (0)	25% (1)	4
Habitat loss (feeding/foraging areas)	50% (2)	0% (0)	25% (1)	25% (1)	0% (0)	0% (0)	4
Small native range (high endemism)	0% (0)	25% (1)	0% (0)	50% (2)	25% (1)	0% (0)	4
Near limits of natural geographic range	25% (1)	25% (1)	0% (0)	25% (1)	25% (1)	0% (0)	4
Large home range requirements	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	0% (0)	4
Viable reproductive population size or availability	25% (1)	25% (1)	50% (2)	0% (0)	0% (0)	0% (0)	4
Specialized reproductive behavior or low reproductive rates	25% (1)	25% (1)	25% (1)	25% (1)	0% (0)	0% (0)	4
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	0% (0)	0% (0)	75% (3)	0% (0)	0% (0)	25% (1)	4
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
						Total Respondents	37

8. Other threats to the Wildlife in Natural Lakes Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

9. Please briefly describe the top two threats to the Wildlife in Natural Lakes Habitat in Indiana identified above.

1. Long-term declines in water quality associated with lake eutrophication.
Annual and seasonal variations in habitat availability.

2. -Cold, clear water is critical for cisco survival; increased runoff and nutrient loading have degraded the habitat for this species in many of the 50+ lakes it once occurred in. Few lakes still have the species, and there is apparently little to no reproduction.

-The deliberate stocking of predator fish in cisco lakes has been a threat to this species for years; if this hasn't been stopped, it needs to.

1. Loss of habitat (reproductive/feeding) that is essential for northern pike survival
Over harvest and illegal harvest (This doesn't seem to be a major threat as of now)

1. Loss of undisturbed natural lake habitat.

Appendix E-8: Natural Lakes

Total Respondents 4

10. Please rank the following threats to the HABITAT of the Wildlife in Natural Lakes Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total													
Commercial or residential development (sprawl)	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	0% (0)	4													
Counterproductive financial incentives or regulations	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4													
Invasive/non-native species	0% (0)	25% (1)	25% (1)	25% (1)	0% (0)	25% (1)	4													
Nonpoint source pollution (sedimentation and nutrients)	50% (2)	25% (1)	0% (0)	25% (1)	0% (0)	0% (0)	4													
Habitat fragmentation	0% (0)	25% (1)	25% (1)	25% (1)	0% (0)	25% (1)	4													
Successional change	25% (1)	25% (1)	0% (0)	25% (1)	25% (1)	0% (0)	4													
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	50% (2)	50% (2)	4													
Habitat degradation	50% (2)	50% (2)	0% (0)	0% (0)	0% (0)	0% (0)	4													
Climate change	25% (1)	0% (0)	0% (0)	0% (0)	50% (2)	25% (1)	4													
Stream channelization	0% (0)	0% (0)	75% (3)	25% (1)	0% (0)	0% (0)	4													
Impoundment of water/flow regulation	0% (0)	0% (0)	25% (1)	0% (0)	50% (2)	25% (1)	4													
Agricultural/forestry practices	25% (1)	50% (2)	25% (1)	0% (0)	0% (0)	0% (0)	4													
Residual contamination (persistent toxins)	0% (0)	0% (0)	25% (1)	50% (2)	0% (0)	25% (1)	4													
Point source pollution (continuing)	0% (0)	0% (0)	50% (2)	25% (1)	0% (0)	25% (1)	4													
Mining/acidification	0% (0)	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4													
Drainage practices (stormwater runoff)	0% (0)	50% (2)	50% (2)	0% (0)	0% (0)	0% (0)	4													
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1													
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1													
Total Respondents							66													

11. Other HABITAT threats to the Wildlife in Natural Lakes Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 2

Appendix E-8: Natural Lakes

12. Please briefly describe the top two HABITAT threats to the Wildlife in Natural Lakes Habitat in Indiana identified above.

Habitat degradation
Successional change

Water quality degradation that leads to cloudy water is the key threat.

1. Emergent bulrush and wetland habitat loss. It has been well documented in northern states that northern pike prefer flooded vegetation for spawning during the spring. Loss of this habitat from boating and wildlife (waterfowl and muskrat feeding) may reduce reproductive habitat for northern pike in some natural lakes.

2. Bulkhead seawall development reduces emergent vegetation used by northern pike for reproduction and for cover during feeding.

Shoreline and labeled alterations

Total Respondents 4

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Natural Lakes Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (4)	4
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (4)	4
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (4)	4
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	25% (1)	75% (3)	4
Regional or local year-round monitoring conducted by state agencies	25% (1)	75% (3)	4
Regional or local once a year monitoring conducted by state agencies	25% (1)	75% (3)	4
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	50% (2)	50% (2)	4
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	100% (4)	0% (0)	4
	Total Respondents		32

Appendix E-8: Natural Lakes

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Natural Lakes Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (4)	4
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (4)	4
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (4)	4
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (4)	4
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (4)	4
Regional or local once a year monitoring conducted by other organizations	25% (1)	75% (3)	4
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	25% (1)	75% (3)	4
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	25% (1)	75% (3)	4
	Total Respondents		32

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Natural Lakes Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	25% (1)	50% (2)	25% (1)	4
Regional or local year-round monitoring conducted by state agencies	0% (0)	25% (1)	0% (0)	50% (2)	25% (1)	4
Regional or local once a year monitoring conducted by state agencies	0% (0)	25% (1)	25% (1)	25% (1)	25% (1)	4
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	25% (1)	50% (2)	0% (0)	25% (1)	4
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	50% (2)	50% (2)	0% (0)	0% (0)	0% (0)	4
	Total Respondents					32

Appendix E-8: Natural Lakes

16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Natural Lakes Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (2)	50% (2)	4
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (2)	50% (2)	4
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (2)	50% (2)	4
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (2)	50% (2)	4
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (2)	50% (2)	4
Regional or local once a year monitoring conducted by other organizations	0% (0)	25% (1)	25% (1)	25% (1)	25% (1)	4
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	25% (1)	25% (1)	50% (2)	4
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	25% (1)	25% (1)	0% (0)	50% (2)	4
Total Respondents						32

17. Regional or local state agency monitoring for the Wildlife in Natural Lakes Habitat in Indiana.

1. Division of Fish and Wildlife at cisco lakes
Department of Environmental Management water quality monitoring

2. NE Indiana by DFW (Jed Pearson)

1. Northern Pike are monitored via general fish surveys conducted to update lake status. There is now monitoring of northern pike on a general schedule.
2. There was a tracking study conducted in two Indiana natural lakes in the late 1990's by the IDNR to better understand reproductive habitat of northern pike.

Division of Fish and Wildlife standardized largemouth bass sampling protocols
Tournament fishing monitoring by the Division of Fish and Wildlife

Total Respondents **4**

18. Regional or local monitoring by other organizations for the Wildlife in Natural Lakes Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

Appendix E-8: Natural Lakes

19. Please list organizations that are monitoring the Wildlife in Natural Lakes Habitat in Indiana.

Bass fishing clubs who hold tournaments on Lake Wawasee and Syracuse Lake

Total Respondents 1

20. What are the current monitoring techniques for the Wildlife in Natural Lakes Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	50% (2)	25% (1)	0% (0)	0% (0)	25% (1)	4
Modeling	0% (0)	25% (1)	25% (1)	0% (0)	0% (0)	50% (2)	4
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Spot mapping	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	3
Driving a survey route	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3
Mark and recapture	25% (1)	0% (0)	25% (1)	25% (1)	0% (0)	25% (1)	4
Professional survey/census	25% (1)	50% (2)	0% (0)	0% (0)	0% (0)	25% (1)	4
Volunteer survey/census	0% (0)	25% (1)	50% (2)	0% (0)	0% (0)	25% (1)	4
Trapping (by any technique)	50% (2)	25% (1)	25% (1)	0% (0)	0% (0)	0% (0)	4
Representative sites	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3
Probabilistic sites	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents 40

21. Other monitoring techniques for the Wildlife in Natural Lakes Habitat in Indiana.

No responses were entered for this question.

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Total Respondents 0

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Natural Lakes Habitat in Indiana?

Occasional gill-netting to verify presence followed by intensive netting to confirm low levels or absence.

Large fyke-nets are used in Lake Webster (Kosciusko Co.) to collect brood stock for muskellunge. These nets would be useful in capturing northern pike as well. This would allow biologist to capture enough fish to get a representative sample of adult fish. There is still no effective method of sampling young esocids without mortality.

Springtime dc electrofishing according to DFW standard protocol
Standard DFW creel survey procedures
Tournament monitoring by the DFW and bass clubs

Total Respondents 3

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Natural Lakes Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	50% (2)	50% (2)	4
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	75% (3)	25% (1)	4
	Total Respondents		32

Appendix E-8: Natural Lakes

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Natural Lakes Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	50% (2)	50% (2)	4
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	50% (2)	50% (2)	4
	Total Respondents		32

Appendix E-8: Natural Lakes

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Natural Lakes Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	4
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	4
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	4
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	4
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	4
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	4
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	4
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	25% (1)	0% (0)	75% (3)	4
						Total Respondents
						32

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Natural Lakes Habitat in Indiana.

NE IN, DFW, Jed Pearson.

Recently the IDNR has began sampling/mapping emergent plant species in some Indiana natural lakes. These plants may be used as reproductive habiatat for northern pike.

Not aware of any

Total Respondents **3**

Appendix E-8: Natural Lakes

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Natural Lakes Habitat in Indiana.

Not aware of any

Total Respondents 1

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Natural Lakes Habitat in Indiana.

Not aware of any

Total Respondents 1

30. What are the current monitoring techniques for the Wildlife in Natural Lakes Habitat in Indiana.

If a technique is not applicable to the Wildlife in Natural Lakes Habitat, do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	25% (1)	25% (1)	0% (0)	0% (0)	50% (2)	4
Aerial photography and analysis	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	3
Systematic sampling	0% (0)	25% (1)	25% (1)	0% (0)	0% (0)	50% (2)	4
Property tax estimates	0% (0)	0% (0)	0% (0)	25% (1)	25% (1)	50% (2)	4
State revenue data	0% (0)	0% (0)	0% (0)	25% (1)	25% (1)	50% (2)	4
Regulatory information	0% (0)	0% (0)	0% (0)	25% (1)	25% (1)	50% (2)	4
Participation in landuse programs	0% (0)	25% (1)	0% (0)	0% (0)	25% (1)	50% (2)	4
Modeling	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
Voluntary landowner reporting	0% (0)	25% (1)	25% (1)	0% (0)	0% (0)	50% (2)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
							Total Respondents 36

Appendix E-8: Natural Lakes

31. Other HABITAT inventory and assessment techniques for the **Wildlife in Natural Lakes Habitat** in Indiana.

No responses were entered for this question.

Total Respondents 0

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the **Wildlife in Natural Lakes Habitat** in Indiana?

1. Emergent bulrush and wetland monitoring and protection via ecozones
2. Evaluate land and water use practices to reduce in lake and upstream degradation of vegetation and shoreline.

Unknown

Total Respondents 2

33. What is the current body of science for the **Wildlife in Natural Lakes Habitat** in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		1	25%
Inadequate		3	75%
Nonexistent		0	0%
Other (please explain below)		0	0%
		Total Respondents	4

Appendix E-8: Natural Lakes

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the **Wildlife in Natural Lakes Habitat** in Indiana, if available. This resource may be used if further detail is needed.

Title = Cisco population status and management in Indiana
 Author = Jed Pearson
 Date = 2001
 Publisher = Division of Fish and Wildlife

Title = Northern Pike Spawning Habitat Investigations At Two Narural Lake In Indiana
 Author = Cwalinski, Tim A.
 Date = September 2001
 Publisher = Indiana Department of Natural Resources

**Response
Total Response
Percent**

Title = DFW largemouth bass database
 Author = Jed Pearson
 Date = unpublished
 Publisher = unpublished

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the **Wildlife in Natural Lakes Habitat** in Indiana. This resource may also be used if further detail is needed.

Title = Largemouth bass size limits at Indiana natural lakes - a 30-year history
 Author = Jed Pearson
 Date = 2003
 Publisher = unpublished

**Response
Total Response
Percent**

36. What is the current HABITAT body of science for the **Wildlife in Natural Lakes Habitat** in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		0	0%
Inadequate		3	75%
Nonexistent		1	25%
Other (please explain below)		0	0%
Total Respondents		4	

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the **Wildlife in Natural Lakes Habitat** in Indiana, if available. This resource may be used if further detail is needed.

Title = Cisco population status and management in Indiana
 Author = Jed Pearson
 Date = 2001
 Publisher = Division of Fish and Wildlife

**Response
Total Response
Percent**

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the **Wildlife in Natural Lakes Habitat** in Indiana. This resource may also be used if further detail is needed.

Appendix E-8: Natural Lakes

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
	Total Respondents	0

39. What are the research needs for the Wildlife in Natural Lakes Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	100% (4)	0% (0)	0% (0)	0% (0)	4
Distribution and abundance	0% (0)	50% (2)	25% (1)	25% (1)	0% (0)	0% (0)	4
Limiting factors (food, shelter, water, breeding sites)	0% (0)	75% (3)	25% (1)	0% (0)	0% (0)	0% (0)	4
Threats (predators/competition, contamination)	0% (0)	50% (2)	25% (1)	25% (1)	0% (0)	0% (0)	4
Relationship/dependence on specific habitats	0% (0)	25% (1)	50% (2)	25% (1)	0% (0)	0% (0)	4
Population health (genetic and physical)	0% (0)	0% (0)	25% (1)	50% (2)	25% (1)	0% (0)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
					Total Respondents		25

Appendix E-8: Natural Lakes

40. Other research needs for the Wildlife in Natural Lakes Habitat in Indiana.

Limiting factors and impacts of competition and predation

Total Respondents 1

41. What are the HABITAT research needs for the Wildlife in Natural Lakes Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	0% (0)	4
Distribution and abundance (fragmentation)	0% (0)	0% (0)	25% (1)	50% (2)	25% (1)	0% (0)	4
Threats (land use change/competition, contamination/global warming)	0% (0)	75% (3)	25% (1)	0% (0)	0% (0)	0% (0)	4
Relationship/dependence on specific site conditions	0% (0)	50% (2)	25% (1)	25% (1)	0% (0)	0% (0)	4
Growth and development of individual components of the habitat	0% (0)	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
							Total Respondents 21

42. Other HABITAT research needs for the Wildlife in Natural Lakes Habitat in Indiana.

Water quality variations and impacts of land us and shoreline alterations

Total Respondents 1

Appendix E-8: Natural Lakes

43. How well do the following conservation efforts address the threats to the Wildlife in Natural Lakes Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	50% (2)	50% (2)	0% (0)	0% (0)	0% (0)	4
Population management (hunting, trapping)	50% (2)	0% (0)	0% (0)	50% (2)	0% (0)	4
Population enhancement (captive breeding and release)	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4
Reintroduction (restoration)	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4
Food plots	0% (0)	0% (0)	0% (0)	100% (4)	0% (0)	4
Threats reduction	50% (2)	25% (1)	0% (0)	25% (1)	0% (0)	4
Native predator control	0% (0)	0% (0)	25% (1)	75% (3)	0% (0)	4
Exotic/invasive species control	0% (0)	75% (3)	0% (0)	25% (1)	0% (0)	4
Regulation of collecting	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4
Disease/parasite management	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4
Translocation to new geographic range	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4
Protection of migration routes	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4
Limiting contact with pollutants/contaminants	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4
Public education to reduce human disturbance	25% (1)	25% (1)	0% (0)	50% (2)	0% (0)	4
Culling/selective removal	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4
Stocking	0% (0)	25% (1)	25% (1)	50% (2)	0% (0)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
				Total Respondents		66

44. Other current conservation practices for the Wildlife in Natural Lakes Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-8: Natural Lakes

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Natural Lakes Habitat in Indiana?

- 1. Habitat protection and education to reduce habitat disturbance
- 2. -Assure there is no stocking of predator fish in cisco lakes
-Greatly limit/mitigate any new development on cisco lakes, particularly addressing runoff from lawns and other water quality issues
-Work to get any farmlands adjacent to cisco lakes into no-till
- 1. Implementation of ecozones in undeveloped areas to conserve that vegetation present.
- 2. Implement a catch and release only regulation in lakes with low densities.

Habitat management and harvest management

Total Respondents 4

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Natural Lakes Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	4
Habitat protection on public lands	0% (0)	75% (3)	0% (0)	0% (0)	25% (1)	4
Habitat protection incentives (financial)	0% (0)	50% (2)	25% (1)	0% (0)	25% (1)	4
Habitat restoration through regulation	25% (1)	25% (1)	25% (1)	0% (0)	25% (1)	4
Habitat restoration on public lands	0% (0)	25% (1)	25% (1)	0% (0)	50% (2)	4
Habitat restoration incentives (financial)	0% (0)	50% (2)	0% (0)	25% (1)	25% (1)	4
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	0% (0)	0% (0)	100% (4)	0% (0)	4
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Succession control (fire, mowing)	0% (0)	25% (1)	0% (0)	50% (2)	25% (1)	4
Corridor development/protection	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4
Managing water regimes	0% (0)	25% (1)	0% (0)	50% (2)	25% (1)	4
Pollution reduction	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	4
Protection of adjacent buffer zone	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	4
Restrict public access and disturbance	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4
Land use planning	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	4
Technical assistance	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Cooperative land management agreements (conservation easements)	25% (1)	25% (1)	0% (0)	25% (1)	25% (1)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
				Total Respondents		69

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47. Other current HABITAT conservation practices for the **Wildlife in Natural Lakes Habitat** in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 2

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the **Wildlife in Natural Lakes Habitat** in Indiana?

Pollution reduction and land-use zoning

1. Implementation of ecozones in undeveloped areas to conserve that vegetation present.
2. Reduce inlet and upstream degradation. Increase awareness and cooperation of landowners to create better shoreline and tributary habitat.

Habitat protection and restoration through regulation.

Total Respondents **3**

49. Do you have any additional comments or information on the **Wildlife in Natural Lakes Habitat** that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

No responses were entered for this question.

Total Respondents **0**

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

Total Respondents 1

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (2)	2
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (2)	2
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (2)	2
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	1
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (2)	2
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (2)	2
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	50% (1)	50% (1)	2
		Total Respondents	14

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (2)	2
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (2)	2
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (2)	2
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (2)	2
Regional or local year-round monitoring conducted by other organizations	50% (1)	50% (1)	2
Regional or local once a year monitoring conducted by other organizations	50% (1)	50% (1)	2
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	50% (1)	50% (1)	2

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	50% (1)	50% (1)	2
	Total Respondents		16

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Regional or local once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
	Total Respondents					16

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

16.	How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
	Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
	Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
	Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
	Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
	Regional or local year-round monitoring conducted by other organizations	50% (1)	0% (0)	0% (0)	50% (1)	0% (0)	2
	Regional or local once a year monitoring conducted by other organizations	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
	Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	2
	Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	2
Total Respondents							16

17.	Regional or local state agency monitoring for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana.	
	None	
	Patoka River watershed	
Total Respondents		2

18.	Regional or local monitoring by other organizations for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana.	
	Newton, Jasper, Pulaski, Starke, Lake & Porter Counties	
Total Respondents		1

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

19. Please list organizations that are monitoring the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana.

Robert Brodman, Saint Joseph's College

DNR/DFW

Total Respondents 2

20. What are the current monitoring techniques for the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Modeling	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	2
Coverboard routes	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Spot mapping	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Driving a survey route	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	2
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	2
Mark and recapture	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Professional survey/census	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	2
Volunteer survey/census	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Trapping (by any technique)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	2
Representative sites	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	2
Probabilistic sites	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
							Total Respondents 24

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

21. Other monitoring techniques for the Wildlife in Lake Michigan Habitat in Indiana.

No responses entered for this question.

Total Respondents **0**

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?

Minnow trapping and either mark recapture or telemetry

Electrofishing

Trap nets

Total Respondents 2

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (2)	2
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (2)	2
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (2)	2
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (2)	2
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (2)	2
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (2)	2
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (2)	2
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (2)	2
		Total Respondents	16

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (2)	2
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (2)	2
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (2)	2
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (2)	2
Regional or local year-round inventory and assessment conducted by other organizations	50% (1)	50% (1)	2
Regional or local once a year inventory and assessment conducted by other organizations	50% (1)	50% (1)	2
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	50% (1)	50% (1)	2
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	50% (1)	50% (1)	2
	Total Respondents		16

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Total Respondents						16

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Regional or local year-round inventory and assessment conducted by other organizations	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	2
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
					Total Respondents	16

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana.

None.

Total Respondents 1

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana.

1. Newton, Jasper, Starke, Pulaski, Lake & Porter counties

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

Total Respondents 1

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana.

Robert Brodman, Saint Joseph's College

None that I am aware of

Total Respondents 2

30. What are the current HABITAT inventory and/or assessment techniques for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Aerial photography and analysis	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Systematic sampling	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	2
Property tax estimates	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
State revenue data	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Regulatory information	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Participation in landuse programs	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Modeling	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents 19

31. Other HABITAT inventory and assessment techniques for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?

1. suvery (intensive) and GIS (less intenstive)

Total Respondents **1**

33. What is the current body of science for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	2	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
Total Respondents	2	

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Amphibians and reptiles from 23 counties of Indiana.

Author = Robert Brodman

Date = 2003

Publisher = Proceedings of the Indiana Academy of Science, 112: 43-54.

**Response
Total Response
Percent**

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

36. What is the current HABITAT body of science for the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	1	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
Total Respondents		1

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Amphibians and reptiles from 23 counties of Indiana.

Author = Robert Brodman

Date = 2003

Publisher = Proceedings of the Indiana Academy of Science, 112: 43-54

Response Total	Response Percent
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Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	

39. What are the research needs for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Distribution and abundance	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	2
Limiting factors (food, shelter, water, breeding sites)	50% (1)	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	2
Threats (predators/competition, contamination)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	2
Relationship/dependence on specific habitats	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	2
Population health (genetic and physical)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Total Respondents							12

40. Other research needs for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana.

1. Very little is known about the basic natural history, population ecology and abundance in Indiana of the lesser siren.

Total Respondents 1

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

41. What are the HABITAT research needs for the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total							
Successional changes	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2							
Distribution and abundance (fragmentation)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	2							
Threats (land use change/competition, contamination/global warming)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	2							
Relationship/dependence on specific site conditions	50% (1)	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	2							
Growth and development of individual components of the habitat	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2							
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1							
						Total Respondents	11							

42. Other HABITAT research needs for the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat in Indiana.

1. Factors that limit the distribution of sirens in Indiana

Total Respondents 1

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

43. How well do the following conservation efforts address the threats to the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Population management (hunting, trapping)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Food plots	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Threats reduction	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Native predator control	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Exotic/invasive species control	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Regulation of collecting	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Disease/parasite management	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Protection of migration routes	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Limiting contact with pollutants/contaminants	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Public education to reduce human disturbance	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Culling/selective removal	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Stocking	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Total Respondents						33

44. Other current conservation practices for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) **1**

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?

- Habitat protection is the key, but we need to better understand factors that limit siren abundance & distribution.

Total Respondents **1**

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

46.	How well do the following conservation efforts address the HABITAT threats to the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
	Habitat protection through regulation	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
	Habitat protection on public lands	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
	Habitat protection incentives (financial)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
	Habitat restoration through regulation	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
	Habitat restoration on public lands	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
	Habitat restoration incentives (financial)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
	Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
	Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
	Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
	Corridor development/protection	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
	Managing water regimes	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
	Pollution reduction	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
	Protection of adjacent buffer zone	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
	Restrict public access and disturbance	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
	Land use planning	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
	Technical assistance	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
	Cooperative land management agreements (conservation easements)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
	Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents
							35

47.	Other current HABITAT conservation practices for the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana.
	No responses were entered for this question.
	Total Respondents 0
	(skipped this question) 1

48.	What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Oxboxes/Backwaters/Sloughs/Embayments Habitat in Indiana?
	Habitat protection. However more research is needed to address the effectiveness of habitat restoration on siren conservation.
	Corridor protection
	Total Respondents 2

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

Appendix E-9: Oxboxes/Backwaters/Sloughs/Embayments

49. Do you have any additional comments or information on the Wildlife in Oxbows/Backwaters/Sloughs/Embayments Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

We need to learn a lot more about lesser sirens in order to develop a good conservation design.

Total Respondents 1

Appendix E-10: Rivers and Streams

7. Please also rank these threats to the Wildlife in Rivers and Streams Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	0% (0)	75% (3)	0% (0)	0% (0)	25% (1)	0% (0)	4
Habitat loss (feeding/foraging areas)	0% (0)	50% (2)	25% (1)	0% (0)	25% (1)	0% (0)	4
Small native range (high endemism)	0% (0)	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4
Near limits of natural geographic range	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	0% (0)	4
Large home range requirements	0% (0)	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4
Viable reproductive population size or availability	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	0% (0)	4
Specialized reproductive behavior or low reproductive rates	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	0% (0)	4
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	0% (0)	50% (2)	25% (1)	0% (0)	25% (1)	0% (0)	4
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	0% (0)	50% (2)	50% (2)	4
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents
							38

8. Other threats to the Wildlife in Rivers and Streams Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

9. Please briefly describe the top two threats to the Wildlife in Rivers and Streams Habitat in Indiana identified above.

1. Habitat loss (loss of large nesting trees)

2. 1. Loss of brood rearing habitat.
2. Loss of high quality nesting habitat.

Habitat loss
Degradation of movement/migration routes

Although not habitat specific, the inability to responsibly and proactively manage mink according to the wildlife conservation model, as opposed to reactive measures through nuisance practices, is a concern regarding the conservation of mink. This concern applies across the landscape, not just in urban and suburban environments.

Total Respondents **4**

Appendix E-10: Rivers and Streams

Appendix E-10: Rivers and Streams

10. Please rank the following threats to the HABITAT of the Wildlife in Rivers and Streams Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total													
Commercial or residential development (sprawl)	0% (0)	50% (2)	50% (2)	0% (0)	0% (0)	0% (0)	4													
Counterproductive financial incentives or regulations	0% (0)	25% (1)	25% (1)	0% (0)	25% (1)	25% (1)	4													
Invasive/non-native species	0% (0)	0% (0)	25% (1)	25% (1)	50% (2)	0% (0)	4													
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	0% (0)	50% (2)	25% (1)	25% (1)	0% (0)	4													
Habitat fragmentation	0% (0)	25% (1)	50% (2)	0% (0)	25% (1)	0% (0)	4													
Successional change	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	0% (0)	4													
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	0% (0)	4													
Habitat degradation	0% (0)	75% (3)	0% (0)	0% (0)	25% (1)	0% (0)	4													
Climate change	0% (0)	0% (0)	0% (0)	50% (2)	25% (1)	25% (1)	4													
Stream channelization	75% (3)	25% (1)	0% (0)	0% (0)	0% (0)	0% (0)	4													
Impoundment of water/flow regulation	25% (1)	25% (1)	25% (1)	0% (0)	25% (1)	0% (0)	4													
Agricultural/forestry practices	25% (1)	25% (1)	25% (1)	0% (0)	25% (1)	0% (0)	4													
Residual contamination (persistent toxins)	0% (0)	0% (0)	25% (1)	50% (2)	25% (1)	0% (0)	4													
Point source pollution (continuing)	0% (0)	0% (0)	25% (1)	50% (2)	25% (1)	0% (0)	4													
Mining/acidification	0% (0)	0% (0)	0% (0)	50% (2)	25% (1)	25% (1)	4													
Drainage practices (stormwater runoff)	25% (1)	0% (0)	50% (2)	0% (0)	25% (1)	0% (0)	4													
Unknown	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2													
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1													
							Total Respondents													67

11. Other HABITAT threats to the Wildlife in Rivers and Streams Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-10: Rivers and Streams

12. Please briefly describe the top two HABITAT threats to the Wildlife in Rivers and Streams Habitat in Indiana identified above.

1. Stream channelization removing nesting sites and destroying brood habitat. Soil runoff caused by poor agricultural practices and urban development.

2. 1. Channelization removes and/or changes the vegetative and invertebrate communities. Channelization also alters the natural water flow which results in a much degraded habitat.

2. The loss of bottomland hardwoods continues to be a threat. These areas provide a high quality food source and nesting sites for woodies.

3. Drainage Practices
Stream Channelization

The participant is forced to speculate about the meaning of successional and climate change. Agriculture/Forestry practices have different effects. Grouping these practices as a single category does not appropriately represent the individual practice. Point and nonpoint pollution may have a positive or negative impact.

Total Respondents 4

Appendix E-10: Rivers and Streams

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Rivers and Streams Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	50% (2)	50% (2)	4
Statewide once a year monitoring conducted by state agencies	33% (1)	67% (2)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Regional or local year-round monitoring conducted by state agencies	33% (1)	67% (2)	3
Regional or local once a year monitoring conducted by state agencies	67% (2)	33% (1)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
		Total Respondents	25

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Rivers and Streams Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	25% (1)	75% (3)	4
Statewide once a year monitoring conducted by other organizations	25% (1)	75% (3)	4
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Regional or local year-round monitoring conducted by other organizations	33% (1)	67% (2)	3
Regional or local once a year monitoring conducted by other organizations	0% (0)	100% (3)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other	0% (0)	100% (3)	3

Appendix E-10: Rivers and Streams

organizations

Total Respondents 26

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Rivers and Streams Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	50% (2)	0% (0)	0% (0)	25% (1)	25% (1)	4
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Regional or local year-round monitoring conducted by state agencies	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3
Regional or local once a year monitoring conducted by state agencies	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
				Total Respondents		25

Appendix E-10: Rivers and Streams

18. Regional or local monitoring by other organizations for the Wildlife in Rivers and Streams Habitat in Indiana.

1. Muscatatuck NWR also perform wood duck banding operations.
2. Muscatatuck NWR

Total Respondents 2

19. Please list organizations that are monitoring the Wildlife in Rivers and Streams Habitat in Indiana.

1. IDNR
USFWS
2. USFWS

Indiana Division of Fish and Wildlife. Population monitoring efforts at the state, regional and local scales are to monitor annual trends. Monitoring programs are not limited to river and stream habitats for mink.

Total Respondents 3

Appendix E-10: Rivers and Streams

20. What are the current monitoring techniques for the Wildlife in Rivers and Streams Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
Modeling	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	3
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Spot mapping	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Driving a survey route	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	3
Mark and recapture	67% (2)	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	3
Professional survey/census	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	2
Volunteer survey/census	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	2
Trapping (by any technique)	67% (2)	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	3
Representative sites	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Probabilistic sites	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Other (please specify below)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Total Respondents							31

21. Other monitoring techniques for the Wildlife in Rivers and Streams Habitat in Indiana.

1. nest box survey

2. Nest box surveys

Total Respondents **2**

(skipped this question) **1**

Appendix E-10: Rivers and Streams

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Rivers and Streams Habitat in Indiana?

1. brood surveys

2. 1. Continued participation in HIP is perhaps the most cost effective method for monitoring the flyway population.
2. Banding operations help in determining the status of populations on a local or statewide level

3. Brood counts
Increased banding efforts

See #19

Total Respondents 4

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Rivers and Streams Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	25% (1)	75% (3)	4
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Regional or local year-round inventory and assessment conducted by state agencies	25% (1)	75% (3)	4
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
		Total Respondents	32

Appendix E-10: Rivers and Streams

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Rivers and Streams Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	25% (1)	75% (3)	4
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Regional or local year-round inventory and assessment conducted by other organizations	25% (1)	75% (3)	4
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
		Total Respondents	32

Appendix E-10: Rivers and Streams

regard to land use patterns within these habitats.

Total Respondents 1

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Rivers and Streams Habitat in Indiana.

IDNR
 USFWS
 USDA
 IDEM
 USACE
 EPA
 local government entities (area plan commissions, zoning boards etc..)

Total Respondents 1

30. What are the current monitoring techniques for the Wildlife in Rivers and Streams Habitat in Indiana.
 If a technique is not applicable to the Wildlife in Rivers and Streams Habitat, do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	25% (1)	25% (1)	0% (0)	0% (0)	0% (0)	50% (2)	4
Aerial photography and analysis	25% (1)	25% (1)	0% (0)	0% (0)	0% (0)	50% (2)	4
Systematic sampling	0% (0)	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	4
Property tax estimates	33% (1)	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	3
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
Regulatory information	33% (1)	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	3
Participation in landuse programs	33% (1)	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	3
Modeling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
							Total Respondents 32

Appendix E-10: Rivers and Streams

31. Other HABITAT inventory and assessment techniques for the Wildlife in Rivers and Streams Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Rivers and Streams Habitat in Indiana?

1. gis mapping
aerial photo. and analysis
2. Developing and maintaing accurate GIS data sets on the habitat is very important.
3. spring, summer, fall and winter surveys

Total Respondents 3

33. What is the current body of science for the Wildlife in Rivers and Streams Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		1	33%
Adequate		0	0%
Inadequate		0	0%
Nonexistent		1	33%
Other (please explain below)		1	33%
Total Respondents		3	

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Rivers and Streams Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Ecology and Management of the Wood Duck
 Author = Bellrose and Holm
 Date = 1994
 Publisher = Stackpole Books

**Response
Total Response
Percent**


Appendix E-10: Rivers and Streams

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Rivers and Streams Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Ducks, Geese and Swans of North America
 Author = Bellrose
 Date = 1976
 Publisher = Stackpole Books

**Response
Total Response
Percent**

36. What is the current HABITAT body of science for the Wildlife in Rivers and Streams Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		0	0%
Inadequate		0	0%
Nonexistent		1	33%
Other (please explain below)	The body of science is better than adequate, it is quite extensive and up to date, but by no means is it complete.	2	67%
Total Respondents		2	

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Rivers and Streams Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Wetlands
 Author = Mitsch & Gosselink
 Date = 1993
 Publisher = Van Nostrand Rheinhold

**Response
Total Response
Percent**

Appendix E-10: Rivers and Streams

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Rivers and Streams Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Southern Forested Wetlands
 Author = Messina & Conner
 Date = 1998
 Publisher = CRC Press LLC

**Response
 Total Response
 Percent**

39. What are the research needs for the Wildlife in Rivers and Streams Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total						
Life cycle	0% (0)	0% (0)	25% (1)	0% (0)	75% (3)	0% (0)	4						
Distribution and abundance	0% (0)	25% (1)	50% (2)	0% (0)	25% (1)	0% (0)	4						
Limiting factors (food, shelter, water, breeding sites)	0% (0)	50% (2)	25% (1)	0% (0)	25% (1)	0% (0)	4						
Threats (predators/competition, contamination)	0% (0)	0% (0)	75% (3)	0% (0)	25% (1)	0% (0)	4						
Relationship/dependence on specific habitats	0% (0)	0% (0)	50% (2)	25% (1)	25% (1)	0% (0)	4						
Population health (genetic and physical)	0% (0)	0% (0)	25% (1)	0% (0)	50% (2)	25% (1)	4						
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1						
							Total Respondents	25					

40. Other research needs for the Wildlife in Rivers and Streams Habitat in Indiana.

Research needs are not limited to river and stream habitats

Total Respondents 1

Appendix E-10: Rivers and Streams

41. What are the HABITAT research needs for the Wildlife in Rivers and Streams Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	25% (1)	50% (2)	0% (0)	25% (1)	0% (0)	4
Distribution and abundance (fragmentation)	0% (0)	25% (1)	50% (2)	0% (0)	25% (1)	0% (0)	4
Threats (land use change/competition, contamination/global warming)	0% (0)	50% (2)	25% (1)	0% (0)	25% (1)	0% (0)	4
Relationship/dependence on specific site conditions	0% (0)	0% (0)	25% (1)	25% (1)	50% (2)	0% (0)	4
Growth and development of individual components of the habitat	0% (0)	0% (0)	75% (3)	0% (0)	25% (1)	0% (0)	4
Other (please specify below)	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	2
							Total Respondents
							22

42. Other HABITAT research needs for the Wildlife in Rivers and Streams Habitat in Indiana.

Affects of channelization on streambank communities and the affects on adjacent oxbows, bottomland hardwoods and other riparian areas

Total Respondents **1**

Appendix E-10: Rivers and Streams

43. How well do the following conservation efforts address the threats to the Wildlife in Rivers and Streams Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	75% (3)	0% (0)	25% (1)	0% (0)	0% (0)	4
Population management (hunting, trapping)	50% (2)	50% (2)	0% (0)	0% (0)	0% (0)	4
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (4)	0% (0)	4
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	100% (4)	0% (0)	4
Food plots	0% (0)	50% (2)	25% (1)	25% (1)	0% (0)	4
Threats reduction	0% (0)	25% (1)	25% (1)	0% (0)	50% (2)	4
Native predator control	0% (0)	25% (1)	25% (1)	50% (2)	0% (0)	4
Exotic/invasive species control	0% (0)	50% (2)	0% (0)	25% (1)	25% (1)	4
Regulation of collecting	25% (1)	0% (0)	0% (0)	75% (3)	0% (0)	4
Disease/parasite management	0% (0)	0% (0)	25% (1)	50% (2)	25% (1)	4
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	100% (4)	0% (0)	4
Protection of migration routes	25% (1)	50% (2)	0% (0)	25% (1)	0% (0)	4
Limiting contact with pollutants/contaminants	0% (0)	50% (2)	25% (1)	25% (1)	0% (0)	4
Public education to reduce human disturbance	0% (0)	50% (2)	25% (1)	25% (1)	0% (0)	4
Culling/selective removal	0% (0)	0% (0)	0% (0)	100% (4)	0% (0)	4
Stocking	0% (0)	0% (0)	0% (0)	100% (4)	0% (0)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
				Total Respondents		65

44. Other current conservation practices for the Wildlife in Rivers and Streams Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-10: Rivers and Streams

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Rivers and Streams Habitat in Indiana?

1. To best benefit the Wood Duck, one must first improve the habitat. This particular question seems redundant with #48. Therefore refer to my answer in box number 48.

2. Habitat protection
nest boxes

See #43. In addition, although not habitat specific, outreach programs are needed to effectively and accurately educate citizens about wildlife (game and non-game), the wildlife conservation model (for game and non-game), and the need for effective mink management programs.

Total Respondents 3

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Rivers and Streams Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	25% (1)	50% (2)	25% (1)	0% (0)	0% (0)	4
Habitat protection on public lands	50% (2)	25% (1)	25% (1)	0% (0)	0% (0)	4
Habitat protection incentives (financial)	50% (2)	25% (1)	25% (1)	0% (0)	0% (0)	4
Habitat restoration through regulation	75% (3)	0% (0)	25% (1)	0% (0)	0% (0)	4
Habitat restoration on public lands	75% (3)	25% (1)	0% (0)	0% (0)	0% (0)	4
Habitat restoration incentives (financial)	75% (3)	25% (1)	0% (0)	0% (0)	0% (0)	4
Artificial habitat creation (artificial reefs, nesting platforms)	25% (1)	50% (2)	0% (0)	25% (1)	0% (0)	4
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	25% (1)	0% (0)	50% (2)	25% (1)	4
Succession control (fire, mowing)	0% (0)	50% (2)	25% (1)	25% (1)	0% (0)	4
Corridor development/protection	25% (1)	50% (2)	0% (0)	25% (1)	0% (0)	4
Managing water regimes	25% (1)	50% (2)	0% (0)	25% (1)	0% (0)	4
Pollution reduction	0% (0)	75% (3)	0% (0)	25% (1)	0% (0)	4
Protection of adjacent buffer zone	50% (2)	25% (1)	0% (0)	25% (1)	0% (0)	4
Restrict public access and disturbance	0% (0)	75% (3)	0% (0)	25% (1)	0% (0)	4
Land use planning	50 (2)	25% (1)	0% (0)	25% (1)	0% (0)	4
Technical assistance	0% (0)	75% (3)	0% (0)	25% (1)	0% (0)	4
Cooperative land management agreements (conservation easements)	33% (1)	33% (1)	0% (0)	0% (0)	33% (1)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
						Total Respondents 68

Appendix E-10: Rivers and Streams

47. Other current HABITAT conservation practices for the **Wildlife in rivers and streams** habitat in Indiana.

No responses were entered for this question.

Total Respondents	0
(skipped this question)	3

Appendix E-10: Rivers and Streams

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Rivers and Streams Habitat in Indiana?

1. Elimination of, or at the very least, reducing, the amount of stream channelization that occurs.
2. Restoration of bottomland hardwoods through the farmbill and other incentive type programs is also very good.
Elimination of ditches and stream channelization

Total Respondents **2**

49. Do you have any additional comments or information on the Wildlife in Rivers and Streams Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

No responses were entered for this question.

Total Respondents **0**

Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

7. Please also rank these threats to the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Habitat loss (feeding/foraging areas)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Small native range (high endemism)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Near limits of natural geographic range	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Large home range requirements	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Viable reproductive population size or availability	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Specialized reproductive behavior or low reproductive rates	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Total Respondents							11

8. Other threats to the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

9. Please briefly describe the top two threats to the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana identified above.

1. Past pollution problems
2. Dams on rivers block migration

Total Respondents **1**

Appendix E-11: Rivers and Streams Great Lakes Drainage Great River

10. Please rank the following threats to the HABITAT of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Commercial or residential development (sprawl)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Counterproductive financial incentives or regulations	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Invasive/non-native species	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Habitat fragmentation	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Successional change	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Habitat degradation	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Climate change	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Stream channelization	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Impoundment of water/flow regulation	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Agricultural/forestry practices	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Residual contamination (persistent toxins)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Point source pollution (continuing)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Mining/acidification	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Drainage practices (stormwater runoff)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents
							18

11. Other HABITAT threats to the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

12. Please briefly describe the top two HABITAT threats to the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana identified above.

1. Sedimentation
2. Dams fragmenting habitat

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Total Respondents 1

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (1)	1
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	1
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (1)	1
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	100% (1)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	1
		Total Respondents	8

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (1)	1
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (1)	1
Regional or local once a year monitoring conducted by other organizations	100% (1)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1

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Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
Total Respondents			8

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?		Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regional or local once a year monitoring conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)		1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Total Respondents							8

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16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total				
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Regional or local once a year monitoring conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1				
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
							Total Respondents	8		

17. Regional or local state agency monitoring for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

IDEM annual ecoregion sampling

Total Respondents 1

18. Regional or local monitoring by other organizations for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

19. Please list organizations that are monitoring the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

City of Elkhart - Elkhart and St. Joseph counties

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Total Respondents 1

20. What are the current monitoring techniques for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Modeling	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Spot mapping	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Driving a survey route	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Mark and recapture	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Professional survey/census	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Volunteer survey/census	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Trapping (by any technique)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Representative sites	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Probabilistic sites	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Total Respondents							13

21. Other monitoring techniques for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

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22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

Radio telemetry or mark & recapture

Total Respondents 1

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
		Total Respondents	8

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (1)	1

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Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Total Respondents			8

25.	How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?					
	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Total Respondents						8

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26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
						Total Respondents
						8

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

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No responses were entered for this question.

Total Respondents **0**
 (skipped this question) 1

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**
 (skipped this question) 1

30. What are the current HABITAT inventory and/or assessment techniques for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?
 If a technique is not applicable to the Wildlife in Great Rivers of the Great Lakes Drainage Habitat do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Aerial photography and analysis	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Systematic sampling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regulatory information	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Participation in landuse programs	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Modeling	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents 10

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31. Other HABITAT inventory and assessment techniques for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

GIS mapping and aerial photography

Total Respondents 1

33. What is the current body of science for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	0	0%
Nonexistent	1	100%
Other (please explain below)	0	0%
Total Respondents	1	

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	
(skipped this question)		1

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Response Total Response Percent

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Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
	Total Respondents	0
	(skipped this question)	1

36. What is the current HABITAT body of science for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	0	0%
Nonexistent	1	100%
Other (please explain below)	0	0%
	Total Respondents	1

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
	Total Respondents	0
	(skipped this question)	1

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%

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Publisher	0	0%
	Total Respondents	0
	(skipped this question)	1

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39. What are the research needs for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Distribution and abundance	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Limiting factors (food, shelter, water, breeding sites)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Threats (predators/competition, contamination)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Relationship/dependence on specific habitats	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Population health (genetic and physical)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							7
						Total Respondents	7

40. Other research needs for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

41. What are the HABITAT research needs for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Distribution and abundance (fragmentation)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Threats (land use change/competition, contamination/global warming)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Relationship/dependence on specific site conditions	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Growth and development of individual components of the habitat	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							6
						Total Respondents	6

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42. Other HABITAT research needs for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

43. How well do the following conservation efforts address the threats to the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Population management (hunting, trapping)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Food plots	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Threats reduction	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Native predator control	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Exotic/invasive species control	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regulation of collecting	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Disease/parasite management	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Protection of migration routes	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Limiting contact with pollutants/contaminants	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Public education to reduce human disturbance	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Culling/selective removal	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Stocking	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
				Total Respondents		17

44. Other current conservation practices for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

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45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

Protection of migration routes

Total Respondents 1

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Habitat protection on public lands	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Habitat protection incentives (financial)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Habitat restoration through regulation	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Habitat restoration on public lands	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Habitat restoration incentives (financial)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Corridor development/protection	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Managing water regimes	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Pollution reduction	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Protection of adjacent buffer zone	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Restrict public access and disturbance	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Land use planning	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Technical assistance	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Cooperative land management agreements (conservation easements)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
				Total Respondents		18

47. Other current HABITAT conservation practices for the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

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48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Great Rivers of the Great Lakes Drainage Habitat in Indiana?

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

49. Do you have any additional comments or information on the Wildlife in Great Rivers of the Great Lakes Drainage Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

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7. Please also rank these threats to the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	0% (0)	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Habitat loss (feeding/foraging areas)	0% (0)	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Small native range (high endemism)	0% (0)	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	3
Near limits of natural geographic range	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Large home range requirements	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Viable reproductive population size or availability	0% (0)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Specialized reproductive behavior or low reproductive rates	0% (0)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	0% (0)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
						Total Respondents	29

8. Other threats to the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

9. Please briefly describe the top two threats to the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana identified above.

Exotic species competition, specifically the round goby.

Habitat degradation, non-point sources runoff resulting from loss of riparian buffers due to development.

High sediment loads during spring rains

Total Respondents 3

Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

10. Please rank the following threats to the HABITAT of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total													
Commercial or residential development (sprawl)	33% (1)	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	3													
Counterproductive financial incentives or regulations	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3													
Invasive/non-native species	33% (1)	33% (1)	0% (0)	0% (0)	33% (1)	0% (0)	3													
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3													
Habitat fragmentation	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3													
Successional change	0% (0)	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	3													
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3													
Habitat degradation	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3													
Climate change	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3													
Stream channelization	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	0% (0)	3													
Impoundment of water/flow regulation	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3													
Agricultural/forestry practices	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	0% (0)	3													
Residual contamination (persistent toxins)	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3													
Point source pollution (continuing)	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3													
Mining/acidification	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3													
Drainage practices (stormwater runoff)	0% (0)	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	3													
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1													
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1													
Total Respondents							50													

11. Other HABITAT threats to the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

12. Please briefly describe the top two HABITAT threats to the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana identified above.

Invasive species competition, specifically round goby interactions. Stream channelazation resulting in loss of habitat.

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Invasive species, non-point source pollution

Sedimentation

Loss of habitat due to development in headwater areas

Total Respondents 3

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (3)	3
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (3)	3
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (3)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	100% (3)	0% (0)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	67% (2)	33% (1)	3
		Total Respondents	24

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (3)	3
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (3)	3
Regional or local once a year monitoring conducted by other	0% (0)	100% (3)	3

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organizations			
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	33% (1)	67% (2)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
		Total Respondents	24

15.	How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?					
	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Regional or local once a year monitoring conducted by state agencies	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	33% (1)	0% (0)	67% (2)	0% (0)	0% (0)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	33% (1)	0% (0)	33% (1)	0% (0)	33% (1)	3
				Total Respondents		24

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19. Please list organizations that are monitoring the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

IDNR-Fish and Wildlife.

Total Respondents 1

20. What are the current monitoring techniques for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Modeling	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	3
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Spot mapping	0% (0)	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3
Driving a survey route	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Mark and recapture	0% (0)	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3
Professional survey/census	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3
Volunteer survey/census	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Trapping (by any technique)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3
Representative sites	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3
Probabilistic sites	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents 36

21. Other monitoring techniques for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

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	Total Respondents 0
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22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

Stream sampling using electrofishing techniques and seining. This should be done every 5 years to get a clear picture of changes that occur to habitat, water quality and invasive species introductions and distribution.

Rotational sampling at reference sites along the headwaters. Historical comparisons from the early 80's will be compared with the sampling that was completed 2001-2004.

Total Respondents 2

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Regional or local once a year inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	100% (3)	0% (0)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	67% (2)	33% (1)	3
	Total Respondents		24

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24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	33% (1)	67% (2)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
		Total Respondents	24

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25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	33% (1)	33% (1)	0% (0)	0% (0)	33% (1)	3
				Total Respondents		24

Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
				Total Respondents		24

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

Trail Creek, East Branch of Little Calumet river, Reynolds Creek, Salt Creek, West Branch of Little Calumet River, Deep River.

IDEM ecoregion surveys

Total Respondents 2

Appendix E-12: Rivers and Streams Great Lakes Drainage Headwater

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

City of Elkhart

Total Respondents 1

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

IDNR-Fish and Wildlife, USFWS

IDNR-Fish and Wildlife, Lake Michigan Fisheries Office

Total Respondents 2

30. What are the current HABITAT inventory and/or assessment techniques for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

If a technique is not applicable to the Wildlife in Headwaters of the Great Lakes Drainage Habitat do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Aerial photography and analysis	0% (0)	33% (1)	0% (0)	33% (1)	0% (0)	33% (1)	3
Systematic sampling	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Property tax estimates	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
State revenue data	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Regulatory information	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Participation in landuse programs	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
Modeling	0% (0)	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents 28

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31. Other HABITAT inventory and assessment techniques for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

IBI, and QHEI for representative sites.

Total Respondents 1

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32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

Sampling.

Sampling using electrofishing and seining in headwater areas. Completing IBI and QHEI and water quality analysis for these sites.

Total Respondents 2

33. What is the current body of science for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		0	0%
Inadequate		0	0%
Nonexistent		1	33%
Other (please explain below)	 Unknown in the larger scale	2	67%
		Total Respondents	3

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Fisheries Survey of the East Branch of the Little Calumet River Watershed
 Author = Neil Ledet
 Date = 1978
 Publisher = IDNR Fisheries Section

Response Total Response Percent

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Stream Survey of the East Arm of the Little Calumet River
 Author = Edward Braun
 Date = 1974
 Publisher = IDNR Division of Fish and Wildlife

Response Total Response Percent

36. What is the current HABITAT body of science for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%

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Inadequate		1	33%
Nonexistent		1	33%
Other (please explain below)	 Unknown on the larger scale	1	33%
Total Respondents			3

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Fisheries Survey of the East Branch of the Little Calumet River Watershed

Author = Neil Ledet

Date = 1978

Publisher = IDNR Fisheries Section

**Response
Total Response
 Percent**

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Stream Survey of the East Arm of the Little Calumet River

Author = Edward Braun

Date = 1974

Publisher = IDNR Division of Fish and Wildlife

**Response
Total Response
 Percent**

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39. What are the research needs for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Distribution and abundance	0% (0)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Limiting factors (food, shelter, water, breeding sites)	0% (0)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Threats (predators/competition, contamination)	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Relationship/dependence on specific habitats	0% (0)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Population health (genetic and physical)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents
							19

40. Other research needs for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

41. What are the HABITAT research needs for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Distribution and abundance (fragmentation)	0% (0)	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3
Threats (land use change/competition, contamination/global warming)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3
Relationship/dependence on specific site conditions	0% (0)	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
Growth and development of individual components of the habitat	0% (0)	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents
							16

42. Other HABITAT research needs for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

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No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

43. How well do the following conservation efforts address the threats to the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
Population management (hunting, trapping)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Food plots	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Threats reduction	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Native predator control	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Exotic/invasive species control	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
Regulation of collecting	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Disease/parasite management	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Protection of migration routes	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Limiting contact with pollutants/contaminants	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Public education to reduce human disturbance	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Culling/selective removal	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Stocking	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
				Total Respondents		49

44. Other current conservation practices for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

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Land use planning and education.

Habitat protection through landuse regulation. Agricultural runoff protection through education and landuse planning.

Total Respondents **2**

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46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
Habitat protection on public lands	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	3
Habitat protection incentives (financial)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Habitat restoration through regulation	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Habitat restoration on public lands	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	3
Habitat restoration incentives (financial)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Corridor development/protection	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Managing water regimes	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
Pollution reduction	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
Protection of adjacent buffer zone	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
Restrict public access and disturbance	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3
Land use planning	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Technical assistance	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Cooperative land management agreements (conservation easements)	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
				Total Respondents		52

47. Other current HABITAT conservation practices for the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana?

Protection of habitat through land use planning. Currently most of the headwaters areas run through agricultural areas and need to maintain riparian buffer strips.

Total Respondents 1

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49. Do you have any additional comments or information on the Wildlife in Headwaters of the Great Lakes Drainage Habitat in Indiana that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

It has been over 20 years since the surveys were conducted, prior to the 2001-2004 surveys. It is important that surveys be conducted every 5 years or so to document changes to water quality, habitat and riparian zone protection.

Total Respondents 1

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

7. Please also rank these threats to the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	3
Habitat loss (feeding/foraging areas)	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	0% (0)	3
Small native range (high endemism)	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Near limits of natural geographic range	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Large home range requirements	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Viable reproductive population size or availability	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3
Specialized reproductive behavior or low reproductive rates	33% (1)	0% (0)	33% (1)	0% (0)	33% (1)	0% (0)	3
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	33% (1)	0% (0)	33% (1)	0% (0)	0% (0)	33% (1)	3
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Total Respondents							30

8. Other threats to the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

My area of expertise is effects of contamination on biological organisms, especially aquatic. This makes filling out the survey difficult. My knowledge is applicable to aquatic habitats rather than specific wildlife species in this survey.

Total Respondents 1

9. Please briefly describe the top two threats to the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana identified above.

1. The acute effects of toxicants are recognized as a threat to organisms, but there is little knowledge on ecosystems or regional effects on chronic insults. Toxicants are more destructive to the embryonic stages, but these are poorly documented. Pollution controls do not have definite focus on chronic effects

2. Habitat loss and pollution

Siltation- hornyhead chub are sight-feeders and mound builders for spawning; thus, muddy water will hamper their chances of survival and if the silt covers gravel and their nest, chances for successful reproduction will be limited. Competition from other wildlife species better adapted to muddy and silty stream conditions

1. Runoff, mostly agricultural
2. Instream modifications

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

Total Respondents 4

10. Please rank the following threats to the HABITAT of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Commercial or residential development (sprawl)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3
Counterproductive financial incentives or regulations	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Invasive/non-native species	33% (1)	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	3
Nonpoint source pollution (sedimentation and nutrients)	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	0% (0)	4
Habitat fragmentation	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Successional change	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	3
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
Habitat degradation	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	0% (0)	4
Climate change	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	3
Stream channelization	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	0% (0)	3
Impoundment of water/flow regulation	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3
Agricultural/forestry practices	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	0% (0)	4
Residual contamination (persistent toxins)	0% (0)	50% (2)	0% (0)	25% (1)	0% (0)	25% (1)	4
Point source pollution (continuing)	0% (0)	75% (3)	0% (0)	25% (1)	0% (0)	0% (0)	4
Mining/acidification	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	0% (0)	4
Drainage practices (stormwater runoff)	0% (0)	75% (3)	25% (1)	0% (0)	0% (0)	0% (0)	4
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Total Respondents							58

11. Other HABITAT threats to the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

Riparian cooridor destruction. Loss of shading and sedimentation

Total Respondents 1

12. Please briefly describe the top two HABITAT threats to the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana identified above.

Habitat Degradation and Nonpoint source pollution

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

Nonpoint source pollution- sedimentation
 Agricultural practices- again sedimentation

1. Loss of riparian corridor
2. Runoff

Total Respondents 3

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (3)	3
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (3)	3
Regional or local once a year monitoring conducted by state agencies	33% (1)	67% (2)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	67% (2)	33% (1)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	67% (2)	33% (1)	3
	Total Respondents		24

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (3)	3
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (3)	3

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Regional or local once a year monitoring conducted by other organizations	33% (1)	67% (2)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	67% (2)	33% (1)	3
		Total Respondents	24

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Regional or local once a year monitoring conducted by state agencies	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
					Total Respondents	24

16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Regional or local once a year monitoring conducted by other organizations	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
Total Respondents						24

17. Regional or local state agency monitoring for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

IDNR periodically conducts fish stream surveys. IDEM conducts stream health surveys using fish and invertebrates.

IDEM monitors the Great Lakes Drainage once every five years; thus, they may have data available for hornyhead chub captured in the basin as part of the fish community assessments. IDNR may also sample fish communities in this area and have data on the hornyhead chub.

Maumee system

Total Respondents 3

18. Regional or local monitoring by other organizations for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

In some cities stream health is also assessed by fish and invertebrate surveys.

Elkhart Public Works and Utilities has a fisheries biologist on staff that actively collects fish community samples from the Great Lakes Basin (1-2 times in the summer). He may have data on the hornyhead chub as well.

Maumee system

Total Respondents 3

19. Please list organizations that are monitoring the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

IDNR, IDEM, City of Elkhart and South Bend.

TNC

Total Respondents 2

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

20. What are the current monitoring techniques for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Modeling	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	33% (1)	3
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Spot mapping	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3
Driving a survey route	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	33% (1)	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	3
Mark and recapture	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Professional survey/census	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	3
Volunteer survey/census	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3
Trapping (by any technique)	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	2
Representative sites	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3
Probabilistic sites	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	33% (1)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Total Respondents							34

21. Other monitoring techniques for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

Professional Fish Surveys and Creel Surveys

IDEM, IDNR, and Elkhart use electrofishing equipment to sample fish communities; however, a seine could probably be used as well as tagging and radio telemetry to track the species movement.

1. Intensive quantitative sampling of known populations. Need to understand demography of wildlife species. See Strayer & Smith, 2003. AFS Monogr. 8.
2. Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of wildlife species. See same for protocols.

Total Respondents 3

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Regional or local once a year inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	67% (2)	33% (1)	3
	Total Respondents		24

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (3)	3
Regional or local once a year inventory and assessment conducted by other organizations	33% (1)	67% (2)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	33% (1)	67% (2)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	67% (2)	33% (1)	3
	Total Respondents		24

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
					Total Respondents	24

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

In all major tributaries of Lake Michigan

Like I mentioned in my survey for the Eastern Sand Darter, IDEM, IDNR, and Eikhart use the QHEI (Qualitative Habitat Evaluation Index) to assess habitat in streams.

Maumee system

Total Respondents 3

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

St. Joseph River

Maumee system

Total Respondents 2

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

IDNR, IDEM, City of Elkhart and South Bend

TNC

Total Respondents 2

30. What are the current HABITAT inventory and/or assessment techniques for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

If a technique is not applicable to the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	3
Aerial photography and analysis	0% (0)	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	3
Systematic sampling	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
Regulatory information	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	3
Participation in landuse programs	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	3
Modeling	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3
Voluntary landowner reporting	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

Total Respondents 29



31. Other HABITAT inventory and assessment techniques for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

Assessment using the Qualitative Habitat Evaluation Index.

1. Assess riparian corridor
2. Water quality

Total Respondents 2

33. What is the current body of science for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	3	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
Total Respondents	3	

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Naiades of Pennsylvania
 Author = Ortmann
 Date = 1919
 Publisher = Carnegie Museum

**Response
Total Response
Percent**

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35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Freshwater mussels of the Midwest
 Author = Cummings & Mayer
 Date = 1992
 Publisher = INHS

Response Total Response Percent

36. What is the current HABITAT body of science for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

Complete, up to date and extensive
 Adequate
 Inadequate
 Nonexistent
 Other (please explain below)

Response Total Response Percent

Total Respondents 3

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Naiades of Pennsylvania
 Author = Ortmann
 Date = 1919
 Publisher = Carnegie Museum

Response Total Response Percent

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Freshwater Mollusca of WI
 Author = Baker
 Date = 1928
 Publisher = WI Geol. Nat. Hist. Survey

Response Total Response Percent

39. What are the research needs for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	33% (1)	0% (0)	0% (0)	33% (1)	33% (1)	0% (0)	3
Distribution and abundance	0% (0)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Limiting factors (food, shelter, water, breeding sites)	0% (0)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Threats (predators/competition,	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3

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contamination)								
Relationship/dependence on specific habitats	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3	
Population health (genetic and physical)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	3	
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1	
							Total Respondents	25

40.	Other research needs for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.
	No responses were entered for this question.
	Total Respondents 0

41.	What are the HABITAT research needs for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?								
		Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total	
	Successional changes	0% (0)	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3	
	Distribution and abundance (fragmentation)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3	
	Threats (land use change/competition, contamination/global warming)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3	
	Relationship/dependence on specific site conditions	33% (1)	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	3	
	Growth and development of individual components of the habitat	33% (1)	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	3	
	Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1	
								Total Respondents	16

42.	Other HABITAT research needs for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.
	No responses were entered for this question.
	Total Respondents 0

43.	How well do the following conservation efforts address the threats to the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?							
		Very well	Somewhat	Not at all	Not used	Unknown	Response Total	
	Habitat protection (use below for details)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2	

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Population management (hunting, trapping)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Food plots	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Threats reduction	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Native predator control	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Exotic/invasive species control	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	2
Regulation of collecting	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	2
Disease/parasite management	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Protection of migration routes	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Limiting contact with pollutants/contaminants	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Public education to reduce human disturbance	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Culling/selective removal	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Stocking	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Total Respondents						34

44. Other current conservation practices for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

Habitat protection if it greatly reduced the turbidity in streams for hornyhead chub feeding and breeding behaviors. Also, exotic/invasive species control would help the hornyhead population. The hornyhead chub is sensitive to pollution so limiting contact with pollutants/contaminants would benefit the species. The hornyhead chub is also a popular bait fish, so regulation of collecting would be beneficial to the species.

Total Respondents 1

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

Habitat protection and Public Education

Habitat protection - erosion controls

Exotic species - possession of exotic species illegal (must dispose of fish properly and not release back to stream)

1. Intensive quantitative sampling of known populations. Need to understand demography of wildlife species. See Strayer & Smith, 2003. AFS Monogr. 8.

2. Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of wildlife species. See same for protocols.

Total Respondents 3

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Habitat protection on public lands	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Habitat protection incentives (financial)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Habitat restoration through regulation	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Habitat restoration on public lands	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Habitat restoration incentives (financial)	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Corridor development/protection	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Managing water regimes	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Pollution reduction	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Protection of adjacent buffer zone	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	3
Restrict public access and disturbance	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Land use planning	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Technical assistance	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Cooperative land management agreements (conservation easements)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
						Total Respondents 36

Appendix E-13: Rivers and Streams Great Lakes Drainage Wadeable/Large River

47. Other current HABITAT conservation practices for the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana.

Habitat protection and restoration on all lands by any means necessary would benefit all wildlife species (except those that are exotic and more tolerant than others) not just the hornyhead chub. Pollution reduction, protection of adjacent buffer zone, land use planning, and conservation easements would all be beneficial practices to the Hornyhead chub.

Total Respondents 1

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat in Indiana?

Protection and restoration of Buffer Zones

Protection of adjacent buffer zone
Nonpoint Source Pollution reduction

1. Assess riparian corridor
 2. Water quality monitoring
- See Watters, 2000. Proc. 1st FMCS Symposium

Total Respondents 3

49. Do you have any additional comments or information on the Wildlife in Wadeable/ Large Rivers of the Great Lakes Drainage Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

The overall smallmouth bass population in this area is somewhat poor aside from the St. Joseph River. I believe this is mostly due to the lack of habitat and loss of buffer zones. Buffer zones are vital to the health of smallmouth bass populations. They supply and protect habitat that is vital to the survival of the smallmouth bass.

IDEM has collected hornyhead chubs from the Elkhart River (Elkhart & Noble counties), St. Joseph River (DeKalb County), Cedar Creek (Allen Co.), Yellow Creek (Elkhart Co.), and Pigeon River (Lagrange Co.). If you would like the data, we can provide water chemistry, biological, and habitat data assessments.

N/A

Total Respondents 3

Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

7. Please also rank these threats to the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	67% (2)	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	3
Habitat loss (feeding/foraging areas)	67% (2)	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	3
Small native range (high endemism)	0% (0)	33% (1)	0% (0)	0% (0)	33% (1)	33% (1)	3
Near limits of natural geographic range	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	0% (0)	3
Large home range requirements	0% (0)	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Viable reproductive population size or availability	33% (1)	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	3
Specialized reproductive behavior or low reproductive rates	33% (1)	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	3
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	67% (2)	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	3
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
							Total Respondents
							27

8. Other threats to the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

9. Please briefly describe the top two threats to the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana identified above.

Pike have suffered a major loss of spawning habitat due to the prevalence of dredging within the watershed. This practice along with levee construction has resulted in the near elimination of instream emergent wetland vegetation throughout the majority of the watershed.

Habitat loss - requires shallow clear water with little current in weedy areas over gravel, sand, and silt to feed on insects and lay reproduce

Dredging (removal of aquatic vegetation and increasing depth of ditch)

Runoff (increases flow of stream, turbidity, and siltation of needed substrates)

Habitat loss (breeding & feeding)- the tadpole madtom feeds in dense vegetation and hides from predators in the leaf litter, dead wood, and other cover. By removing vegetation and cover in the stream, the tadpole madtom also loses spawning areas (tadpole madtoms typically lay eggs under submerged objects).

Degradation of the stream channel will also increase the velocity of the current (if straightened or cleared of debris)

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which will remove the tadpole madtom's preferred current-free, quiet habitat.

Total Respondents

3

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10. Please rank the following threats to the HABITAT of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total													
Commercial or residential development (sprawl)	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3													
Counterproductive financial incentives or regulations	0% (0)	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3													
Invasive/non-native species	0% (0)	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3													
Nonpoint source pollution (sedimentation and nutrients)	33% (1)	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	3													
Habitat fragmentation	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3													
Successional change	0% (0)	33% (1)	33% (1)	0% (0)	33% (1)	0% (0)	3													
Diseases (of plants that create habitat)	0% (0)	0% (0)	33% (1)	0% (0)	33% (1)	33% (1)	3													
Habitat degradation	67% (2)	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	3													
Climate change	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3													
Stream channelization	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	0% (0)	3													
Impoundment of water/flow regulation	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	0% (0)	3													
Agricultural/forestry practices	33% (1)	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	3													
Residual contamination (persistent toxins)	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3													
Point source pollution (continuing)	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	0% (0)	3													
Mining/acidification	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2													
Drainage practices (stormwater runoff)	33% (1)	0% (0)	0% (0)	33% (1)	33% (1)	0% (0)	3													
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0													
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0													
Total Respondents							47													

11. Other HABITAT threats to the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

12. Please briefly describe the top two HABITAT threats to the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana identified above.

The channelization of many streams in the upper Kankakee watershed and the associated fragmentation of wetland habitat has severely altered the state of the aquatic habitat in general.

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Non-point source pollution (sedimentation resulting in smothering of substrates and turbidity)
Habitat degradation (removal of vegetation and shallow water)

Stream channelization (straightening the channels to move water faster) and Habitat degradation (removal of debris in the stream to speed up the transfer of water off of the land and into the receiving stream)

Total Respondents 3

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (3)	3
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (3)	3
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (3)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (3)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	67% (2)	33% (1)	3
		Total Respondents	24

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (3)	3
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (3)	3
Regional or local year-round monitoring conducted by other	0% (0)	100% (3)	3

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16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Regional or local once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	33% (1)	67% (2)	3
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Total Respondents						24

17. Regional or local state agency monitoring for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

DNR fishery surveys are occasionally conducted on the Iroquois River, the Yellow River, and the Kankakee River. IDEM occasionally samples fish for contaminants analysis for the annual Fish Consumption Advisory.

IDEM and IDNR collect fish community samples in this area; thus, they may have data on the distribution of Least darters.

IDEM monitors the Kankakee River basin once every five years to determine if the stream are supporting a well-balanced warmwater aquatic community. Tadpole madtoms may have been captured while sampling headwater streams.

Total Respondents 3

18. Regional or local monitoring by other organizations for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

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19. Please list organizations that are monitoring the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

DNR and IDEM

Total Respondents 1

20. What are the current monitoring techniques for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
Modeling	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Spot mapping	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Driving a survey route	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	33% (1)	0% (0)	33% (1)	0% (0)	33% (1)	3
Mark and recapture	0% (0)	0% (0)	67% (2)	0% (0)	0% (0)	33% (1)	3
Professional survey/census	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3
Volunteer survey/census	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	67% (2)	3
Trapping (by any technique)	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	3
Representative sites	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	3
Probabilistic sites	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
							Total Respondents 31

21. Other monitoring techniques for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

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Total Respondents 0

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

Periodic electrofishing surveys and mark recapture techniques probably provide the best information about the pike populations.

Representative sites or look for sites where the habitat is suitable for the least darter and seine in the vegetation over rocky substrate.

seining or kick net
electrofishing

Total Respondents 3

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (3)	3
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	33% (1)	67% (2)	3
			Total Respondents 24

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other	0% (0)	100% (3)	3

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Total Respondents 16



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26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	2
				Total Respondents		16

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

Habitat evaluations are conducted as part of general stream surveys by DNR biologists. Such surveys have been conducted on the Iroquois River, the Yellow River, and the Kankakee River.

As I stated in previous surveys, the QHEI would provide a habitat assessment for sites where least darters were collected.

IDEM conducts a habitat assessment while sampling stream for fish community assessments using the QHEI (Qualitative Habitat Evaluation Index).

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Total Respondents 3

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

DNR division of Fish and Wildlife

Total Respondents 1

30. What are the current HABITAT inventory and/or assessment techniques for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana? If a technique is not applicable to the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Aerial photography and analysis	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Systematic sampling	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	2
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regulatory information	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	2
Participation in landuse programs	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	2
Modeling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
							Total Respondents 14

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31. Other HABITAT inventory and assessment techniques for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

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32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

Systematic sampling of the habitat along the length of the stream to provide baseline data for comparison across time. GIS mapping of restored, fully connected wetland to provide an inventory of available spawning habitat.

Total Respondents 1

33. What is the current body of science for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	3	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
Total Respondents	3	

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Fishery, Habitat, and Recreational Use Surveys for the Kankakee River
 Author = Price and Robertson
 Date = 2005
 Publisher = DNR - Division of Fish and Wildlife (in review)

Response Total Response Percent

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = A fishery survey of the Kankakee River in Indiana
 Author = Robertson and Ledet
 Date = 1981
 Publisher = DNR - Division of Fish and Wildlife

Response Total Response Percent

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36. What is the current HABITAT body of science for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	3	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
Total Respondents	3	

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Fishery, Habitat, and Recreational Use Surveys for the Kankakee River		
Author = Price and Robertson		
Date = 2005		
Publisher = DNR - Division of Fish and Wildlife (in review)		
	Response Total	Response Percent

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = A fishery survey of the Kankakee River in Indiana		
Author = Robertson and Ledet		
Date = 1981		
Publisher = DNR - Division of Fish and Wildlife		
	Response Total	Response Percent

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42. Other HABITAT research needs for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

43. How well do the following conservation efforts address the threats to the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Population management (hunting, trapping)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Population enhancement (captive breeding and release)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Reintroduction (restoration)	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Food plots	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Threats reduction	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Native predator control	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Exotic/invasive species control	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Regulation of collecting	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Disease/parasite management	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Translocation to new geographic range	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Protection of migration routes	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Limiting contact with pollutants/contaminants	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Public education to reduce human disturbance	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	2
Culling/selective removal	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Stocking	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
				Total Respondents		32

44. Other current conservation practices for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

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45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

Restoring the connection between the streams and the wetlands that were formerly associated with them to allow pike access to spawning areas. Current water management regimes often rely on pumping to fill restored wetlands, thus, fish passage is still restricted.

Habitat protection and the possible reintroduction of the least darter into suitable habitats that have been restored.

Habitat protection

Total Respondents 3

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	2
Habitat protection on public lands	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	2
Habitat protection incentives (financial)	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	2
Habitat restoration through regulation	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Habitat restoration on public lands	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	2
Habitat restoration incentives (financial)	50% (1)	0% (0)	50% (1)	0% (0)	0% (0)	2
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Corridor development/protection	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Managing water regimes	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	2
Pollution reduction	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Protection of adjacent buffer zone	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Restrict public access and disturbance	50% (1)	0% (0)	0% (0)	50% (1)	0% (0)	2
Land use planning	50% (1)	0% (0)	0% (0)	50% (1)	0% (0)	2
Technical assistance	0% (0)	50% (1)	0% (0)	50% (1)	0% (0)	2
Cooperative land management agreements (conservation easements)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
						Total Respondents 31

47. Other current HABITAT conservation practices for the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

No responses were entered for this question.

Total Respondents **0**

Appendix E-14: Rivers and Streams Kankakee River (Illinois River) Drainage Headwater

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

Wetland restoration projects with connectivity to the stream or "corridor" development that allows passage to wetlands already restored. We need to move toward natural regulation of water levels instead of artificial means.

Habitat protection through regulation
Protection of adjacent buffer zone.

Habitat protection
Restrict disturbance to habitat (dredging, removal of debris)

Total Respondents 3

49. Do you have any additional comments or information on the Wildlife in Headwaters of the Kankakee River (Illinois River) Drainage Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

IDEM has captured least darters at the following locations: Ringeisen Ditch, Trib of Carpenter Cr, Keefe Ditch, Claude May Ditch, and Howe Ditch in Jasper County, Singleton Ditch in Lake Co., Weiss Ditch in Newton Co., and Minier Lateral in Benton Co.

IDEM has collected tadpole madtoms on the following streams: West Creek and Singleton Ditch in Lake County, Dausman Ditch in Kosciusko Co., Bogus Run in Starke Co., and Slough Creek in Jasper Co.

Total Respondents 2

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

7. Please also rank these threats to the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Habitat loss (feeding/foraging areas)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Small native range (high endemism)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Near limits of natural geographic range	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Large home range requirements	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Viable reproductive population size or availability	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Specialized reproductive behavior or low reproductive rates	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Total Respondents							10

8. Other threats to the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

9. Please briefly describe the top two threats to the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana identified above.

habitat loss/unintentional take-'cleaning' and dredging of streams of the Kankakee drainage can result in a large amount of creek heelsplitters being lost
dependence on other wildlife species-require fish host to reproduce; if fish populations decrease for any of a variety of reasons, then creek heelsplitter reproduction could decrease substantially

Habitat loss - requires shallow clear water with little current in weedy areas over gravel, sand, and silt to feed on insects and lay reproduce
Dredging (removal of aquatic vegetation and increasing depth of ditch)
Runoff (increases flow of stream, turbidity, and siltation of needed substrates)

Habitat loss (breeding & feeding)- the tadpole madtom feeds in dense vegetation and hides from predators in the leaf litter, dead wood, and other cover. By removing vegetation and cover in the stream, the tadpole madtom also loses spawning areas (tadpole madtoms typically lay eggs under submerged objects).
Degradation of the stream channel will also increase the velocity of the current (if straightened or cleared of

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

Degradation of the stream channel will also increase the velocity of the current (if straightened or cleared of debris) which will remove the tadpole madtom's preferred current-free, quiet habitat.

Total Respondents 3

10. Please rank the following threats to the HABITAT of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total														
Commercial or residential development (sprawl)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1														
Counterproductive financial incentives or regulations	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1														
Invasive/non-native species	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1														
Nonpoint source pollution (sedimentation and nutrients)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1														
Habitat fragmentation	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1														
Successional change	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1														
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1														
Habitat degradation	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1														
Climate change	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1														
Stream channelization	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1														
Impoundment of water/flow regulation	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1														
Agricultural/forestry practices	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1														
Residual contamination (persistent toxins)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1														
Point source pollution (continuing)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1														
Mining/acidification	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1														
Drainage practices (stormwater runoff)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1														
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1														
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1														
							Total Respondents	18													

11. Other HABITAT threats to the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

12. Please briefly describe the top two HABITAT threats to the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana identified above.

habitat degradation, stream channelization-cause temporary loss of habitat and impact the mussels directly by killing them or taking them out of the habitat

Non-point source pollution (sedimentation resulting in smothering of substrates and turbidity)
Habitat degradation (removal of vegetation and shallow water)

Stream channelization (straighting the channels to move water faster) and Habitat degradation (removal of debris in the stream to speed up the transfer of water off of the land and into the receiving stream)

Total Respondents 3

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (1)	1
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	100% (1)	0% (0)	1
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (1)	1
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	1
		Total Respondents	8

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (1)	1
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (1)	1
Regional or local once a year monitoring conducted by other organizations	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
		Total Respondents	8

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Occasional regional or local (less than						

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

once a year and not regularly scheduled)
monitoring conducted by state agencies

Total Respondents 8

16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Total Respondents						8

17. Regional or local state agency monitoring for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

random locations within the Kankakee drainage

IDEM and IDNR collect fish community samples in this area; thus, they may have data on the distribution of Least darters.

IDEM monitors the Kankakee River basin once every five years to determine if the stream are supporting a well-balanced warmwater aquatic community. Tadpole madtoms may have been captured while sampling headwater streams.

Total Respondents 3

18. Regional or local monitoring by other organizations for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

none	Total Respondents	1
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19.	Please list organizations that are monitoring the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.	
none		Total Respondents
		1

20.	What are the current monitoring techniques for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?																																																																																																																	
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 10%;">Frequently used</th> <th style="width: 10%;">Occasionally used</th> <th style="width: 10%;">Not used but possible with existing technology and data</th> <th style="width: 10%;">Not used and not possible with existing technology and data</th> <th style="width: 10%;">Not economically feasible</th> <th style="width: 10%;">Unknown</th> <th style="width: 10%;">Response Total</th> </tr> </thead> <tbody> <tr> <td>Radio telemetry and tracking</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Modeling</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Coverboard routes</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Spot mapping</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Driving a survey route</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Reporting from harvest, depredation, or unintentional take (road kill, bycatch)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Mark and recapture</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Professional survey/census</td> <td>100% (1)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Volunteer survey/census</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Trapping (by any technique)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Representative sites</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Probabilistic sites</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Other (please specify below)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td>0% (0)</td> <td style="text-align: center;">0</td> </tr> </tbody> </table>		Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total	Radio telemetry and tracking	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	Modeling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	Spot mapping	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	Driving a survey route	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	Mark and recapture	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	Professional survey/census	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1	Volunteer survey/census	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	Trapping (by any technique)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	Representative sites	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	Probabilistic sites	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0	
	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total																																																																																																											
Radio telemetry and tracking	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0																																																																																																											
Modeling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0																																																																																																											
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0																																																																																																											
Spot mapping	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0																																																																																																											
Driving a survey route	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0																																																																																																											
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0																																																																																																											
Mark and recapture	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0																																																																																																											
Professional survey/census	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1																																																																																																											
Volunteer survey/census	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0																																																																																																											
Trapping (by any technique)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0																																																																																																											
Representative sites	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0																																																																																																											
Probabilistic sites	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0																																																																																																											
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0																																																																																																											

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

Total Respondents 1

21. Other monitoring techniques for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

professional surveys using timed searches, systematic sampling (Strayer and Smith 2003)-A guide to sampling freshwater mussel populations. American Fisheries Society Monograph 8. American Fisheries Society. Bethesda, Maryland. 103 pp.

Representative sites or look for sites where the habitat is suitable for the least darter and seine in the vegetation over rocky substrate.

seining or kick net
electrofishing

Total Respondents 3

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
			Total Respondents 8

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
		Total Respondents	8

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
				Total Respondents		8

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
				Total Respondents		8

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

none

As I stated in previous surveys, the QHEI would provide a habitat assessment for sites where least darters were collected.

IDEM conducts a habitat assessment while sampling stream for fish community assessments using the QHEI (Qualitative Habitat Evaluation Index).

Total Respondents 3

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

none

Total Respondents 1

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

none

Total Respondents 1

30. What are the current HABITAT inventory and/or assessment techniques for Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Aerial photography and analysis	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Systematic sampling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Regulatory information	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Participation in landuse programs	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Modeling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
							Total Respondents 3

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

31. Other HABITAT inventory and assessment techniques for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

don't really think that a habitat inventory of any kind is necessary for creek heelsplitter habitat in the Kankakee drainage

Total Respondents 1

33. What is the current body of science for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	3	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
Total Respondents	3	

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	0
(skipped this question)		1

36. What is the current HABITAT body of science for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	1	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
Total Respondents	1	1

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	0
(skipped this question)		1

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
	Total Respondents	0
	(skipped this question)	1

39. What are the research needs for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Distribution and abundance	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Limiting factors (food, shelter, water, breeding sites)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Threats (predators/competition, contamination)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Relationship/dependence on specific habitats	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Population health (genetic and physical)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
	Total Respondents						7

40. Other research needs for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

41. What are the HABITAT research needs for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Distribution and abundance (fragmentation)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Threats (land use change/competition, contamination/global warming)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Relationship/dependence on specific site conditions	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Growth and development of individual components of the habitat	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
					Total Respondents		6

42. Other HABITAT research needs for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

43. How well do the following conservation efforts address the threats to the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Population management (hunting, trapping)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Food plots	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Threats reduction	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Native predator control	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Exotic/invasive species control	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Regulation of collecting	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Disease/parasite management	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Protection of migration routes	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Limiting contact with pollutants/contaminants	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Public education to reduce human disturbance	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Culling/selective removal	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Stocking	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
				Total Respondents		17

44. Other current conservation practices for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

protect habitat by limiting the amount of dredging that occurs in the Kankakee watershed

Habitat protection and the possible reintroduction of the least darter into suitable habitats that have been restored.

Habitat protection

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

Total Respondents 3

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Habitat protection on public lands	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Habitat protection incentives (financial)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Habitat restoration through regulation	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Habitat restoration on public lands	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Habitat restoration incentives (financial)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Corridor development/protection	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Managing water regimes	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Pollution reduction	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Protection of adjacent buffer zone	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Restrict public access and disturbance	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Land use planning	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Technical assistance	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Cooperative land management agreements (conservation easements)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
				Total Respondents		18

47. Other current HABITAT conservation practices for the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat in Indiana?

any type of habitat protection/restoration-eliminate dredging

Habitat protection through regulation
Protection of adjacent buffer zone.

Appendix E-15: Rivers and Streams Kankakee River (Illinois River) Drainage
Wadeable/Large River

Habitat protection
Restrict disturbance to habitat (dredging, removal of debris)

Total Respondents 3

49. Do you have any additional comments or information on the Wildlife in Wadeable/ Large Rivers of the Kankakee River (Illinois River) Drainage Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

IDEM has captured least darters at the following locations: Ringeisen Ditch, Trib of Carpenter Cr, Keefe Ditch, Claude May Ditch, and Howe Ditch in Jasper County, Singleton Ditch in Lake Co., Weiss Ditch in Newton Co., and Minier Lateral in Benton Co.

IDEM has collected tadpole madtoms on the following streams: West Creek and Singleton Ditch in Lake County, Dausman Ditch in Kosciusko Co., Bogus Run in Starke Co., and Slough Creek in Jasper Co.

Total Respondents 2

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

7. Please also rank these threats to the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	17% (1)	83% (5)	0% (0)	0% (0)	0% (0)	0% (0)	6
Habitat loss (feeding/foraging areas)	17% (1)	83% (5)	0% (0)	0% (0)	0% (0)	0% (0)	6
Small native range (high endemism)	0% (0)	0% (0)	17% (1)	0% (0)	83% (5)	0% (0)	6
Near limits of natural geographic range	0% (0)	0% (0)	17% (1)	0% (0)	83% (5)	0% (0)	6
Large home range requirements	0% (0)	0% (0)	0% (0)	0% (0)	83% (5)	17% (1)	6
Viable reproductive population size or availability	0% (0)	67% (4)	0% (0)	17% (1)	0% (0)	17% (1)	6
Specialized reproductive behavior or low reproductive rates	0% (0)	33% (2)	67% (4)	0% (0)	0% (0)	0% (0)	6
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	17% (1)	50% (3)	0% (0)	0% (0)	17% (1)	17% (1)	6
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	50% (3)	33% (2)	17% (1)	6
Unknown	0% (0)	0% (0)	75% (3)	0% (0)	0% (0)	25% (1)	4
Other (please specify below)	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	0% (0)	3
Total Respondents							61

8. Other threats to the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Threats to the Orangethroat Darter are related to threats to the habitat. It prefers high-functioning, high quality riffle habitat in headwater streams. Headwater streams, are not always given as much protection or value as larger rivers downstream. Threats to the species colonization, such as aquatic passage problems through culverts are one threat. Threats to the species watersheds, such as pollution, clearing of the riparian vegetation, creek gravel mining, and channelization are also threats to the habitat of this species.; Threats to the Orangethroat Darter are related to threats to the habitat. It prefers high-functioning, high quality riffle habitat in headwater streams. Headwater streams, are not always given as much protection or value as larger rivers downstream. Threats to the species colonization, such as aquatic passage problems through culverts are one threat. Threats to the species watersheds, such as pollution, clearing of the riparian vegetation, creek gravel mining, and channelization are also threats to the habitat of this species.;

Threats to the Orangethroat Darter are related to threats to the habitat. It prefers high-functioning, high quality riffle habitat in headwater streams. Headwater streams, are not always given as much protection or value as larger rivers downstream. Threats to the species colonization, such as aquatic passage problems through culverts are one threat. Threats to the species watersheds, such as pollution, clearing of the riparian vegetation, creek gravel mining, and channelization are also threats to the habitat of this species.;

Threats to the Orangethroat Darter are related to threats to the habitat. It prefers high-functioning, high quality riffle habitat in headwater streams. Headwater streams, are not always given as much protection or value as larger rivers downstream. Threats to the species colonization, such as aquatic passage problems through culverts are one threat. Threats to the species watersheds, such as pollution, clearing of the riparian vegetation, creek gravel mining, and channelization are also threats to the habitat of this species.

Total Respondents 1

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

9. Please briefly describe the top two threats to the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana identified above.

dredging of headwater streams
alterations of hydrology from land-use changes

1. Runoff
2. Habitat modification

The top two threats for the wildlife species are threats to migration (aquatic passage problems through stream crossing structures) and threats to the breeding habitat (high quality riffles). Threats to riffle habitat result from water quality degradation and loss of stream channel stability due to land management activities such as dredging, channelization, roads, and clearing of riparian vegetation.; The top two threats for the wildlife species are threats to migration (aquatic passage problems through stream crossing structures) and threats to the breeding habitat (high quality riffles). Threats to riffle habitat result from water quality degradation and loss of stream channel stability due to land management activities such as dredging, channelization, roads, and clearing of riparian vegetation.; The top two threats for the wildlife species are threats to migration (aquatic passage problems through stream crossing structures) and threats to the breeding habitat (high quality riffles). Threats to riffle habitat result from water quality degradation and loss of stream channel stability due to land management activities such as dredging, channelization, roads, and clearing of riparian vegetation.

Habitat loss (breeding and foraging/feeding areas): Siltation of small headwater streams is limiting the population of southern redbelly dace because the species spawn over gravel substrates. Also, the removal of vegetation could decrease food availability to the herbivorous species. They occupy streams that have a permanent flow of clear water; thus siltation or alterations in flow regimes could also affect the species.

Total Respondents 4

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

10. Please rank the following threats to the HABITAT of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total													
Commercial or residential development (sprawl)	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	0% (0)	4													
Counterproductive financial incentives or regulations	25% (1)	0% (0)	0% (0)	0% (0)	50% (2)	25% (1)	4													
Invasive/non-native species	0% (0)	0% (0)	0% (0)	100% (4)	0% (0)	0% (0)	4													
Nonpoint source pollution (sedimentation and nutrients)	25% (1)	50% (2)	25% (1)	0% (0)	0% (0)	0% (0)	4													
Habitat fragmentation	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	0% (0)	4													
Successional change	0% (0)	0% (0)	25% (1)	25% (1)	0% (0)	50% (2)	4													
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	50% (2)	0% (0)	50% (2)	4													
Habitat degradation	50% (2)	50% (2)	0% (0)	0% (0)	0% (0)	0% (0)	4													
Climate change	0% (0)	0% (0)	25% (1)	25% (1)	50% (2)	0% (0)	4													
Stream channelization	50% (2)	50% (2)	0% (0)	0% (0)	0% (0)	0% (0)	4													
Impoundment of water/flow regulation	25% (1)	25% (1)	0% (0)	50% (2)	0% (0)	0% (0)	4													
Agricultural/forestry practices	25% (1)	50% (2)	25% (1)	0% (0)	0% (0)	0% (0)	4													
Residual contamination (persistent toxins)	0% (0)	0% (0)	25% (1)	25% (1)	0% (0)	50% (2)	4													
Point source pollution (continuing)	0% (0)	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	4													
Mining/acidification	0% (0)	0% (0)	25% (1)	50% (2)	0% (0)	25% (1)	4													
Drainage practices (stormwater runoff)	50% (2)	50% (2)	0% (0)	0% (0)	0% (0)	0% (0)	4													
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1													
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0													
							Total Respondents	65												

11. Other HABITAT threats to the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

12. Please briefly describe the top two HABITAT threats to the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana identified above.

Runoff, mostly agricultural
Channelization

Top two threats from the list up above are habitat degradation and stream channelization

Non-point source pollution in the form of sedimentation
Destruction of clear shaded waters by forestry/agricultural practices or stream channelization.

Total Respondents 3

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (5)	5
Statewide once a year monitoring conducted by state agencies	20% (1)	80% (4)	5
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	20% (1)	80% (4)	5
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	40% (2)	60% (3)	5
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (5)	5
Regional or local once a year monitoring conducted by state agencies	20% (1)	80% (4)	5
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	40% (2)	60% (3)	5
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	80% (4)	20% (1)	5
		Total Respondents	40

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (5)	5
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (5)	5
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (5)	5
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (5)	5
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (5)	5
Regional or local once a year monitoring conducted by other organizations	40% (2)	60% (3)	5
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	40% (2)	60% (3)	5
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	80% (4)	20% (1)	5
	Total Respondents		40

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	40% (2)	0% (0)	40% (2)	20% (1)	5
Statewide once a year monitoring conducted by state agencies	40% (2)	20% (1)	0% (0)	20% (1)	20% (1)	5
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	40% (2)	40% (2)	0% (0)	0% (0)	20% (1)	5
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	40% (2)	40% (2)	0% (0)	0% (0)	20% (1)	5
Regional or local year-round monitoring conducted by state agencies	0% (0)	40% (2)	20% (1)	20% (1)	20% (1)	5
Regional or local once a year monitoring conducted by state agencies	40% (2)	20% (1)	0% (0)	20% (1)	20% (1)	5
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	60% (3)	40% (2)	0% (0)	0% (0)	0% (0)	5
Occasional regional or local (less than						

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

once a year and not regularly scheduled)
monitoring conducted by state agencies

Total Respondents 40

16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	40% (2)	20% (1)	20% (1)	20% (1)	5
Statewide once a year monitoring conducted by other organizations	40% (2)	0% (0)	20% (1)	20% (1)	20% (1)	5
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	40% (2)	0% (0)	20% (1)	20% (1)	20% (1)	5
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	40% (2)	0% (0)	20% (1)	20% (1)	20% (1)	5
Regional or local year-round monitoring conducted by other organizations	0% (0)	40% (2)	20% (1)	20% (1)	20% (1)	5
Regional or local once a year monitoring conducted by other organizations	40% (2)	0% (0)	20% (1)	20% (1)	20% (1)	5
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	40% (2)	20% (1)	0% (0)	20% (1)	20% (1)	5
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	40% (2)	40% (2)	0% (0)	0% (0)	20% (1)	5
						Total Respondents 40

17. Regional or local state agency monitoring for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

IDNR non-game biologist does mussel surveys. But, he is only one person and there are thousands of miles of streams in state.

? Wabash system

IDEM and the DNR Nongame program also conduct monitoring during the field season, once a year for fish. These above fish surveys are not specific to the Orangethroat Darter, but would include the Orangethroat Darter.; IDEM and the DNR Nongame program also conduct fish monitoring during the field season. These above fish surveys are not specific to the Orangethroat Darter, but would include the Orangethroat Darter.

IDEM monitors the health of major river basins every 5 years by looking at chemical, physical, and biological data collected at random locations within the watershed. Southern redbelly dace have been captured in the Ohio River Drainage Habitat; however, specific monitoring for the species has not occurred to my knowledge by anyone state or other organization.

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior
Plateau Ecoregions Headwater

Total Respondents	4
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Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

18. Regional or local monitoring by other organizations for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Commonwealth Biomonitoring frequently does habitat evaluations in small streams as part of watershed studies. If I happen to see a shell, I make a note of it in field notes. These are NOT official mussel surveys.

? Wabash system

The Hoosier National Forest conducts yearly fish surveys within two or more 5th level HUCs that encompass the Hoosier National Forest, which includes the Ohio River Drainage, Eastern Corn Belt/Interior Plateau Ecoregions. These above fish surveys are not specific to the Orangethroat Darter, but would include the Orangethroat Darter.; The Hoosier National Forest conducts yearly fish surveys within two or more 5th level HUCs that encompass the Hoosier National Forest, which includes the Ohio River Drainage, Eastern Corn Belt/Interior Plateau Ecoregions. These above fish surveys are not specific to the Orangethroat Darter, but would include the Orangethroat Darter.

Total Respondents 3

19. Please list organizations that are monitoring the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

None than I know of. Most mussel surveys are on bigger rivers. I was contacted by a college prof. interested in taking a class out to a small stream to learn about mussels. I discouraged him from doing so unless he followed DNR regulations concerning collectors' permits. I haven't heard any more from him.

consultants, perhaps TNC

USDA Forest Service, Hoosier National Forest; USDI Fish and Wildlife Service; IDEM; IDNR; USDA Forest Service, Hoosier National Forest; USDI Fish and Wildlife Service; IDEM; IDNR

Total Respondents 3

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

20. What are the current monitoring techniques for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	0% (0)	2
Modeling	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	2
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Spot mapping	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	2
Driving a survey route	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	2
Mark and recapture	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	0% (0)	2
Professional survey/census	60% (3)	40% (2)	0% (0)	0% (0)	0% (0)	0% (0)	5
Volunteer survey/census	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	2
Trapping (by any technique)	0% (0)	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
Representative sites	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	0% (0)	2
Probabilistic sites	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	0% (0)	3
Other (please specify below)	75% (3)	0% (0)	0% (0)	0% (0)	0% (0)	25% (1)	4
Total Respondents							32

21. Other monitoring techniques for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Electro-fishing and seining are appropriate methods for monitoring the Orangethroat darter.; Electro-fishing and seining are appropriate methods for monitoring the Orangethroat darter.; Electro-fishing and seining are appropriate monitoring techniques for the Orangethroat Darter.

Total Respondents 1

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

Intensive quantitative sampling of known populations. Need to understand demography of wildlife species. See Strayer & Smith, 2003. AFS Monogr. 8.

2. Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of wildlife species. See same for protocols.

Electro-fishing streams..take a random sampling of streams within a watershed (5th or 6th level HUC)and standardize the stream reach length for the survey...usually 15 times the stream width. Seining is also an appropriate method for sampling, especially in the riffle habitats.; Electro-fishing streams..take a random sampling of streams within a watershed (5th or 6th level HUC)and standardize the stream reach length for the survey...usually 15 times the stream width. Seining is also an appropriate method for sampling, especially in the riffle habitats.; Electro-fishing can be used to sample stream habitats. I suggest designing a random sample of all streams within a watershed (5th or 6th level HUC). The size of the stream reach sampled would be 15 times the stream width. Seining would also be an appropriate method for sampling.

Target the habitat with seining equipment or electrofishing.

Total Respondents 3

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	25% (1)	75% (3)	4
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (4)	4
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	25% (1)	75% (3)	4
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	75% (3)	25% (1)	4
	Total Respondents		32

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Statewide once a year inventory and assessment conducted by other organizations	25% (1)	75% (3)	4
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	25% (1)	75% (3)	4
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	25% (1)	75% (3)	4
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (4)	4
Regional or local once a year inventory and assessment conducted by other organizations	25% (1)	75% (3)	4
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	25% (1)	75% (3)	4
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	75% (3)	25% (1)	4
		Total Respondents	32

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	25% (1)	25% (1)	25% (1)	25% (1)	4
Statewide once a year inventory and assessment conducted by state agencies	25% (1)	25% (1)	0% (0)	25% (1)	25% (1)	4
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	50% (2)	25% (1)	0% (0)	0% (0)	25% (1)	4
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	50% (2)	0% (0)	25% (1)	0% (0)	25% (1)	4
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	25% (1)	25% (1)	25% (1)	25% (1)	4
Regional or local once a year inventory and assessment conducted by state agencies	25% (1)	0% (0)	50% (2)	0% (0)	25% (1)	4
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	25% (1)	50% (2)	25% (1)	0% (0)	0% (0)	4
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	25% (1)	25% (1)	25% (1)	0% (0)	25% (1)	4
					Total Respondents	32

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	25% (1)	50% (2)	0% (0)	25% (1)	4
Statewide once a year inventory and assessment conducted by other organizations	25% (1)	0% (0)	50% (2)	0% (0)	25% (1)	4
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	25% (1)	0% (0)	50% (2)	0% (0)	25% (1)	4
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	25% (1)	0% (0)	50% (2)	0% (0)	25% (1)	4
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	25% (1)	50% (2)	0% (0)	25% (1)	4
Regional or local once a year inventory and assessment conducted by other organizations	25% (1)	0% (0)	50% (2)	0% (0)	25% (1)	4
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	50% (2)	0% (0)	25% (1)	0% (0)	25% (1)	4
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3
						Total Respondents
						31

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

? Wabash system

Total Respondents **1**

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

We (Commonwealth Biomonitoring) do habitat evaluations on small streams as part of watershed studies. These evaluations are not specific to mussels, but are Ohio EPA QHEI methods.

? Wabash system

Two or more 5th level HUC watersheds a year that encompass the Hoosier National Forest are sampled; a random sampling of streams found within these 5th level HUCs occurs.

Total Respondents 3

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

consultants, perhaps TNC

IDEM, IDNR, USDA Forest Service, USDI Fish and Wildlife Service

IDEM- Qualitative Habitat Evaluations completed at sites where southern redbelly dace may have been captured as part of the fish community sampling program.

Total Respondents 3

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

30. If a technique is not applicable to the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3
Aerial photography and analysis	0% (0)	0% (0)	0% (0)	50% (1)	50% (1)	0% (0)	2
Systematic sampling	33% (1)	67% (2)	0% (0)	0% (0)	0% (0)	0% (0)	3
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Regulatory information	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Participation in landuse programs	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Modeling	0% (0)	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Voluntary landowner reporting	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	0% (0)	2
Other (please specify below)	50% (1)	0% (0)	0% (0)	0% (0)	0% (0)	50% (1)	2
Total Respondents							22

31. Other HABITAT inventory and assessment techniques for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Qualitative Habitat Evaluation Index(QHEI); REMAP protocols for Northern Forested Streams; stream channel cross-sections and longitudinal profiles; substrate analysis; descriptions of riparian vegetation; water quality parameters are measured using probes and Hydro-labs

Total Respondents 1

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

Assess riparian corridor presence
Water quality

Two protocols that I recommend for reference include the following:

1. Harrelson, C.C., C.L. Rawlins, and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. USDA Forest Service. General Technical Report RM-245.

The above reference offers useful guidance on measuring stream channel cross-sections and substrate within the stream. This information can be used to determine if a stream channel is stable and if the substrate is available within riffle habitats, which are the preferred habitat of the Orangethroat Darter.

2. Simon, T. P. and P.M. Stewart. 1998. Standard Operating Procedures For Development of Watershed Indicators In REMAP: Northern Lakes and Forest Streams.

The above reference is very useful for developing a watershed level sampling design and includes useful methods for measuring stream channel and stream habitat parameters.

3. The Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA is a useful qualitative field method that can be used to prioritize sites within a watershed for stream habitat or water quality improvement.

Total Respondents 2

33. What is the current body of science for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		1	33%
Inadequate		2	67%
Nonexistent		0	0%
Other (please explain below)		0	0%
		Total Respondents	3

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Occurrence and distribution of freshwater mussels in the small streams of Tippecanoe County, Indiana
 Author = Myers-Kinzie, M., S. Wentz, & A. Spacie
 Date = 2001
 Publisher = Proc. Ind. Acad. Sci.

Response Total Response Percent

Title = Naiades of Pennsylvania
 Author = Ortmann
 Date = 1919
 Publisher = Carnegie Museum

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Freshwater Mollusca of WI
 Author = Baker
 Date = 1919
 Publisher = WI Geol. Nat. Hist. Surv.

Response Total Response Percent

36. What is the current HABITAT body of science for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	3	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
Total Respondents	3	

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Naiades of Pennsylvania
 Author = Ortmann
 Date = 1919
 Publisher = Carnegie Museum

Response Total Response Percent

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Freshwater Mollusca of WI
 Author = Baker
 Date = 1919
 Publisher = WI Geol. Nat. Hist. Surv.

Response Total Response Percent

39. What are the research needs for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total											
Life cycle	25% (1)	0% (0)	50% (2)	25% (1)	0% (0)	0% (0)	4											
Distribution and abundance	0% (0)	0% (0)	75% (3)	25% (1)	0% (0)	0% (0)	4											
Limiting factors (food, shelter, water, breeding sites)	0% (0)	50% (2)	50% (2)	0% (0)	0% (0)	0% (0)	4											
Threats (predators/competition, contamination)	25% (1)	25% (1)	50% (2)	0% (0)	0% (0)	0% (0)	4											
Relationship/dependence on specific habitats	25% (1)	25% (1)	50% (2)	0% (0)	0% (0)	0% (0)	4											
Population health (genetic and physical)	0% (0)	0% (0)	50% (2)	50% (2)	0% (0)	0% (0)	4											
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1											
Total Respondents							25											

40. Other research needs for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

- Habitat needs are not completely understood. I have seen fresh dead cylindrical papershell in channelized ag ditches. Other small streams with good habitat have only weathered dead fragments.

Total Respondents 1

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

41. What are the HABITAT research needs for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	0% (0)	25% (1)	25% (1)	25% (1)	25% (1)	4
Distribution and abundance (fragmentation)	0% (0)	0% (0)	100% (4)	0% (0)	0% (0)	0% (0)	4
Threats (land use change/competition, contamination/global warming)	25% (1)	75% (3)	0% (0)	0% (0)	0% (0)	0% (0)	4
Relationship/dependence on specific site conditions	50% (2)	25% (1)	25% (1)	0% (0)	0% (0)	0% (0)	4
Growth and development of individual components of the habitat	25% (1)	0% (0)	75% (3)	0% (0)	0% (0)	0% (0)	4
Other (please specify below)	0% (0)	50% (1)	0% (0)	0% (0)	0% (0)	50% (1)	2
						Total Respondents	22

42. Other HABITAT research needs for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Effects of roads and stream crossings on the wildlife species; Is aquatic passage through culverts and other stream crossing structures adequate or are these crossings causing aquatic habitat fragmentation?

Total Respondents 1

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

43. How well do the following conservation efforts address the threats to the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Population management (hunting, trapping)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Food plots	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Threats reduction	0% (0)	33% (1)	33% (1)	33% (1)	0% (0)	3
Native predator control	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Exotic/invasive species control	0% (0)	0% (0)	67% (2)	33% (1)	0% (0)	3
Regulation of collecting	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	3
Disease/parasite management	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Protection of migration routes	0% (0)	0% (0)	0% (0)	67% (2)	33% (1)	3
Limiting contact with pollutants/contaminants	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Public education to reduce human disturbance	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Culling/selective removal	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Stocking	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
				Total Respondents		49

44. Other current conservation practices for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Habitat protection occurs in the form of the Clean Water Act, National Forest Management Act and other state and federal regulations that protect aquatic habitat and aquatic species. These regulations may or may not be enough for the sake of Orangethroat Darter conservation.

Total Respondents 1

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

The following applies to all mussel species. Educate anglers that it is ILLEGAL to use mussels as fishing bait.

CREP, other incentives for BMP's
Limit instream modifications
See Watters, 2000. Proc. 1st FMCS Symposium

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

1. Restoration of stream channels..restoring or protecting stream channel function so that riffle habitats are enhanced or protected.
2. Restoration or enhancement of riparian vegetation to enhance or protect stream channels from runoff or impacts to the channel.
3. Maintenance of roads and stream crossings so that stream channel function and aquatic passage are maintained.

Habitat protection

Total Respondents 3

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	67% (2)	33% (1)	0% (0)	0% (0)	3
Habitat protection on public lands	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Habitat protection incentives (financial)	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Habitat restoration through regulation	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Habitat restoration on public lands	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Habitat restoration incentives (financial)	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	100% (3)	0% (0)	3
Corridor development/protection	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Managing water regimes	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Pollution reduction	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Protection of adjacent buffer zone	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Restrict public access and disturbance	0% (0)	0% (0)	33% (1)	67% (2)	0% (0)	3
Land use planning	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Technical assistance	0% (0)	100% (3)	0% (0)	0% (0)	0% (0)	3
Cooperative land management agreements (conservation easements)	0% (0)	67% (2)	0% (0)	33% (1)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Total Respondents						51

47. Other current HABITAT conservation practices for the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

I am not aware of any of the above for which I marked "not used."

Total Respondents 1

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior
Plateau Ecoregions Headwater

Appendix E-16: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Headwater

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

Treat small streams as biological resources and not just drainage ditches. At the very least, require that a mussel survey be done before dredging.

1. Promote riparian corridor
2. Limit habitat modifications

1. Streambank stabilization or stream restoration (reconstructing the channel to reconnect it to its natural floodplain elevation).
2. Culvert or stream crossing structure improvement (replace non-functioning culverts or other crossing structures and replace with ones that function and are at the right elevation/location within the stream's longitudinal profile).
3. Restoration of riparian vegetative communities through tree planting, etc.

Habitat protection and Protection of adjacent buffer zone

Total Respondents 4

49. Do you have any additional comments or information on the Wildlife in Headwaters in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

N/A

IDEM has captured many southern redbelly dace in their random fish sampling program. Most of these specimens came from the Whitewater Basin in headwater streams <20 sq. miles with high gradient and high biological integrity.

Total Respondents 2

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

7. Please also rank these threats to the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	31% (4)	46% (6)	0% (0)	8% (1)	8% (1)	8% (1)	13
Habitat loss (feeding/foraging areas)	15% (2)	62% (8)	0% (0)	7% (1)	7% (1)	7% (1)	13
Small native range (high endemism)	7% (1)	15% (2)	7% (1)	0% (0)	69% (9)	0% (0)	13
Near limits of natural geographic range	0% (0)	7% (1)	7% (1)	7% (1)	77% (10)	0% (0)	13
Large home range requirements	0% (0)	0% (0)	0% (0)	18% (2)	73% (8)	9% (1)	11
Viable reproductive population size or availability	7% (1)	23% (3)	0% (0)	23% (3)	38% (5)	7% (1)	13
Specialized reproductive behavior or low reproductive rates	0% (0)	31% (4)	7% (1)	23% (3)	31% (4)	7% (1)	13
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	7% (1)	15% (2)	15% (2)	0% (0)	46% (6)	15% (2)	13
Genetic pollution (hybridization)	0% (0)	0% (0)	7% (1)	23% (3)	69% (9)	0% (0)	13
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (6)	6
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
						Total Respondents	125

8. Other threats to the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

High stream flows for a few months following spawning can seriously reduce year class strength.

High stream flows following spawning can seriously reduce year class strength. This threat can be reduced by reducing ditching in headwaters, installing grass waterways and WASCOS, maintaining riparian corridors. All of these measures will slow stream flows and reduce siltation.

Total Respondents 2

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

9. Please briefly describe the top two threats to the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana identified above.

Hellbenders has a small geographic range and population sizes in Indiana. In many locations there is concern about low reproductive rates, but this is unknown in Indiana populations.

1. Runoff
2. Habitat modification

1. Runoff introducing sediments, even if only temporary
2. In-stream modifications

1. Pollution within the Tippecanoe River system in Indiana.

2. Any factor which reduces the reproductive population size.

1. Pollution

2. (1) Habitat loss - siltation of spawning areas and pools, loss of instream cover, riparian destruction, channelization

(2) Point source pollution which triggers fish kills or repels rock bass from the area.

3. Habitat loss and degradation are serious threats to rock bass. They prefer silt free streams to reproduce and thrive. They also relate closely to structure/cover therefore any habitat loss is a threat.

Habitat Loss - The Eastern Sand darter requires sandy bottoms in fast flowing streams to bury eggs, hide from predators, ambush prey, conserve energy, and maintain position in unstable/shifting sandbars. Low reproductive rates/small populations - reach maturity at age 1, but only lives a few years.

Breeding and feeding/foraging habitat loss due to sedimentation from farm fields and stream banks as well as the removal of natural riparian vegetation; breeding and feeding/foraging habitat loss due to sedimentation from farm fields and stream banks as well as the removal of natural riparian vegetation

(1) Habitat loss - siltation which reduces spawning areas and fills pools, loss of instream cover (snagging and log removal), riparian destruction which allows water to warm and will reduce opportunity for logs and woody debris to enter stream, channelization.

(2) Pollution which triggers fish kills or repels smallmouth from the area.

Total Respondents

10

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

10. Please rank the following threats to the HABITAT of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Commercial or residential development (sprawl)	0% (0)	67% (8)	25% (3)	8% (1)	0% (0)	0% (0)	12
Counterproductive financial incentives or regulations	0% (0)	16% (2)	16% (2)	0% (0)	0% (0)	67% (8)	12
Invasive/non-native species	0% (0)	0% (0)	20% (2)	50% (5)	10% (1)	20% (2)	10
Nonpoint source pollution (sedimentation and nutrients)	43% (6)	36% (5)	7% (1)	7% (1)	0% (0)	7% (1)	14
Habitat fragmentation	25% (3)	8% (1)	50% (6)	0% (0)	0% (0)	17% (2)	12
Successional change	0% (0)	18% (2)	0% (0)	0% (0)	36% (4)	45% (5)	11
Diseases (of plants that create habitat)	0% (0)	0% (0)	10% (1)	0% (0)	50% (5)	40% (4)	10
Habitat degradation	50% (7)	25% (3)	17% (2)	0% (0)	0% (0)	8% (1)	13
Climate change	0% (0)	0% (0)	8% (1)	17% (2)	33% (4)	42% (5)	12
Stream channelization	62% (8)	38% (5)	0% (0)	0% (0)	0% (0)	0% (0)	13
Impoundment of water/flow regulation	20% (2)	20% (2)	50% (5)	10% (1)	0% (0)	0% (0)	10
Agricultural/forestry practices	10% (1)	80% (8)	10% (1)	0% (0)	0% (0)	100% (1)	11
Residual contamination (persistent toxins)	8% (1)	17% (2)	42% (5)	8% (1)	0% (0)	25% (3)	12
Point source pollution (continuing)	42% (5)	50% (6)	0% (0)	8% (1)	0% (0)	0% (0)	12
Mining/acidification	0% (0)	42% (5)	8% (1)	17% (2)	8% (1)	25% (3)	12
Drainage practices (stormwater runoff)	8% (1)	75% (9)	17% (2)	0% (0)	0% (0)	0% (0)	12
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
						Total Respondents	195

11. Other HABITAT threats to the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

12. Please briefly describe the top two HABITAT threats to the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana identified above.

Habitat degradation of streams

1. Instream modifications
2. Runoff, both agricultural and residential

1. Agricultural runoff
2. Impoundment

1. Any significant sedimentation into the stream can become a major threat.

2. Any toxins or pollutants are a critical threat.

3. Any channelization which reduces the shallow (less than 1.5 feet) sand/gravel substrate can critically reduce or fragment habitat.

(1) (1) Habitat degradation - sedimentation, channelization, cover removal, riparian removal

(2) Point source pollution - waste water treatment plants and confined feeding operations.

Any practices that create more erosion/sediment deposition and eliminates instream cover is a serious threat.

Therefore, I'd have to say nonpoint source pollution and habitat degradation are the most serious threats.

Habitat Degradation and stream channelization because this will directly affect the sediment transfer within the stream and microhabitat of the Eastern Sand Darter.

Breeding and feeding/foraging habitat loss due to sedimentation from farm fields and stream banks as well as the removal of natural riparian vegetation especially thru drainage maintenance activities

(1) Habitat degradation by sedimentation, channelization, cover removal, riparian removal.

(2) Point source pollution - These ecoregions have major threats from large cities causing fish kills from waste water treatment plans. Also, confined feeding operations in the rural areas are a major threat to the stream fish communities.

Total Respondents

9

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	17% (2)	83% (10)	12
Statewide once a year monitoring conducted by state agencies	9% (1)	91% (10)	11
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	36% (4)	64% (7)	11
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	64% (7)	36% (4)	11
Regional or local year-round monitoring conducted by state agencies	17% (2)	83% (10)	12
Regional or local once a year monitoring conducted by state agencies	18% (2)	82% (9)	11
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	73% (8)	27% (3)	11
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	100% (11)	0% (0)	11
		Total Respondents	90

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (12)	12
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (12)	12
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (12)	12
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (12)	12
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (12)	12
Regional or local once a year monitoring conducted by other organizations	25% (3)	75% (9)	12
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	17% (2)	83% (10)	12
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other	58% (7)	42% (5)	12

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

organizations

Total Respondents 96

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	18% (2)	0% (0)	18% (2)	64% (7)	0% (0)	11
Statewide once a year monitoring conducted by state agencies	10% (1)	10% (1)	20% (2)	60% (6)	0% (0)	10
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	20% (2)	20% (2)	50% (5)	10% (1)	0% (0)	10
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	60% (6)	0% (0)	40% (4)	0% (0)	10
Regional or local year-round monitoring conducted by state agencies	9% (1)	27% (3)	18% (2)	45% (5)	0% (0)	11
Regional or local once a year monitoring conducted by state agencies	0% (0)	30% (3)	60% (6)	10% (1)	0% (0)	10
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	10% (1)	50% (5)	30% (3)	10% (1)	0% (0)	10
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	18% (2)	55% (6)	9% (1)	18% (2)	0% (0)	11
				Total Respondents		83

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

17. Regional or local state agency monitoring for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

IDNR Fish & Wildlife Division

Wabash system

Tippecanoe River, Maumee system

Periodic (usually annual) monitoring in the Tippecanoe River by IDNR.

1. Blue River (Harrison County)

Sugar Creek (Shelby County)

Indian Creek (Greene County)

2. (1) IN early to mid 1990's, Division of Fish and Wildlife conducted fish community inventories on the major streams throughout the state.

(2) Game fish population estimates (including rock bass) have been conducted on 5 streams every other year from 1998 through 2004.

3. various streams throughout the region, some are sampled more regularly than others

IDEM Probabilistic sampling

Indiana DNR Special Studies on T&E species- IDNR, Brant Fisher, did a study on the population of Eastern Sand Darters in Indiana over the past five years. IDNR- regional fish collection surveys may have collected some specimens of the Eastern Sand Darter. Indiana Department of Environmental Management (IDEM) occasionally collected Eastern Sand Darters as part of their Surface Water Quality Monitoring Strategy evaluating fish community structure in certain watersheds every 5 years.

See IDEM OWQ's Surface Water Quality Monitoring Strategy and project work plans and IDNR Fisheries Section Work Plans

Blue River (Harrison County)

(1) In early to mid 1990's the Division of Fish and Wildlife conducted a smallmouth bass inventory.

(2) 5 streams have been sampled every other year from 1998 to 2004 to estimate smallmouth bass populations to determine the effect of smallmouth bass population changes due to the imposition of a 12 inch black bass size limit in 1998.

Total Respondents

12

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

18. Regional or local monitoring by other organizations for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Wabash system

Tippecanoe River, Maumee system

Uncertain.

1. None known to occur that specifically target rock bass.

2. West Fork White River & tributaries(Muncie area)

Ball State University fish sampling

While collecting fish community samples to evaluate the community structure and ability of the stream to support a healthy fish community, these organizations may have collected Eastern Sand Darters: Soil and Water Conservation Districts within those Ecoregions, Purdue University, Wildcat Creek Watershed Alliance? I would check with the Scientific Collectors Permit office for a list of organizations collecting in those ecoregions and also check with the IDEM Section 319 webpage for project summaries where fish or habitat in those ecoregions were studied.

US Environmental Protection Agency; USGS Water Resources Division; Ohio River Valley Water Sanitation Commission; Midwest Biodiversity Institute, US Army Corps of Engineers; Muncie Bureau of Water Quality; City of Elkhart Water Quality; various universities; various consulting firms

None known to occur that specifically target smallmouth bass.

Total Respondents 9

19. Please list organizations that are monitoring the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

consultants

TNC

TNC, USFWS

Uncertain.

1. DNR/DFW

2. None known that specifically target rock bass.

3. Muncie Bureau of Water Quality

See 17 & 18

DNR/DFW

None known that are specifically targeting smallmouth bass.

Total Respondents 9

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

20. What are the current monitoring techniques for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	55% (6)	9% (1)	18% (2)	18% (2)	11
Modeling	0% (0)	7% (1)	67% (7)	7% (1)	0% (0)	18% (2)	11
Coverboard routes	0% (0)	0% (0)	0% (0)	10% (1)	0% (0)	90% (8)	9
Spot mapping	20% (2)	10% (1)	30% (3)	0% (0)	0% (0)	40% (4)	10
Driving a survey route	11% (1)	0% (0)	0% (0)	33% (3)	22% (2)	33% (3)	9
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	27% (3)	9% (1)	36% (4)	9% (1)	18% (2)	11
Mark and recapture	17% (2)	42% (5)	25% (3)	0% (0)	0% (0)	17% (2)	12
Professional survey/census	67% (8)	33% (4)	0% (0)	0% (0)	0% (0)	0% (0)	12
Volunteer survey/census	0% (0)	50% (5)	20% (2)	10% (1)	0% (0)	20% (2)	10
Trapping (by any technique)	0% (0)	0% (0)	25% (1)	12% (1)	25% (2)	38% (3)	7
Representative sites	67% (7)	27% (3)	9% (1)	0% (0)	0% (0)	0% (0)	11
Probabilistic sites	42% (5)	8% (1)	42% (5)	0% (0)	0% (0)	8% (1)	12
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
						Total Respondents	129

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

- 21.** Other monitoring techniques for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Unintentional take could be monitored from fish kill cadaver counts if the officers could be trained to identify northern hog suckers instead of not counting them or just lumping them into the generic class of "round bodied suckers"

Total Respondents 1

- 22.** What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

Professional Survey

1. Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.

2. Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of the clubshell. See same for protocols.

1. Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.

2. Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of the clubshell. See same for protocols.

1. State DNR or professional census at representative or probabilistic sites.

2. Development of trained, select volunteer core to undertake surveys at probabilistic sites, particularly where the wildlife species should, or could occur and has not been documented in recent years.

1. Stream fish community surveys.
Rock bass population estimates.

2. electrofishing surveys

See where populations of the darter have been captured in the past and then with seines or electrofishing equipment mark and recapture the darter to document habitat characteristics, water quality information, and land use characterization where the darters occur. You will need to target the habitat and not the exact location since the sandbars will probably shift over time. Look on the web for mark and recapture surveys as well as other eastern sand darter publications. I found many by just searching the web for Eastern Sand Darter.

Electrofishing results from probabilistic and representative sites

Electrofishing catch rate data

Population estimates

Angler creel surveys

(1) Stream fish community surveys - To determine smallmouth bass distribution and abundance. There may be a correlation of smallmouth abundance to the species richness to the overall fish community.

(2) Smallmouth bass population estimates.

Total Respondents 10

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	9% (1)	91% (10)	11
Statewide once a year inventory and assessment conducted by state agencies	9% (1)	91% (10)	11
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	18% (2)	82% (9)	11
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	33% (4)	67% (7)	11
Regional or local year-round inventory and assessment conducted by state agencies	9% (1)	91% (10)	11
Regional or local once a year inventory and assessment conducted by state agencies	18% (2)	82% (9)	11
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	33% (4)	67% (7)	11
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	73% (8)	27% (3)	11
		Total Respondents	88

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (12)	12
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (12)	12
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	8% (1)	92% (11)	12
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	8% (1)	92% (11)	12
Regional or local year-round inventory and assessment conducted by other organizations	8% (1)	92% (11)	12
Regional or local once a year inventory and assessment conducted by other organizations	25% (3)	75% (9)	12
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	25% (3)	75% (9)	12
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	33% (4)	67% (8)	12
		Total Respondents	96

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Wabash system

? Tippecanoe River and Maumee system

(Usually wildlife species inventories are made, with relevant habitat information)

1. Blue River (Harrison County)
Sugar Creek (Shelby County)
Indian Creek (Greene County)

2. Indiana Department of Natural Resources - Division of Fish and Wildlife
Indiana Department of Environmental Management

3. IDEM - statewide QHEI

I don't know of any Habitat Inventory or Assessment done specifically for the Eastern Sand Darter in the habitat you list; however, I do know that IDEM as well as IDNR and other organizations use the Qualitative Habitat Evaluation Index to document the habitat quality of the streams sampled for aquatic communities.

IDEM/OWQ/BSS; IDNR/FWD/FS; ORSANCO;

Blue River (Harrison County)

Indiana Dept of Natural Resources - Division of Fish and Wildlife
Indiana Department of Environmental Management

Total Respondents

10

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Wabash system

? Tippecanoe River and Maumee system

1. none known

2. Muncie BWQ - WFWR and and tributaries in the Muncie area

none

None known.

Total Respondents 6

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Consultants

TNC

TNC, USFWS

1. DNR/DFW

2. none known

Muncie; Elkhart; USGS/WRD

DNR/DFW

None known.

Total Respondents 7

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

30. What are the current HABITAT inventory and/or assessment techniques for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	9% (1)	18% (2)	45% (5)	0% (0)	0% (0)	27% (3)	11
Aerial photography and analysis	0% (0)	9% (1)	9% (1)	9% (1)	0% (0)	73% (8)	11
Systematic sampling	36% (4)	36% (4)	0% (0)	0% (0)	0% (0)	27% (3)	11
Property tax estimates	0% (0)	0% (0)	0% (0)	36% (4)	9% (1)	55% (6)	11
State revenue data	0% (0)	0% (0)	0% (0)	36% (4)	9% (1)	55% (6)	11
Regulatory information	0% (0)	9% (1)	0% (0)	18% (2)	0% (0)	73% (8)	11
Participation in landuse programs	0% (0)	27% (3)	27% (3)	10% (1)	0% (0)	36% (4)	11
Modeling	0% (0)	27% (3)	27% (3)	0% (0)	0% (0)	45% (5)	11
Voluntary landowner reporting	0% (0)	18% (2)	9% (1)	9% (1)	9% (1)	55% (6)	11
Other (please specify below)	20% (1)	0% (0)	0% (0)	0% (0)	0% (0)	80% (4)	5
Total Respondents							104

31. Other HABITAT inventory and assessment techniques for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Water quality monitoring

QHEI

Total Respondents 2

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

Systematic survey & GIS

1. Assess riparian corridor
 2. Water quality monitoring
1. CREP, farmer incentives for no-till, riparian corridors, etc.
 2. Strictly control instream modifications: mining, snagging, etc.
1. More extensive use of GIS- modeled habitat probabilities.

1. QHEI

2. QHEI

More habitat inventories and assessments

QHEI
GIS

Qualitative Habitat Evaluation Index (QHEI) in conjunction with a stream community survey or sampling specifically for smallmouth bass. This can show which habitat components most strongly correlate with smallmouth bass abundance and or size structure.

Total Respondents 9

33. What is the current body of science for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		5	50%
Inadequate		5	50%
Nonexistent		0	0%
Other (please explain below)		0	0%
		Total Respondents	10

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Amphibians and reptiles from 23 counties of Indiana.
Author = Robert Brodman
Date = 2003
Publisher = Proceedings of the Indiana Academy of Science, 112: 43-54.

Title = Naiades of Pennsylvania
Author = Ortmann
Date = 1919
Publisher = Carnegie Museum

Title = Federal Recovery Plan
Author = USFWS
Date = 1993
Publisher = USFWS

Title = 'Clubshell'
Author = USFW, Division of Endangered Species
Date = 12/1997
Publisher = Online

Title = A survey of fish communities and aquatic habitats at Indiana's major steams with emphasis on smallmouth bass distribution and abundance
Author = Stuart T. Shipman
Date = December 1997
Publisher = DNR fisheries section

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance.
Author = Stuart T. Shipman
Date = December 1997
Publisher = DNR fisheries section

Response Total Response Percent

Title = The Fishes of Missouri
Author = William L. Plieger
Date = 1997
Publisher = Missouri Conservation Commission

Title = Handbook of freshwater fishery biology
Author = Kenneth D. Carlander
Date = 1997
Publisher = Iowa University Press

Title = Fishes of Ohio
Author = Milt Troutman
Date = 12/1997
Publisher = OSU Press

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance
Author = Stuart Shipman
Date = December 1997
Publisher = DNR/Fisheries section

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

Author = Stuart Shipman
Date = December 1997
Publisher = IDNR

Total Respondents 11

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Freshwater mussels of the Midwets
Author = Cummings & Mayer
Date = 1992
Publisher = INHS

Title = Field guide to freshwater mussels of Midwest
Author = Cummings & Mayer
Date = 1992
Publisher = INHS

Title = Surveys of the fish communities and aquatic habitats in 16 small streams in Indiana from 1996 through 1997.
Author = Douglas C. Keller
Date = 1999
Publisher = IDNR

Title = fishes of Tennessee
Author = Etnire and Starnes
Date =
Publisher =

Title = FW fishes of Canada
Author = Scott & Crossman
Date =
Publisher =

Title = Surveys of the fish communities and aquatic habitats in 16 small streams in Indiana from 1996 through 1997.
Author = Douglas C. Keller
Date = 1999
Publisher = IDNR

Response Total Response Percent

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

36. What is the current HABITAT body of science for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		6	50%
Inadequate		3	25%
Nonexistent		2	17%
Other (please explain below)		1	8%
Total Respondents		12	

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Naiades of Pennsylvania
Author = Ortmann
Date = 1919
Publisher = Carnegie Museum

Title = Federal Recovery Plan
Author = USFWS
Date = 1993
Publisher = USFWS

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance.
Author = Stuart T. Shipman
Date = December 1997
Publisher = IDNR

**Response Response
Total Percent**

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance
Author = Stuart T. Shipman
Date = 12/1997
Publisher = DNR/Fisheries section

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance
Author = Stuart T. Shipman
Date = December 1997
Publisher = IDNR

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Freshwater Mollusca of WI
Author = Baker
Date = 1929
Publisher = WI Geol. Nat. Sci. Surv.

Title = Naiades of Pennsylvania
Author = Ortmann
Date = 1919
Publisher = Carnegie Museum

Title = Surveys of the fish communities and aquatic habitats in 16 small streams in Indiana from 1996 through 1997.
Author = Douglas C. Keller
Date = 1999
Publisher = IDNR

Response Total **Response Percent**

Title = Surveys of the fish communities and aquatic habitats in 16 small streams in Indiana from 1996 through 1997.
Author = Douglas C. Keller
Date = 1999
Publisher = IDNR

39. What are the research needs for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total								
Life cycle	25% (3)	8% (1)	25% (3)	8% (1)	33% (4)	0% (0)	12								
Distribution and abundance	17% (2)	33% (4)	17% (2)	8% (1)	25% (3)	0% (0)	12								
Limiting factors (food, shelter, water, breeding sites)	33% (4)	25% (3)	17% (2)	8% (1)	17% (2)	0% (0)	12								
Threats (predators/competition, contamination)	8% (1)	42% (5)	17% (2)	17% (2)	17% (2)	0% (0)	12								
Relationship/dependence on specific habitats	33% (4)	25% (3)	17% (2)	0% (0)	25% (3)	0% (0)	12								
Population health (genetic and physical)	17% (2)	17% (2)	33% (4)	0% (0)	33% (4)	0% (0)	12								
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	25% (1)	75% (3)	4								
					Total Respondents		80								

40. Other research needs for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

To find out why the Clubshell has depopulated most of its former distribution in Indiana. Developing some sort of timeline (late Pleistocene, Holocene (usually archaeological), or historic) for relic valve distribution might narrow the possibilities of critical limiting factors (post-settlement siltation, etc.).

Total Respondents **1**

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

41. What are the HABITAT research needs for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	8% (1)	0% (0)	42% (5)	42% (5)	8% (1)	12
Distribution and abundance (fragmentation)	17% (2)	25% (3)	25% (3)	8% (1)	17% (2)	8% (1)	12
Threats (land use change/competition, contamination/global warming)	25% (3)	42% (5)	17% (2)	17% (2)	0% (0)	0% (0)	12
Relationship/dependence on specific site conditions	25% (3)	42% (5)	8% (1)	8% (1)	17% (2)	0% (0)	12
Growth and development of individual components of the habitat	8% (1)	17% (2)	42% (5)	0% (0)	25% (3)	8% (1)	12
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	20% (1)	80% (4)	5
							Total Respondents
							65

42. Other HABITAT research needs for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) **1**

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

43. How well do the following conservation efforts address the threats to the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	27% (3)	45% (5)	10% (1)	0% (0)	18% (2)	11
Population management (hunting, trapping)	9% (1)	36% (4)	9% (1)	27% (3)	18% (2)	11
Population enhancement (captive breeding and release)	0% (0)	18% (2)	0% (0)	73% (8)	9% (1)	11
Reintroduction (restoration)	18% (2)	27% (3)	0% (0)	45% (5)	10% (1)	11
Food plots	0% (0)	0% (0)	0% (0)	73% (8)	27% (3)	11
Threats reduction	0% (0)	27% (3)	0% (0)	55% (6)	18% (2)	11
Native predator control	0% (0)	0% (0)	0% (0)	91% (10)	9% (1)	11
Exotic/invasive species control	0% (0)	10% (1)	27% (3)	27% (3)	36% (4)	11
Regulation of collecting	0% (0)	55% (6)	18% (2)	18% (2)	9% (1)	11
Disease/parasite management	0% (0)	18% (2)	0% (0)	45% (5)	36% (4)	11
Translocation to new geographic range	9% (1)	18% (2)	0% (0)	64% (7)	9% (1)	11
Protection of migration routes	0% (0)	0% (0)	0% (0)	67% (7)	36% (4)	11
Limiting contact with pollutants/contaminants	27% (3)	45% (5)	0% (0)	18% (2)	7% (1)	11
Public education to reduce human disturbance	0% (0)	27% (3)	0% (0)	45% (5)	27% (3)	11
Culling/selective removal	0% (0)	27% (3)	0% (0)	73% (8)	0% (0)	11
Stocking	18% (2)	18% (2)	0% (0)	64% (7)	0% (0)	11
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
	Total Respondents					180

44. Other current conservation practices for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

Habitat protection

1. Eliminate instream modifications, including inpoundment
2. Restore riparian corridor

See Waters, 2000, Proc. 1st EMCS Symposium

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Wadeable/Large River

See Watters, 2000. Proc. 1st FMCS Symposium

1. Strict enforcement of laws regulating instream modification; incentives to farmers.
2. Propagation

Protect the shallow sand/gravel habitat from siltation and channelization, and keep the waters free of pollutants and toxins.

1. Pollution control.
Habitat protection or enhancement.

2. Rock bass appear to be doing very well with little to no intensive management in streams where there is ample instream cover and good water quality. Therefore, habitat protection and contaminant reduction would be my recommendations.

I am not sure what you are asking in this question. The best way to conserve the eastern sand darter would be to reduce sedimentation covering the sand substrate which the darter needs to survive and reproduce. Current efforts to reduce sedimentation in streams is somewhat effective, but I'm not sure if it is enough to keep the eastern sand darter from disappearing.

Declare moratorium on channel/drainage "improvement" projects that do not mitigate losses;

Pollution control - from waste water treatment plants and confined feeding operations.
Habitat protection and enhancement.

Total Respondents

9

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	18% (2)	45% (5)	10% (1)	0% (0)	27% (3)	11
Habitat protection on public lands	18% (2)	64% (7)	0% (0)	0% (0)	18% (2)	11
Habitat protection incentives (financial)	36% (4)	45% (5)	0% (0)	0% (0)	18% (2)	11
Habitat restoration through regulation	18% (2)	45% (5)	0% (0)	10% (1)	27% (3)	11
Habitat restoration on public lands	18% (2)	55% (6)	10% (1)	0% (0)	18% (2)	11
Habitat restoration incentives (financial)	36% (4)	36% (4)	10% (1)	0% (0)	18% (2)	11
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	27% (3)	10% (1)	45% (5)	18% (2)	11
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	8% (1)	67% (8)	25% (3)	12
Succession control (fire, mowing)	0% (0)	0% (0)	8% (1)	92% (11)	0% (0)	12
Corridor development/protection	33% (4)	25% (3)	8% (1)	9% (1)	25% (3)	12
Managing water regimes	0% (0)	55% (6)	0% (0)	18% (2)	27% (3)	11
Pollution reduction	55% (6)	27% (3)	0% (0)	0% (0)	18% (2)	11
Protection of adjacent buffer zone	55% (6)	18% (2)	9% (1)	0% (0)	18% (2)	11
Restrict public access and disturbance	0% (0)	27% (3)	36% (4)	18% (2)	18% (2)	11
Land use planning	9% (1)	64% (7)	90% (1)	0% (0)	18% (2)	11
Technical assistance	0% (0)	73% (8)	0% (0)	9% (1)	18% (2)	11
Cooperative land management agreements (conservation easements)	36% (4)	36% (4)	10% (1)	0% (0)	18% (2)	11
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
				Total Respondents		194

47. Other current HABITAT conservation practices for the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana.

Again, I don't know if these practices are working well in Indiana, but the best way to conserve the critical habitat for the eastern sand darter would be habitat protection on all lands through whatever means necessary, habitat restoration of the floodplain would also be critical to the amount of sedimentation reaching the stream bed, managing water regimes may also impact the settling of sediments in stream (thus dam removal may be appropriate), protection of adjacent buffer zone is key to stopping deleterious effects of erosion and sedimentation in the stream, land use planning and conservation easements would also keep the runoff to a minimum.

Total Respondents 1

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat in Indiana?

Habitat protection

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau Ecoregions Wadeable/Large River

1. CREP and other incentives for BMP's
2. Restrict instream modifications
See Watters, 2000. Proc. 1st FMCS Symposium

1. No instream modifications.
2. Limit runoff through incentives or other means.
See Watters, 2000. Proc. 1st FMCS Symposium.

Manage pollutants and toxins, maintain available habitat through regulation and buffer zones, increase habitat through incentives, technical assistance and restoration.

1. Protection of adjacent buffer zones (riparian corridor).

2. 1) buffer/riparian zone protection - leads to improved water quality and more instream cover
2) pollution reduction - improved water quality and fewer fish kills

Habitat protection
Land use planning

Protection of adjacent buffer zones (riparian corridor). More participation would likely occur with financial incentives.

Total Respondents 8

Appendix E-17: Rivers and Streams Ohio River Drainage Eastern Corn Belt/Interior Plateau
Ecoregions Wadeable/Large River

49. Do you have any additional comments or information on the Wildlife in Wadeable/Large Rivers in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

Too little is known about this wildlife species, especially Indiana populations.

N/A

N/A

1. To find out just why the Clubshell depopulated so much of its former range, which once included much of the interior of Indiana. Knowing this "why" should disclose a critical limiting factor, and could lead to its future preservation.

2. There is a great potential source for select avocational technical assistance (= volunteers) to undertake monitoring and survey where funding falls short.

I would definitely search the internet for more information on specific studies done on the Eastern Sand Darter; however, I could not find much on the habitat itself in the Eastern Corn Belt/Interior Plateau Ecoregions of the Ohio River Drainage. IDEM has a list of sites of where Eastern Sand Darters have been collected with water chemistry and habitat (QHEI) assessments if interested.

The length of this survey possibly destroys its usefulness as many/most experts will not have the time and or patience to do this for very many wildlife species; some may not even do it at all.

no

Total Respondents

7

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

12. Please briefly describe the top two HABITAT threats to the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana identified above.

- 1. Impoundment
 - 2. Instream modifications

 - 1. Dredging (mining, COE)
 - 2. Impoundment
 - 1. Stream channelization
 - 2. Non-point source pollution
- loss of high quality riffles and outside bend deep fast runs
- loss of riparian zone and siltation

Total Respondents 5

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (9)	9
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (9)	9
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	11% (1)	89% (8)	9
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	22% (2)	78% (7)	9
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (9)	9
Regional or local once a year monitoring conducted by state agencies	22% (2)	78% (7)	9
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	22% (2)	78% (7)	9
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	89% (8)	11% (1)	9
		Total Respondents	72

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (9)	9
Statewide once a year monitoring conducted by other organizations	11% (1)	78% (8)	9
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (9)	9
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (9)	9
Regional or local year-round monitoring conducted by other organizations	22% (2)	78% (7)	9
Regional or local once a year monitoring conducted by other organizations	22% (2)	78% (7)	9
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	11% (1)	89% (8)	9
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	22% (2)	78% (7)	9
		Total Respondents	72

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	33% (3)	67% (6)	0% (0)	9
Statewide once a year monitoring conducted by state agencies	50% (3)	0% (0)	17% (1)	83% (5)	0% (0)	6
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	17% (1)	17% (1)	17% (1)	50% (3)	0% (0)	6
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	33% (3)	11% (1)	56% (5)	0% (0)	9
Regional or local year-round monitoring conducted by state agencies	0% (0)	13% (1)	25% (2)	63% (5)	0% (0)	8
Regional or local once a year monitoring conducted by state agencies	33% (3)	22% (2)	0% (0)	44% (4)	0% (0)	9
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	44% (4)	22% (2)	11% (1)	22% (2)	0% (0)	9
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	44% (4)	0% (0)	22% (2)	33% (3)	0% (0)	9
Total Respondents						65

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	33% (3)	67% (6)	0% (0)	9
Statewide once a year monitoring conducted by other organizations	11% (1)	0% (0)	33% (3)	56% (5)	0% (0)	9
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	11% (1)	33% (3)	56% (5)	0% (0)	9
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	11% (1)	22% (2)	67% (6)	0% (0)	9
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	22% (2)	78% (7)	0% (0)	9
Regional or local once a year monitoring conducted by other organizations	11% (1)	0% (0)	22% (2)	67% (6)	0% (0)	9
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	22% (2)	11% (1)	67% (6)	0% (0)	9
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	22% (2)	0% (0)	11% (1)	67% (6)	0% (0)	9
						Total Respondents
						72

17. Regional or local state agency monitoring for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.

Ohio River, Wabash system

Ohio River, Wabash

1. Wabash River

West Fork White River

East Fork White River

Ohio River

2. Ohio, White and Wabash rivers

3. Occasional stream surveys

INDFW, 1999 Wabash River, 2003 East Fork White River, 2004 West Fork White River, 2004 Main Stem White River, 1993 Patoka River, 2004 Ohio River Cannelton Pool, annual commercial fish harvest monitoring.

Ohio River, Newburgh and McApline Tailwater fall/winter annual monitoring, occasional stream surveys

Total Respondents **7**

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

18. Regional or local monitoring by other organizations for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.

Ohio River

Ohio River, Wabash

Ohio, White and Wabash rivers

Total Respondents 3

19. Please list organizations that are monitoring the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.

USFWS

USFWS
consultants

1. DNR/DFW
Electric utilities, Ball State University, Purdue University

Total Respondents 4

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

20. What are the current monitoring techniques for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	25% (2)	50% (4)	0% (0)	25% (2)	0% (0)	8
Modeling	22% (2)	33% (3)	0% (0)	33% (3)	0% (0)	11% (1)	9
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (5)	5
Spot mapping	0% (0)	75% (3)	25% (1)	0% (0)	0% (0)	0% (0)	4
Driving a survey route	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	17% (1)	17% (1)	50% (3)	0% (0)	17% (1)	6
Mark and recapture	33% (3)	44% (4)	11% (1)	0% (0)	11% (1)	0% (0)	9
Professional survey/census	56% (5)	44% (4)	0% (0)	0% (0)	0% (0)	0% (0)	9
Volunteer survey/census	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3
Trapping (by any technique)	40% (2)	0% (0)	0% (0)	0% (0)	0% (0)	60% (3)	5
Representative sites	38% (3)	63% (5)	0% (0)	0% (0)	0% (0)	0% (0)	8
Probabilistic sites	25% (1)	0% (0)	50% (2)	0% (0)	0% (0)	25% (1)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
							Total Respondents 76

21. Other monitoring techniques for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.

Larval sampling to check for reproduction

Total Respondents 1

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

1. Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.

2. Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of the clubshell. See same for protocols.

1. Intensive quantitative sampling of known populations. Need to understand demography of the clubshell. See Strayer & Smith, 2003. AFS Monogr. 8.

2. Less intensive qualitative sampling of new or not recently surveyed areas. Need to determine distribution and status of the clubshell. See same for protocols.

1. lectrofishing swift water habitats
Hoop nets

2. 1. Electrofishing river wide
2. Hoop-netting by scientists and commercial fishermen

3. periodic stream surveys

fall/winter Ohio River tailwater sampling and occasional stream surveys

Total Respondents 6

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (9)	9
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (9)	9
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (9)	9
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	11% (1)	89% (8)	9
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (9)	9
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (9)	9
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (9)	9
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	44% (4)	56% (5)	9
		Total Respondents	72

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (8)	8
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (7)	7
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (8)	8
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (8)	8
Regional or local year-round inventory and assessment conducted by other organizations	13% (1)	88% (7)	8
Regional or local once a year inventory and assessment conducted by other organizations	14% (1)	86% (6)	7
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	13% (1)	88% (7)	8
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	67% (6)	33% (3)	9
		Total Respondents	63

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

2. Unknown	
3. USACOE Ohio River	
USACOE Ohio River	
Total Respondents	6

29.	Please list organizations that are monitoring this HABITAT for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.
USFWS	
USFWS consultants	
1. DNR/DFW	
2. Unknown	
3. USACOE Ohio River	
USACOE Ohio River	
Total Respondents	6

30.	If a technique is not applicable to the Wildlife in Great Rivers of the Ohio River Drainage Habitat do not select a response in that row.						
	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	78% (7)	11% (1)	0% (0)	11% (1)	0% (0)	9
Aerial photography and analysis	0% (0)	44% (4)	11% (1)	22% (2)	0% (0)	22% (2)	9
Systematic sampling	33% (2)	50% (3)	0% (0)	0% (0)	0% (0)	25% (1)	6
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
Regulatory information	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
Participation in landuse programs	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3
Modeling	13% (1)	75% (6)	0% (0)	0% (0)	0% (0)	13% (1)	8

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Voluntary landowner reporting	0% (0)	67% (2)	0% (0)	0% (0)	0% (0)	33% (1)	3	
Other (please specify below)	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	3	
						Total Respondents	53	

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

31. Other HABITAT inventory and assessment techniques for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.

QHEI

Total Respondents 1

32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

1. Assess zebra mussel infestations. Contact P. Morrison, USFWS, Parkersburg, WV

1. Zebra mussel assessment. Contact P. Morrison, USFWS, Parkersburg, WV

QHEI

1. Recording GIS information

2. Record habitat when the wildlife species is collected during a survey.

GIS mapping and aerial photography and analysis

GIS mapping and aerial photography and analysis

Total Respondents 6

33. What is the current body of science for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		3	30%
Inadequate		6	60%
Nonexistent		1	10%
Other (please explain below)		0	0%
Total Respondents		10	

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Federal Recovery Plan

Author = USFWS

Date = 1991

Publisher = USFWS

Title = Freshwater mussels of Tennessee

Author = Parmalee & Bogan

Date = 1998

Publisher = U of Tennessee Press

Response Response

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Title = Wabash River Catfish Reports
 Author = Rob Columbo
 Date = 2002,2003,2004,2005
 Publisher = SIU/INDFW
 Title = GIS mapping and aerial photography and analysis
 Author = ORFMT
 Date = annually since 1999
 Publisher = ORFMT

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Life history and propagation...
 Author = Jones & Neves
 Date = 2002
 Publisher = JNABS

Title = Freshwater mussels of the Midwest
 Author = Cummings & Mayer
 Date = 1992
 Publisher = INHS

Title = numerous INDFW FMR's
 Author = Numerous
 Date = numerous
 Publisher = INDFW

Title = various INDFW FMR's
 Author = various
 Date = various
 Publisher = INDFW

Response Total Response Percent

36. What is the current HABITAT body of science for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate 	6	67%
Nonexistent 	3	33%
Other (please explain below)	0	0%
Total Respondents	9	

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = Federal Recovery Plan
 Author = USFWS
 Date =1991

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Publisher = USFWS

Title = Freshwater Mollusca of WI
 Author = Baker
 Date = 1928
 Publisher = WI Geol. Nat. Hist. Surv.

Title = Ohio River Mainstem Study
 Author = USACOE
 Date = 2000?
 Publisher = USACOE

Title = Ohio River Mainstem Study
 Author = USACOE
 Date = 2000?
 Publisher = USACOE

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Naiades of Pennsylvania
 Author = Ortmann
 Date = 1919
 Publisher = Carnegie Museum

39. What are the research needs for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	22% (2)	11% (1)	22% (2)	33% (3)	11% (1)	0% (0)	9
Distribution and abundance	33% (3)	0% (0)	33% (3)	22% (2)	11% (1)	0% (0)	9
Limiting factors (food, shelter, water, breeding sites)	22% (2)	22% (2)	11% (1)	33% (3)	11% (1)	0% (0)	9
Threats (predators/competition, contamination)	33% (3)	11% (1)	11% (1)	33% (3)	11% (1)	0% (0)	9
Relationship/dependence on specific habitats	11% (1)	22% (2)	22% (1)	53% (3)	11% (1)	0% (0)	8
Population health (genetic and physical)	22% (2)	11% (1)	11% (1)	56% (5)	0% (0)	0% (0)	9
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
	Total Respondents						55

40. Other research needs for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.

Determine population limiting factors in the Ohio River.

Total Respondents 1

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

41. What are the HABITAT research needs for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	0% (0)	0% (0)	0% (0)	100% (8)	0% (0)	8
Distribution and abundance (fragmentation)	38% (3)	0% (0)	25% (2)	25% (2)	13% (1)	0% (0)	8
Threats (land use change/competition, contamination/global warming)	38% (3)	0% (0)	25% (2)	25% (2)	13% (1)	0% (0)	8
Relationship/dependence on specific site conditions	0% (0)	13% (1)	38% (3)	25% (2)	13% (1)	0% (0)	7
Growth and development of individual components of the habitat	13% (1)	0% (0)	38% (3)	38% (3)	13% (1)	0% (0)	8
Other (please specify below)	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	67% (2)	3
						Total Respondents	42

42. Other HABITAT research needs for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.

Water quality requirements							
						Total Respondents	1

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

43. How well do the following conservation efforts address the threats to the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	0% (0)	78% (7)	0% (0)	11% (1)	11% (1)	9
Population management (hunting, trapping)	0% (0)	33% (3)	0% (0)	56% (5)	11% (1)	9
Population enhancement (captive breeding and release)	0% (0)	0% (0)	11% (1)	89% (8)	0% (0)	9
Reintroduction (restoration)	0% (0)	11% (1)	11% (1)	78% (7)	0% (0)	9
Food plots	0% (0)	0% (0)	11% (1)	56% (5)	22% (2)	8
Threats reduction	0% (0)	22% (2)	11% (1)	67% (6)	0% (0)	9
Native predator control	0% (0)	0% (0)	11% (1)	89% (8)	0% (0)	9
Exotic/invasive species control	0% (0)	0% (0)	33% (3)	22% (2)	44% (4)	9
Regulation of collecting	0% (0)	33% (3)	44% (4)	11% (1)	11% (1)	9
Disease/parasite management	0% (0)	0% (0)	0% (0)	56% (5)	33% (3)	8
Translocation to new geographic range	0% (0)	0% (0)	11% (1)	89% (8)	0% (0)	9
Protection of migration routes	0% (0)	0% (0)	11% (1)	44% (4)	44% (4)	9
Limiting contact with pollutants/contaminants	0% (0)	57% (4)	0% (0)	43% (3)	0% (0)	7
Public education to reduce human disturbance	0% (0)	67% (6)	0% (0)	33% (3)	0% (0)	9
Culling/selective removal	0% (0)	0% (0)	11% (1)	89% (8)	0% (0)	9
Stocking	0% (0)	0% (0)	11% (1)	89% (8)	0% (0)	9
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
				Total Respondents		144

44. Other current conservation practices for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

- 1. Strictly limit instream modifications
 - 2. Remove existing dams wherever possible
- See Watters, 2000. Proc. 1st FMCS Symposium

- 1. Limit instream modification.
 - 2. Restore free-flowing systems
- See Watters, 2000. Proc. 1st FMCS Symposium

- 1. Public education
- 2. Regulation of collecting

habitat protection/restoration and pollution control

Total Respondents 4

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	78% (7)	11% (1)	11% (1)	0% (0)	9
Habitat protection on public lands	0% (0)	67% (6)	11% (1)	22% (2)	0% (0)	9
Habitat protection incentives (financial)	0% (0)	78% (7)	0% (0)	22% (2)	0% (0)	9
Habitat restoration through regulation	0% (0)	67% (6)	0% (0)	22% (2)	11% (1)	9
Habitat restoration on public lands	0% (0)	67% (6)	0% (0)	33% (3)	0% (0)	9
Habitat restoration incentives (financial)	0% (0)	44% (4)	0% (0)	11% (1)	0% (0)	5
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	33% (3)	22% (2)	44% (4)	0% (0)	9
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	33% (3)	67% (6)	9
Succession control (fire, mowing)	0% (0)	0% (0)	14% (1)	86% (6)	0% (0)	7
Corridor development/protection	0% (0)	63% (5)	13% (1)	25% (2)	0% (0)	8
Managing water regimes	0% (0)	44% (4)	11% (1)	44% (4)	0% (0)	9
Pollution reduction	11% (1)	78% (7)	0% (0)	11% (1)	0% (0)	9
Protection of adjacent buffer zone	0% (0)	78% (7)	0% (0)	22% (2)	0% (0)	9
Restrict public access and disturbance	0% (0)	22% (2)	11% (1)	67% (6)	0% (0)	9
Land use planning	0% (0)	78% (7)	0% (0)	22% (2)	0% (0)	9
Technical assistance	0% (0)	56% (5)	11% (1)	33% (3)	0% (0)	9
Cooperative land management agreements (conservation easements)	0% (0)	78% (7)	11% (1)	11% (1)	0% (0)	9
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
						Total Respondents 150

Appendix E-18: Rivers and Streams Ohio River Drainage Great River

47. Other current HABITAT conservation practices for the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Great Rivers of the Ohio River Drainage Habitat in Indiana?

1. Restrict instream modifications
2. Restore free-flowing systems

1. Eliminate habitat modifications (in-stream dredging, channelization, etc.)
See Watters, 2000. Proc. 1st FMCS Symposium

Buffer strips
Bank stabilization

1. Non-point source pollution reduction
2. 2. riparian conservation easements

restoration of riparian zones, riffle protection/restoration

Total Respondents 5

49. Do you have any additional comments or information on the Wildlife in Great Rivers of the Ohio River Drainage Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

N/A

N/A

no

The blue sucker population is doing well in the Wabash River and parts of the White River. Reintroduction into additional waterbodies is a possible option, but research is needed to determine why the population is healthy in the Wabash/White and not other Great Rivers.

Total Respondents 4

Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland Headwater

7. Please also rank these threats to the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total
Habitat loss (breeding range)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Habitat loss (feeding/foraging areas)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Small native range (high endemism)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Near limits of natural geographic range	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Large home range requirements	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Viable reproductive population size or availability	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Specialized reproductive behavior or low reproductive rates	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Degradation of movement/migration routes (overwintering habitats, nesting and staging sites)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Genetic pollution (hybridization)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Total Respondents							7

8. Other threats to the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

9. Please briefly describe the top two threats to the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana identified above.

Degradation of nesting and staging sites- pools or riffles with slow current beneath flat rocks
 Low reproductive rates-Males reach sexual maturity at 2 while females can reproduce at 1 and they only have a life span of about 3 years.

Total Respondents 1

Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland Headwater

10. Please rank the following threats to the HABITAT of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

	Critical threat	Serious threat	Somewhat of a threat	Slight threat	No threat	Unknown	Response Total													
Commercial or residential development (sprawl)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1													
Counterproductive financial incentives or regulations	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1													
Invasive/non-native species	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1													
Nonpoint source pollution (sedimentation and nutrients)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1													
Habitat fragmentation	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1													
Successional change	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1													
Diseases (of plants that create habitat)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	1													
Habitat degradation	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1													
Climate change	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1													
Stream channelization	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1													
Impoundment of water/flow regulation	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1													
Agricultural/forestry practices	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1													
Residual contamination (persistent toxins)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1													
Point source pollution (continuing)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1													
Mining/acidification	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1													
Drainage practices (stormwater runoff)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1													
Unknown	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0													
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0													
Total Respondents							16													

11. Other HABITAT threats to the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

12. Please briefly describe the top two HABITAT threats to the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana identified above.

Habitat degradation in terms of removal of substrate for spawning and sedimentation for covering the substrate needed to spawn.

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Total Respondents 1

13. What current monitoring efforts by state agencies are you aware of for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (1)	1
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (1)	1
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (1)	1
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	100% (1)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	100% (1)	0% (0)	1
		Total Respondents	8

14. What current monitoring efforts by other organizations are you aware of for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (1)	1
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (1)	1
Regional or local once a year monitoring conducted by other organizations	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1

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Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (1)	1
Total Respondents			8

15. How crucial are these monitoring efforts by state agencies for the conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regional or local once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Total Respondents						8

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16. How crucial are these monitoring efforts by other organizations for the conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total				
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Regional or local once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1				
							Total Respondents	8		

17. Regional or local state agency monitoring for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

IDNR I believe has conducted special studies on some wildlife species in this habitat. IDEM has record of the species being caught in that area.

Total Respondents 1

18. Regional or local monitoring by other organizations for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

19. Please list organizations that are monitoring the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

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Total Respondents	0
(skipped this question)	1

20. What are the current monitoring techniques for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Modeling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Coverboard routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Spot mapping	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Driving a survey route	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Mark and recapture	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Professional survey/census	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Volunteer survey/census	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Trapping (by any technique)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Representative sites	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Probabilistic sites	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Total Respondents							2

21. Other monitoring techniques for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.	No responses were entered for this question.	
Total Respondents		0
(skipped this question)		1

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22. What one or two monitoring techniques would you recommend for effective conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

Seining at representative sites

Total Respondents 1

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	100% (1)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	1
Total Respondents			8

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment	0% (0)	100% (1)	1

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conducted by other organizations			
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (1)	1
		Total Respondents	8

25. How crucial are these HABITAT efforts by state agencies for the conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
					Total Respondents	8

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26. How crucial are these HABITAT efforts by other organizations for the conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
					Total Respondents	8

27. Regional or local state agency HABITAT inventory and assessment for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

28. Regional or local HABITAT inventory and assessment by other organizations for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

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No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

29. Please list organizations that are monitoring this HABITAT for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

IDEM performs habitat assessments in this area

Total Respondents 1

30. What are the current monitoring techniques for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?
If a technique is not applicable to the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Aerial photography and analysis	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Systematic sampling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Regulatory information	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Participation in landuse programs	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Modeling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
							Total Respondents 0
							(skipped this question) 1

31. Other HABITAT inventory and assessment techniques for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

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Headwater

No responses were entered for this question.

Total Respondents **0**

(skipped this question) 1

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32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

33. What is the current body of science for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	1	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
Total Respondents	1	

34. Please provide a citation (title, author, date, publisher) that would give the best overview of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents	0	
(skipped this question)		1

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%

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Publisher	0	0%
	Total Respondents	0
	(skipped this question)	1

36. What is the current HABITAT body of science for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Response Total	Response Percent
Complete, up to date and extensive	0	0%
Adequate	0	0%
Inadequate	1	100%
Nonexistent	0	0%
Other (please explain below)	0	0%
	Total Respondents	1

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
	Total Respondents	0
	(skipped this question)	1

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
	Total Respondents	0
	(skipped this question)	1

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Headwater

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39. What are the research needs for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Life cycle	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Distribution and abundance	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Limiting factors (food, shelter, water, breeding sites)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Threats (predators/competition, contamination)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Relationship/dependence on specific habitats	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Population health (genetic and physical)	0% (0)	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
	Total Respondents						6

40. Other research needs for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

41. What are the HABITAT research needs for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Urgently needed	Greatly needed	Needed	Slightly needed	Not needed	Unknown	Response Total
Successional changes	0% (0)	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	1
Distribution and abundance (fragmentation)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Threats (land use change/competition, contamination/global warming)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Relationship/dependence on specific site conditions	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Growth and development of individual components of the habitat	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
	Total Respondents						5

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42. Other HABITAT research needs for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

43. How well do the following conservation efforts address the threats to the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total															
Habitat protection (use below for details)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Population management (hunting, trapping)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Population enhancement (captive breeding and release)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Reintroduction (restoration)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Food plots	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Threats reduction	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Native predator control	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Exotic/invasive species control	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Regulation of collecting	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Disease/parasite management	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Translocation to new geographic range	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Protection of migration routes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Limiting contact with pollutants/contaminants	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Public education to reduce human disturbance	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Culling/selective removal	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Stocking	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0															
						Total Respondents 0															
						(skipped this question)															

44. Other current conservation practices for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

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(skipped this question) 1

45. What one or two specific practices would you recommend for more effective conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

Habitat protection and threats reduction

Total Respondents 1

46. How well do the following conservation efforts address the HABITAT threats to the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Habitat protection on public lands	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Habitat protection incentives (financial)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Habitat restoration through regulation	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Habitat restoration on public lands	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Habitat restoration incentives (financial)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Corridor development/protection	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Managing water regimes	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Pollution reduction	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Protection of adjacent buffer zone	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Restrict public access and disturbance	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Land use planning	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Technical assistance	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Cooperative land management agreements (conservation easements)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0

Total Respondents 0

(skipped this question) 1

47. Other current HABITAT conservation practices for the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

(skipped this question) 1

Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland
Headwater

Appendix E-19: Rivers and Streams Ohio River Drainage Interior River Lowland Headwater

48. What one or two specific HABITAT practices would you recommend for more effective conservation of the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

Habitat restoration and protection

Total Respondents 1

49. Do you have any additional comments or information on the Wildlife in Headwaters in the Interior River Lowland of the Ohio River Drainage Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

IDEM has collected spottail darters in Posey Co. on a trib of Black River and Hawthorne Creek.

Total Respondents 1

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland
Wadeable/Large River

9. Please briefly describe the top two threats to All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana identified above.

1. 1) commercial type fishing devices - trot lines, branch lines, big nets, other passive fishing
2) extreme depredation by overabundant raccoons (on eggs) - maybe by cayotes, too.
3) extant population (if any) far below level for unassisted recovery.

2. 1) nest depredation mainly by raccoons = very low recruitment.
2) nest/embryo/hatchling loss associated with attraction to rowcrop land for nesting.
3) potential loss of adults to road kill and to rogue raccoons (kill adults for their eggs)

3. 1. Insuring that populations maintain critical larva-host connections.

4. Habitat loss for both breeding and feeding/foraging areas. The slough darter prefers a mud or silt bottom with little current velocity and vegetation to deposit eggs on. They also spawn few eggs so reproduction is lower in places where vegetation is lacking. They also compete with other darters for insects and have a high mortality due to stagnation and freezing in the pools they desire to live in.

Total Respondents

4

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland
Wadeable/Large River

12. Please briefly describe the top two HABITAT threats to All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana identified above.

- 1) channelization
 - 2) drain/cut off oxbow ponds
 - 3) trample sandbars or remove other nesting areas along banks
- 1) habitat loss through channelization and draining of oxbow ponds and elimination of flows that create point bars on rivers.
 - 2) rowcrop practices: crushing nests during ground insect/weed control; crushing overwinter hatchlings during harvest & early spring plowing
1. Pollutants and toxins are major threats.
2. Habitat degradation may be a factor, since there are large expanses in the Wabash and East Fork White River where relic valves are common, but the living species is absent.
- Habitat degradation and stream channelization as development continues in the Ohio River Drainage Habitat.

Total Respondents 4

13. What current monitoring efforts by state agencies are you aware of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	100% (5)	5
Statewide once a year monitoring conducted by state agencies	0% (0)	100% (5)	5
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	100% (5)	5
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	20% (1)	80% (4)	5
Regional or local year-round monitoring conducted by state agencies	0% (0)	100% (5)	5
Regional or local once a year monitoring conducted by state agencies	0% (0)	100% (5)	5
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	40% (2)	60% (3)	5
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by state agencies	60% (3)	40% (2)	5
	Total Respondents		40

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland
Wadeable/Large River

14. What current monitoring efforts by other organizations are you aware of for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	Not aware of these efforts occurring	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	100% (5)	5
Statewide once a year monitoring conducted by other organizations	0% (0)	100% (5)	5
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (5)	5
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (5)	5
Regional or local year-round monitoring conducted by other organizations	0% (0)	100% (5)	5
Regional or local once a year monitoring conducted by other organizations	0% (0)	100% (5)	5
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	100% (5)	5
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	20% (1)	80% (4)	5
	Total Respondents		40

15. How crucial are these monitoring efforts by state agencies for the conservation of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	5
Statewide once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	5
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	20% (1)	0% (0)	60% (3)	20% (1)	5
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	5
Regional or local year-round monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	5
Regional or local once a year monitoring conducted by state agencies	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	5
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by state agencies	0% (0)	33% (2)	33% (2)	33% (2)	0% (0)	6
Occasional regional or local (less than						

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland
Wadeable/Large River

once a year and not regularly scheduled)
monitoring conducted by state agencies

Total Respondents 40

16. How crucial are these monitoring efforts by other organizations for the conservation of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Very crucial	Somewhat crucial	Slightly crucial	Not crucial	Unknown	Response Total
Statewide year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	5
Statewide once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	5
Periodic statewide (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	5
Occasional statewide (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	5
Regional or local year-round monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	5
Regional or local once a year monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	80% (4)	20% (1)	5
Periodic regional or local (less than once a year but still regularly scheduled) monitoring conducted by other organizations	0% (0)	0% (0)	0% (0)	60% (3)	40% (2)	5
Occasional regional or local (less than once a year and not regularly scheduled) monitoring conducted by other organizations	0% (0)	20% (1)	0% (0)	40% (2)	40% (2)	5
						Total Respondents 40

17. Regional or local state agency monitoring for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

1. I'm unaware of any. Perhaps some occur coincident with large fish survey.
2. Ask Zack Walker
I believe there was an accidental capture near Shoals
3. IDNR nongame biologist continually monitors fishes and mussels throughout the state, including Yellow Sandshell habitat. Two surveys have been done- ten years apart, completed last year - by IDNR biologists in the Wabash, Tippecanoe, and East Fork White Rivers; results are pending. This is in prime Yellow Sandshell habitat.
4. Blue River (Harrison County)
East Fork White River
West Fork White River

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Wadeable/Large River

Total Respondents

4

Appendix E-20: Rivers and Streams Ohio River Drainage Interior River Lowland
Wadeable/Large River

18. Regional or local monitoring by other organizations for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

1. I'm unaware of any.
2. none

Total Respondents 2

19. Please list organizations that are monitoring All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

1. None?
2. IDEM monitors fish communities not particular species; however, the Slough darter has been captured by electrofishing in the Ohio River Drainage Habitat
3. DNR/DFW

Total Respondents 3

20. What are the current monitoring techniques for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
Radio telemetry and tracking	0% (0)	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	4
Modeling	0% (0)	0% (0)	50% (2)	0% (0)	0% (0)	50% (2)	4
Coverboard routes	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Spot mapping	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (2)	2
Driving a survey route	0% (0)	0% (0)	50% (1)	0% (0)	0% (0)	50% (1)	2
Reporting from harvest, depredation, or unintentional take (road kill, bycatch)	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	3
Mark and recapture	25% (1)	0% (0)	25% (1)	0% (0)	0% (0)	50% (2)	4
Professional survey/census	25% (1)	50% (2)	0% (0)	0% (0)	0% (0)	25% (1)	4
Volunteer	0% (0)	33% (1)	33% (1)	0% (0)	0% (0)	33% (1)	3

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survey/census							
Trapping (by any technique)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (3)	3
Representative sites	25% (1)	25% (1)	0% (0)	0% (0)	0% (0)	50% (2)	4
Probabilistic sites	33% (1)	33% (1)	33% (1)	0% (0)	0% (0)	0% (0)	3
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
						Total Respondents	39

21. Other monitoring techniques for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

22. What one or two monitoring techniques would you recommend for effective conservation of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

- 1) Occasional censusing with very large, heavily bated hoop nets left out overnight.
 - a) do not set during rising waters.
 - b) check within 12 hours.
1. b) check within 12 hours.
- 2) Search for nests in June (after determining any adults present at all) methods used in FL and LA for nests, in AR and LA for capturing adults
- 1) looking for basking individuals with a spotting scope.
- 2) perhaps use of fyke nets with big leads, or basking traps to estimate numbers after visual spotting determines presence.
1. Systematic monitoring of probabilistic sites (professional).
2. Use of volunteer census/monitoring.
- Seining or electrofishing representative sites using professionals.
- ELECTROFISHING CATCH RATES
- POPULATION ESTIMATES

Total Respondents 5

23. What current HABITAT inventory and assessment efforts or activities by state agencies are you aware of for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	100% (5)	5
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	100% (5)	5
Periodic statewide (less than once a year but still regularly			

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scheduled) inventory and assessment conducted by state agencies			
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	100% (5)	5
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	100% (5)	5
Regional or local once a year inventory and assessment conducted by state agencies	20% (1)	80% (4)	5
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	60% (3)	40% (2)	5
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	40% (2)	60% (3)	5
		Total Respondents	40

24. What current HABITAT inventory and assessment efforts or activities by other organizations are you aware of for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Yes, these efforts occur	No effort that I'm aware of	Response Total
Statewide year-round inventory and assessment conducted by other organizations	0% (0)	100% (5)	5
Statewide once a year inventory and assessment conducted by other organizations	0% (0)	100% (5)	5
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (5)	5
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (5)	5
Regional or local year-round inventory and assessment conducted by other organizations	0% (0)	100% (5)	5
Regional or local once a year inventory and assessment conducted by other organizations	0% (0)	100% (5)	5
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (5)	5
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by other organizations	0% (0)	100% (5)	5
		Total Respondents	40

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25. How crucial are these HABITAT efforts by state agencies for the conservation of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	These efforts are very crucial for this HABITAT	These efforts are somewhat crucial for this HABITAT	These efforts are slightly crucial for this HABITAT	These efforts are not crucial for this HABITAT	Unknown	Response Total
Statewide annual inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	60% (3)	40% (2)	5
Statewide once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	60% (3)	40% (2)	5
Periodic statewide (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	5
Occasional statewide (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	0% (0)	0% (0)	60% (3)	40% (2)	5
Regional or local year-round inventory and assessment conducted by state agencies	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	5
Regional or local once a year inventory and assessment conducted by state agencies	0% (0)	0% (0)	20% (1)	40% (2)	40% (2)	5
Periodic regional or local (less than once a year but still regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	20% (1)	80% (4)	0% (0)	0% (0)	5
Occasional regional or local (less than once a year and not regularly scheduled) inventory and assessment conducted by state agencies	0% (0)	20% (1)	40% (2)	20% (1)	20% (1)	5
						40
				Total Respondents		40

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27. Regional or local state agency HABITAT inventory and assessment for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

1. If any inventory is occurring, it's for water quality or fish contamination.

I am assuming that the governmental division responsible for water pollution control conducts some sampling regarding organic and heavy metal toxins in the water.

2. I'm unclear as to whether there is any survey on silting in or natural changes in river channels

3. IDNR primarily monitors mussel species, making habitat notations. No real habit monitors made. However, Indiana Department of Environmental Management, IDNR Division of Water do monitor water quality (as a component of habitat).

4. BLUE RIVER (HARRISON COUNTY)

Total Respondents 4

28. Regional or local HABITAT inventory and assessment by other organizations for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

1. If any inventory is occurring, it's for water quality or fish contamination.

2. Occasional grants to universities - ???

3. NONE

Total Respondents 3

29. Please list organizations that are monitoring this HABITAT for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

1. whoever samples for state water pollution control.
Fish quality? State board of health??

2. IDEM makes assessments of the habitat while doing fish community surveys in the Ohio River Drainage Habitat.

3. DNR/DFW

Total Respondents 3

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30. What are the current monitoring techniques for All Wildlife in the Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.
If a technique is not applicable to the Alligator snapping turtle (*Macrochelys temmincki*) do not select a response in that row.

	Frequently used	Occasionally used	Not used but possible with existing technology and data	Not used and not possible with existing technology and data	Not economically feasible	Unknown	Response Total
GIS mapping	0% (0)	50% (2)	25% (1)	0% (0)	0% (0)	25% (1)	4
Aerial photography and analysis	0% (0)	25% (1)	0% (0)	0% (0)	0% (0)	75% (3)	4
Systematic sampling	0% (0)	0% (0)	0% (0)	25% (1)	0% (0)	75% (3)	4
Property tax estimates	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
State revenue data	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Regulatory information	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Participation in landuse programs	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Modeling	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Voluntary landowner reporting	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Other (please specify below)	0% (0)	33% (1)	0% (0)	0% (0)	0% (0)	67% (2)	3
Total Respondents							39

31. Other HABITAT inventory and assessment techniques for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

OHEI.

Total Respondents 1

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32. What one or two HABITAT inventory and assessment techniques would you recommend for effective conservation of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

- High resolution aerial photography DURING LOW WATER - digitized for GIS. locate:
1.
 - 1) Deep river holes with woody debris (favored by adults)
 - 2) health/permanence of oxbow ponds
 - 3) nesting habitat
 2.
 - 1) high resolution aerial photography during low water periods - digitize and use in GIS - re. how lasting are oxbow ponds during droughts.
 - 2) occasional site visits to assess vegetation quality for this herbivorous turtle.
 3.
 1. To look at saturation of potential habitat: with GIS construction of existing potential habitat(based upon known factors)and overlaying the current distribution of the Yellow Sandshell.
 4. QHEI

Total Respondents 4

33. What is the current body of science for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		2	40%
Inadequate		3	60%
Nonexistent		0	0%
Other (please explain below)		0	0%
Total Respondents		5	

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34. Please provide a citation (title, author, date, publisher) that would give the best overview All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title =

Author = Minton

Date = 2001

Publisher =

Title = (Numerous internet sites, including USF&W)

Author =

Date =

Publisher =

**Response Response
Total Percent**

Title = A survey of fish communities and aquatic habitats at Indiana's major streams with emphasis on smallmouth bass distribution and abundance

Author = Stuart Shipman

Date = 12/1997

Publisher = DNR/Fisheries section

35. If possible, please provide a second citation (title, author, date, publisher) that would give another good overview of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

Title = Freshwater Mussels of the Midwest

Author = Cummings & Mayer




Date = 1992

Publisher = Illinois Natural History Survey

**Response Response
Total Percent**

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36. What is the current HABITAT body of science for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

		Response Total	Response Percent
Complete, up to date and extensive		0	0%
Adequate		2	0%
Inadequate		2	40%
Nonexistent		0	40%
Other (please explain below)	 not my expertise - look for historical geography/hydrology	1	20%
Total Respondents		5	

37. Please provide a citation (title, author, date, publisher) that would give the best HABITAT overview of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana, if available. This resource may be used if further detail is needed.

Title = ??? Sugar Creek???

Author =?

Date = late 1970s/early 1980s

Publisher = PhD thesis IU Bloomington

Response
Total Response
Percent

38. If possible, please provide a second citation (title, author, date, publisher) that would give another good HABITAT overview of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana. This resource may also be used if further detail is needed.

	Response Total	Response Percent
Title	0	0%
Author	0	0%
Date	0	0%
Publisher	0	0%
Total Respondents		0

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Total Respondents 26

42. Other HABITAT research needs for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

1. Same as on previous panel

Total Respondents 1

43. How well do the following conservation efforts address the threats to All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection (use below for details)	25% (1)	50% (2)	0% (0)	0% (0)	25% (1)	4
Population management (hunting, trapping)	25% (1)	25% (1)	0% (0)	25% (1)	25% (1)	4
Population enhancement (captive breeding and release)	25% (1)	0% (0)	0% (0)	75% (3)	0% (0)	4
Reintroduction (restoration)	50% (2)	0% (0)	0% (0)	50% (2)	0% (0)	4
Food plots	0% (0)	0% (0)	0% (0)	100% (4)	0% (0)	4
Threats reduction	25% (1)	0% (0)	0% (0)	50% (2)	25% (1)	4
Native predator control	25% (1)	0% (0)	0% (0)	75% (3)	0% (0)	4
Exotic/invasive species control	0% (0)	0% (0)	25% (1)	50% (2)	25% (1)	4
Regulation of collecting	0% (0)	25% (1)	25% (1)	0% (0)	50% (2)	4
Disease/parasite management	0% (0)	0% (0)	0% (0)	0% (0)	100% (4)	4
Translocation to new geographic range	50% (2)	0% (0)	0% (0)	50% (2)	0% (0)	4
Protection of migration routes	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	4
Limiting contact with pollutants/contaminants	50% (2)	0% (0)	0% (0)	25% (1)	25% (1)	4
Public education to reduce human disturbance	25% (1)	25% (1)	25% (1)	0% (0)	25% (1)	4
Culling/selective removal	0% (0)	0% (0)	25% (1)	50% (2)	25% (1)	4
Stocking	50% (2)	0% (0)	0% (0)	50% (2)	0% (0)	4
Other (please specify below)	0% (0)	0% (0)	50% (1)	0% (0)	50% (1)	2
	Total Respondents					66

44. Other current conservation practices for All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

1. Wildlife species listed as endangered are illegal to take/"collect."
People need to be reminded of this.

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Total Respondents	1
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45. What one or two specific practices would you recommend for more effective conservation of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

- 1) restock, as too few if any turtles remain
 - 2) end use of commercial fishing equipment
 - 3) Do periodic local removal of raccoons
2. 1. Protection of the habitat against pollutants and toxins.
 - 1) Expand and liberalize the taking of raccoons so as to greatly reduce numbers associated with river cooter habitat. Raccoon reduction used re. sea turtles in FL and endangered Illinois mud turtle in IA, proposed for alligator s. in LA
 - 2) Cease any future channelization plans and restore existing oxbow ponds - provide landowner financial incentive.
 - 3) local restocking where raccoons reduced should hasten delisting criteria.
4. Habitat protection
Threats Reduction

Total Respondents 4

46. How well do the following conservation efforts address the HABITAT threats to All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

	Very well	Somewhat	Not at all	Not used	Unknown	Response Total
Habitat protection through regulation	0% (0)	50% (2)	25% (1)	0% (0)	25% (1)	4
Habitat protection on public lands	0% (0)	75% (3)	0% (0)	0% (0)	25% (1)	4
Habitat protection incentives (financial)	50% (2)	25% (1)	0% (0)	0% (0)	25% (1)	4
Habitat restoration through regulation	25% (1)	50% (2)	0% (0)	0% (0)	25% (1)	4
Habitat restoration on public lands	50% (2)	25% (1)	0% (0)	0% (0)	25% (1)	4
Habitat restoration incentives (financial)	75% (3)	0% (0)	0% (0)	0% (0)	25% (1)	4
Artificial habitat creation (artificial reefs, nesting platforms)	0% (0)	75% (3)	0% (0)	0% (0)	25% (1)	4
Selective use of functionally equivalent exotic species in place of extirpated natives	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Succession control (fire, mowing)	0% (0)	0% (0)	0% (0)	75% (3)	25% (1)	4
Corridor development/protection	25% (1)	25% (1)	0% (0)	25% (1)	25% (1)	4
Managing water regimes	0% (0)	75% (3)	0% (0)	0% (0)	25% (1)	4
Pollution reduction	25% (1)	50% (2)	0% (0)	0% (0)	25% (1)	4
Protection of adjacent buffer zone	75% (3)	0% (0)	0% (0)	0% (0)	25% (1)	4
Restrict public access and disturbance	25% (1)	25% (1)	25% (1)	0% (0)	25% (1)	4
Land use planning	50% (2)	25% (1)	0% (0)	0% (0)	25% (1)	4
Technical assistance	0% (0)	25% (1)	0% (0)	0% (0)	75% (3)	4

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Cooperative land management agreements (conservation easements)	75% (3)	0% (0)	0% (0)	0% (0)	25% (1)	4
Other (please specify below)	0% (0)	0% (0)	0% (0)	0% (0)	100% (1)	1
Total Respondents						69

47. Other current HABITAT conservation practices All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana.

No responses were entered for this question.

Total Respondents 0

48. What one or two specific HABITAT practices would you recommend for more effective conservation of All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat in Indiana?

1.
 - 1) Encourage return to natural meander channel (within flood control).
 - 2) Let dead trees in river stay; perhaps add some.
 - 3) rehabilitate drained oxbow ponds through conservation easment.
2.
 - 1) oxbow pond conservation easements and restoration - prime feeding habitat.
 - 2) enhance natural river channel evolution including point bar development and snags (downed trees in the water) - provides basking sites and nesting habitat away from row crop agriculture
3.
 1. Manage water quality and pollutants.
4.
 2. Protection of adjacent buffer zones.
4. Habitat protection

Total Respondents 4

49. Do you have any additional comments or information on All Wildlife in Wadeable/Large Rivers in the Interior River Lowland of the Ohio River Drainage Habitat that you feel would be useful in the development of the Indiana Comprehensive Wildlife Strategy?

1.
 - 1) Convince DNR that some restocking will be necessary (only known capture in Indiana in last 50 years died on DNR watch).
 - 2) Convince DNR that raccoon population reduction will be critical during early rehab (and important later on - increase recreational harvest).
 - 3) Put lower West Fork and Middle East Forks White River off limits to commercial fishing. Forget about Ohio R & lower Wabash (State cannot control).

2.

As with alligator snapping turtle, persuade DNR to take measures for significant raccoon reduction in/near river cooter habitat. Assuming cooter populations then increase, raccoon control remains desirable but less important.

This species is herbivorous and thus not attracted to fish bait. Use of giant nets in oxbow ponds would trap cooters, which might then drown.

3.

Yellow Sandshell appear to be a resilient species that are relatively tolerant of some silt; it has expanded beyond rivers and streams and has taken up residence in reservoirs. If we afford it the broad protection (i.e., against pollutants and habitat destruction) that we attempt to give to mussels in general and to other components of our wildlife and environment, it should do well.

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4. IDEM has captured slough darters on the following streams: Turkey Cr (Clay Co.), Patoka R and N Fk Little Pigeon Cr (Dubois Co.), Patoka R and Yellow Cr as well as Smith Fk Pigeon Cr (Gibson Co.), Bruster Br and Flat Cr (Pike Co.), E Fk Crooked Cr (Spencer Co.), Busseron Cr (Sullivan Co.), and Lost Cr, Otter Cr, N Br Otter Cr in Vigo Co.
5. no

Total Respondents 5