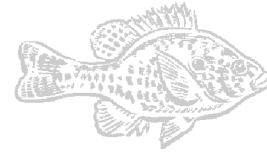
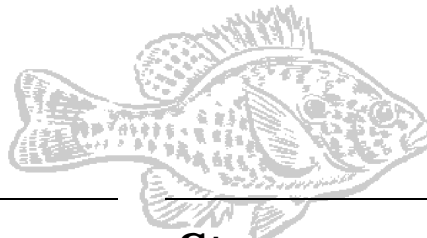




Chapter 6

Aquatic Communities: Status, Needs, and Goals



6.1

Introduction

This chapter describes and assesses aquatic communities—those of rivers and streams, of inland lakes and ponds, and of Lake Michigan. It reports on the status of the communities and their habitats in terms of their condition and problems, defines goals, and identifies actions needed.

The information presented in this chapter is based on the knowledge of participants in the expert workshops and reviewers of the resulting working papers. Much of the content is based on professional experience, rather than the published literature, and is provided to give an indication of priority and direction for future conservation work. Workshop reports on which this chapter is based can be found on the Chicago Wilderness web site (www.chiwild.org). Each of the aquatic communities was examined by a different assessment process, as described in each section.

The Illinois Environmental Protection Agency lists 76 streams within the Illinois portion of the Chicago Wilderness region (IEPA 1996). In addition, there are approximately 20 streams in the Indiana and Wisconsin portions. Each stream's watershed boundary can be mapped to help delineate important water resource areas for biodiversity protection and recovery planning. These watersheds are the basic management units for determining recovery goals and actions for aquatic biodiversity.

The following sections describe the streams of Chicago Wilderness in terms of their general descriptive classification, protection and recovery goals, quality assessment, prioritization, threats, and recommended actions.

6.2

Stream communities—status, recovery goals, and recommended actions

6.2.1 Stream classification

Stream ecosystems within watersheds of the Chicago Wilderness region fall into three general categories: headwater, low-order, and mid-order. Within these groups are subcategories defined by flow, gradient, and substrate. The following is a brief description of each class and examples of streams within those classes.

Headwater streams

Continuous-flow headwater streams are first-order streams¹ with small drainage areas and little or no pool development. They are characterized by relatively stable, cool temperatures and consistent levels of dissolved oxygen. They have low habitat heterogeneity and low trophic complexity. Indicator fish species include sculpins and dace. Invertebrate indicator species include caddis flies and stone flies. Plants include watercress, chara, water parsnip, and berula. There are two general types of continuous-flow headwater streams: those with coarse substrates (e.g., Black Partridge Creek and Silver Creek) and those with fine substrates (e.g., Rob Roy Creek).

Intermittent-flow headwater streams are first-order streams with highly variable flows and temperatures. They are inhabited by colonizer species with high reproductive rates or are largely abiotic. Indicator fish species include bluntnose minnow and striped shiner. Intermittent-flow headwater streams can also be divided into those with coarse substrates and those with fine substrates.

¹ A first-order stream is a headwater stream without any tributaries. When two streams of the same order unite, the resulting stream is raised one level. Thus, when two first-order streams unite, the resulting stream is a second-order stream. When two second order streams unite, the resulting stream is a third order. The order of a stream is not increased when a lower-order stream enters it.

Low-order streams

High-gradient low-order streams are second- to fourth-order, small- to medium-sized creeks, often with distinct riffle and pool development. They have more complex habitats and trophic characteristics than headwater streams. High-gradient low-order streams fall more than three feet per mile and have coarse substrates, mostly cobble, gravel, and sand with some silt. Indicator fish species include darters, stonerollers, hornyhead chub, and juvenile suckers. Examples include Tyler Creek, Buck Creek, and Long Run Creek.

Low-gradient low-order streams are second- to fourth-order creeks that fall less than three feet per mile and have predominantly fine-textured substrates. Indicator fish species include creek chub and bluntnose minnow; plants include sago pondweed, water star weed, and American pondweed. Examples include Lily Cache Creek, Skokie River, Plum Creek, and Mill Creek.

Mid-order streams

High-gradient mid-order streams are fifth- to eighth-order, large creeks to medium-sized rivers with relatively stable flows, temperatures, and high habitat diversity. They have the most complex habitats, are highest in species diversity, and harbor abundant predators. High-gradient mid-order streams fall more than three feet per mile and have coarse substrates. Indicator fish species include smallmouth bass, northern hogsucker, and redhorse. Examples include Kankakee River, Kishwaukee River, and the Lower Fox River.

Low-gradient mid-order streams differ from high-gradient mid-order streams in that they fall less than three feet per mile and have finer substrates. Indicator fish species include largemouth bass, pike, and channel catfish. Examples include the Upper Fox and the Upper Des Plaines River.

6.2.2 Functions of streams

Streams and rivers are familiar features in the Chicago Wilderness region. They perform many important functions, some obvious and some not so apparent.

Drainage is their most obvious function. Streams convey runoff from the land, most noticeably during floods, when even the least conspicuous drainageway can become a raging torrent. Streams also convey the treated and untreated wastes of our urban and agricultural lands. In fact, during the drier times of the year, treated wastewater constitutes virtually the entire flow in some of our more urban streams.

Streams also are valued for recreation because of their potential to support fishing, swimming, wildlife obser-

vation, and boating. Healthy streams provide habitat for diverse communities of fish, amphibians, insects, and aquatic plants. Stream and river corridors also are viewed as aesthetic amenities for residential development and public open space, and they provide travel corridors for wildlife.

Historically, however, conflicts have arisen between the various uses and functions of streams. In particular, increased reliance on streams as conduits for storm water and wastewater has greatly diminished their ability to provide benefits of recreation, habitat, water quality, and aesthetics.

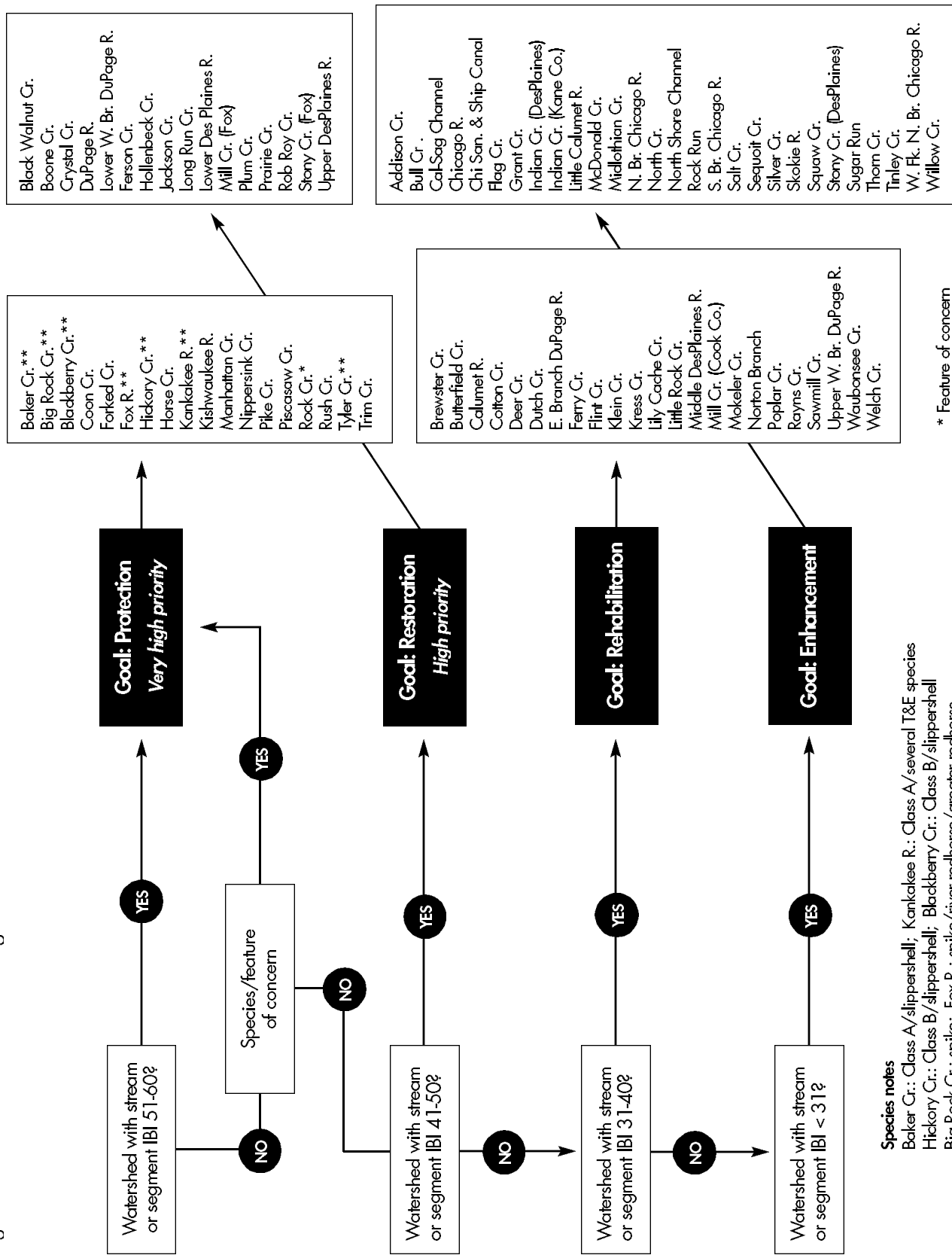
There are two principal causes for these conflicts. The first is the alteration or destruction of the stream channel and its adjacent corridor, or *riparian zone*. Activities such as stream channelization or straightening destroy critical habitat and upset the natural balance between a stream and its floodplain that has developed over thousands of years. The second cause is the alteration of the stream's watershed. For example, the conversion of farmland to subdivisions and shopping centers increases the impervious land surface. This can result in adverse changes to both the quantity and quality of stream-flow. These changes can upset the natural equilibrium of a stream, often resulting in channel erosion, lost habitat, degraded water quality, and frequent flooding.

6.2.3 Stream assessment and prioritization

One of the goals of the biodiversity recovery plan is to build consensus on the protection and enhancement of streams that provide a high degree of biological function. Watersheds of streams that have exceptional aquatic biological integrity, or have the potential to be restored, should be identified in order to establish priorities for future efforts in protection and recovery.

The information in this section results from a Chicago Wilderness project called "Stream Biodiversity Recovery Priorities." As a first step, the project identified perennial streams that support or have the potential to support native fish and aquatic life populations in the six-county northeastern Illinois region (Cook, DuPage, Kane, Lake, McHenry, and Will Counties) were identified. The project developed a stream prioritization method that classified streams into four categories according to the following recovery goals: protection, restoration, rehabilitation, and enhancement. Streams for which the goals are protection and restoration are considered of very high priority and high priority respectively. (See Figure 6.1.) The streams were classified by the following criteria:

Figure 6.1 Flow chart for determining stream and watershed status



- Index of biotic integrity (IBI)
- Species or features of concern
- Macroinvertebrate Biotic Index (MBI)
- Abiotic indicators

The following describes each of these criteria and discusses their use and limitations in determining priorities for protection and recovery in the Chicago Wilderness region.

Index of Biotic Integrity (IBI)

The IBI uses fish-sampling data to indicate the overall health and integrity of a stream. The IBI assesses the health of fish communities using twelve different metrics. These twelve metrics fall into three categories: species composition, trophic composition, and fish abundance and condition. Data are obtained for each metric at a given site, and a number rating is assigned to each metric. The sum of the twelve ratings yields an overall site score, with scores in Illinois ranging from 12 for exceptionally poor quality to 60 for exceptionally high quality. The IBI integrates information about individuals, populations, communities, and the ecosystem into a single ecologically based index of water-resource quality (Karr 1981, Karr et al. 1986, IEPA 1996).

IBI data from Illinois were used to characterize streams. Streams with an IBI score of greater than 50 were designated as very high priority, with a primary goal of protection. Streams with an IBI score of 50 or less, but with species or habitat features of concern (described in the next section), were also designated as very high priority. Streams with IBI 41–50 that lacked species and habitat features of concern were designated as high priority, with a goal of restoration. Streams with IBI 31–40 that lacked species and habitat features of concern were assigned a goal of rehabilitation. Streams with IBI less than 31 that lacked species and habitat features of concern were assigned a goal of enhancement. Figure 6.1 shows the method for developing stream and watershed priorities and gives examples of watersheds for each category.

Species or features of concern

These include state threatened and endangered species as well as other unique aquatic habitat and biological characteristics. Professional experience and judgement were used in cases where fish and invertebrate data were unavailable, where unique cold-water habitats exist, or where unique fish and invertebrate communities were believed degraded because of point and non-point sources of pollution. Streams that contained species or features of concern were designated as very high priority, with the goal of protection. Table 6.1 gives a provisional list of stream-based species and features of concern.

Macroinvertebrate Biotic Index (MBI)

MBI values, based on pollution-tolerance ratings for macroinvertebrates, were compiled for streams where data were available. Streams with IBI scores of less than 40 and with MBI scores of less than five may indicate good-quality, healthy stream ecosystems that have some potential for restoration, rehabilitation, or enhancement. However, until a relationship between MBI and IBI values can be verified, other criteria must be used to assign goals for recovery and protection.

Abiotic indicators

For streams where biological data are extremely limited (for example, almost all headwater streams), abiotic watershed variables need to be considered in order to predict biotic potential and assign a recovery or protection goal. Abiotic watershed variables are frequently components of both aquatic *and* terrestrial ecosystems. Land-use patterns, percentage of impervious land surface, stream-flow obstructions, in-stream habitat, degree of erosion and sedimentation, degree of alteration and channelization, stream width, and substrate are all examples of abiotic factors affecting streams. Until these conditions can be adequately described and a prioritization method established, the assignment of recovery priority goals will rely primarily on professional judgement.

6.2.4 The relationship between stream quality and urban development

The biotic quality of streams and rivers in the Chicago Wilderness region is highly variable. As in other parts of the country, there is clear evidence that watershed urbanization has adverse impacts on the ecological integrity and beneficial uses of downstream bodies of water. In northeastern Illinois, this impact is reflected in a relationship between urbanization, as measured by watershed population density, and stream quality, as measured by the fish-based Index of Biotic Integrity (IBI). The assessment of over 40 northeastern Illinois streams and rivers shows that nearly all streams in urban and suburban watersheds (that is, with population densities exceeding roughly 300 people per square mile) exhibit signs of considerable impairment of their fish communities, with conditions being described as fair to very poor. In contrast, most rural streams support fish communities that are rated good or excellent.

6.2.5 Status of streams in northwest Indiana

A recent study provides details on the structure and function of fish communities in the Lake Michigan watershed of northwest Indiana (Simon and Stewart 1999). There are three functioning riverine watersheds in northwest

Table 6.1
Stream based species features of concern

Mussels	Fish	Amphibians and reptiles
Slippershell	Iowa darter	Spotted turtle
Spike	Western sand darter	Smooth softshell turtle
Ellipse	Rainbow darter	Blanding's turtle
Creek heelsplitter	Pallid shiner	
Elephant-ear	Mottled sculpin	
Rainbow	Blacknose shiner	Mammals
Wavy-rayed lampmussel	Pugnose shiner	River otter
Snuffbox	Greater redhorse	
Higgins eye	Banded killifish	
Salamander mussel	Ironcolor shiner	Plants
Sheepnose	Blackchin shiner	Heart-leaved plantain, <i>Plantago cordata</i>
Pondhorn	Weed shiner	Water marigold, <i>Bidens beckii</i>
Spectaclecase	Longnose dace	
	Brook lamprey	
	Pugnose minnow	
Insects	Starhead topminnow	Other features
	Banded darter	Streams with > 8 species of mussels
Hine's emerald dragonfly	Bowfin	Other conditions that are known to harbor unique biological characteristics
	Spottail shiner	
	Brassy minnow	
	Largescale stoneroller	
	Creek chubsucker	
	Pirate perch	

Indiana, the Little Calumet River, the Grand Calumet River, and Trail Creek. In addition, there are creeks draining the area of the Great Marsh in the Indiana Dunes National Lakeshore. The natural hydrology of this part of the Chicago Wilderness region has been greatly changed from natural conditions by human actions over the past 200 years, beginning with changes in drainage patterns by Native Americans (Indiana DNR 1999).

There are no high quality reference sites for streams remaining in this region, and few areas qualify even as "least-impacted." The Trail Creek watershed is the only one with a significant percentage of species that are intolerant of degradation in water and habitat quality. The fish community in each watershed is composed of at least ten-percent exotic species, with the Grand Calumet River fish community having nearly 60 percent exotic species. Improvements in native species richness and the biological integrity of these streams will require extensive habitat restoration, as even the protected lands in the area are not functioning as high quality fish habitat (Simon and Stewart 1999).

6.2.6 Long-term vision and recovery goals

The goals in this chapter focus on achieving a desired biotic integrity and biological diversity for streams of the Chicago Wilderness region. The goals provide the basis for actions, such as best management practices, information and education activities, land acquisition, and other initiatives that would promote stream biodiversity, capacity, and resiliency.

We use the terms *protection*, *restoration*, *rehabilitation*, and *enhancement* to describe the recommendations for managing streams and watersheds. The following goal statements help define the terms as they are applied to watersheds throughout the region (see Figure 6.1 and Figure 6.2).

Protection is used for high-quality streams that fully support their potential biological integrity and diversity. Controlling point- and non-point-source pollution, channelization, impoundment, and other threats to biological integrity and diversity is necessary to assure that

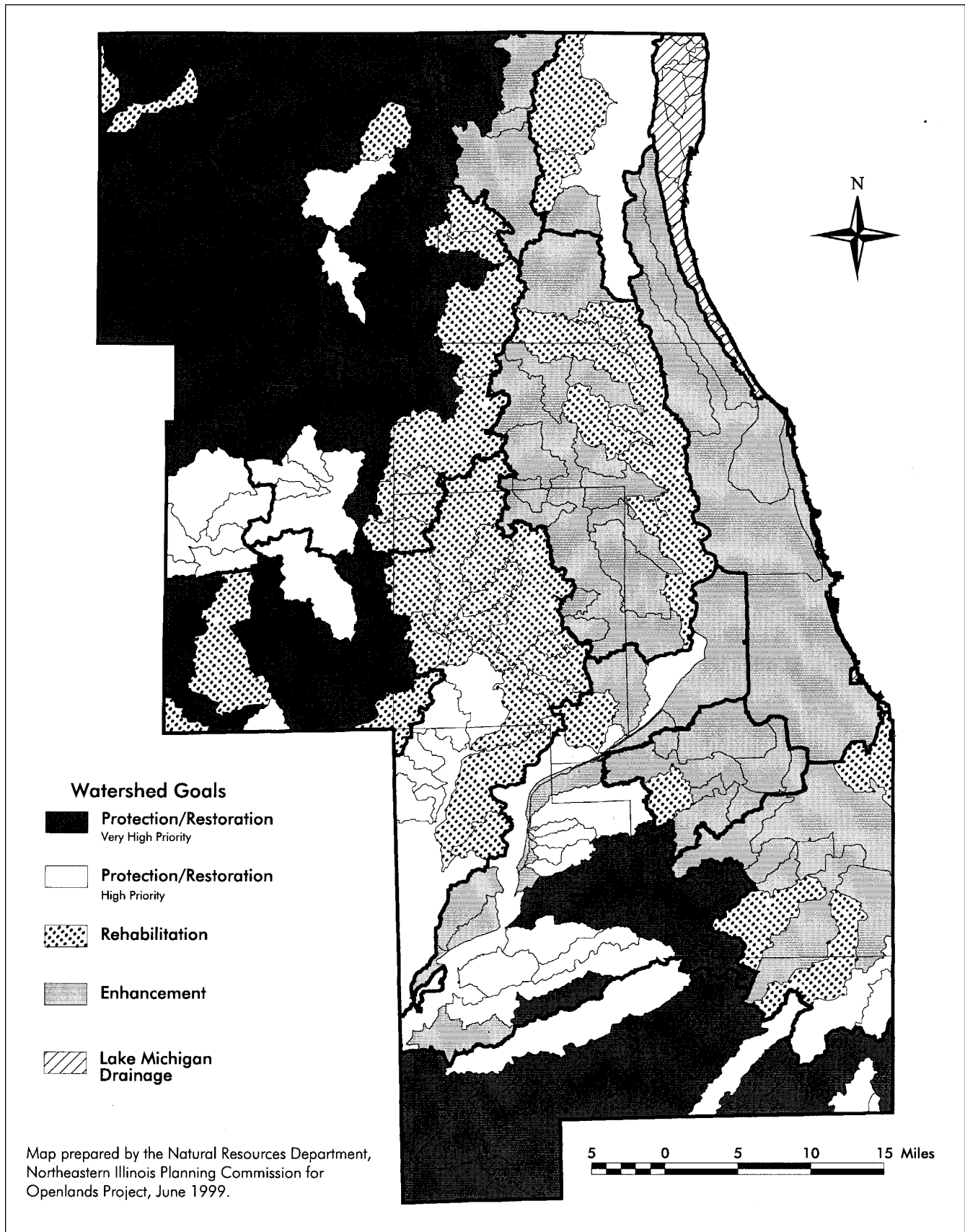


Figure 6.2 Priority watersheds in northeastern Illinois

stream quality is maintained and *not degraded*. For example, if a stream is supporting a high-quality fish community or an endangered species, the goal is to protect those conditions.

Restoration is used for streams that are moderately degraded and only partially meet their potential biological integrity and diversity. Restoration seeks to replace lost or damaged biological conditions, restoring ecological processes and linkages (such as energy flow, dispersal mechanisms, and succession). For example, if a stream is supporting a moderate-quality fish community and is directly linked to a viable source of species recolonization, as is the Kankakee River, the goal is to restore the stream to a more diverse fish community by restoring lost habitat and improving degraded water quality.

Rehabilitation is used for streams that are more severely degraded and do not meet their potential biological integrity and diversity. The goal here is to replace some of the lost or damaged biological functions and linkages of the stream. For example, if a low-quality fish community retains some functional linkage to a viable source of recolonization, the goal is to re-establish some biological integrity by partially restoring some habitat or water-quality components.

Enhancement is used for streams that are the most severely degraded. The goal is to reclaim severely damaged ecosystems. For example, if a very poor fish community has no functional linkage to a source of recolonization, the goal is to mitigate the sources of degradation in the stream, but to recognize that this will only have a limited effect on biological functions.

6.2.7 Threats

As watersheds undergo development, land is covered with impervious materials (such as pavements and rooftops) or surfaces that limit infiltration (such as cultivated fields and areas with shallow-rooted plants). As a result, stormwater collects on or near the surface. Groundwater recharge areas are restricted and surface runoff becomes the principal source of stream flows. The result is “flashier” streams that are prone to flooding and severe erosion. Watersheds with greater than 10%–15% impervious surface area tend to produce degraded stream habitat and biodiversity (Center for Watershed Protection 1998a). In addition, drainage of wetlands and other low-lying storage areas and channelization of streams alter a watershed’s hydrology and reduce aquatic biodiversity.

Based on watershed assessments of impaired streams, both point and non point sources of pollution are major contributors to impairment. While point sources, partic-

ularly municipal wastewater-treatment plants and combined sewer overflows, generally contribute the greatest pollutant loads to most urban rivers and streams, dramatic reductions in the concentration of pollutants in discharges have occurred in the last two decades. Impairments from non-point-source pollution are substantial and are actually increasing in many watersheds due to expanding suburban development in the region. Thus, a major challenge is to better control the impacts of development-related non-point-source pollution to protect the region’s remaining high-quality streams.

Runoff from residences, businesses, construction sites, and industries carries sediment, nutrients, pesticides, metals, grease, oil, bacteria, salts, and debris to nearby streams. Runoff from agricultural areas carries similar pollutants but at different rates and concentrations. Losses in dissolved oxygen and thermal pollution are other water-quality problems associated with human impacts on streams and watersheds.

As development occurs, streams are often impounded, straightened and channelized, the banks sometimes armored with concrete or stripped of native vegetation—all to accommodate buildings, roads, flood control and stormwater conveyance systems. The resulting stream habitat degradation severely limits aquatic life, encourages exotic species, and reduces healthy biodiversity.

6.2.8 Recommended actions

- **Reduce hydrological alteration**

- ✓ **Continue to identify watersheds with streams that have exceptional aquatic biological integrity to inform planning efforts and set priorities.**

This chapter describes a technique, using well-established indicators, for classifying streams according to their biological integrity and suggests priority goals for protecting or restoring their biodiversity. This process has been applied to the streams in the Illinois portion of the Chicago Wilderness region but should be extended to cover the entire region, so that priorities can be set at the regional level.

- ✓ **Limit development in some high-priority subwatersheds.**

Recent research has shown that the amount of impervious cover in a watershed can be used to project the current and future health of many headwater streams. There also is strong evidence suggesting that impervious cover is linked to the quality of other water resources such as lakes, reservoirs, and aquifers (Center for Watershed Protection 1998b).

✓ **Direct development into areas that limit hydrological alteration.**

Many model land-development principles have been documented to limit adverse stormwater impacts and to benefit both the stream environment and the community. These principles involve the careful location and design of residential streets, parking lots, building footprints, and conservation areas (Dreher and Price 1994).

✓ **Promote cluster development.**

Cluster development uses smaller lot sizes and less pavement to minimize impervious area, reduce construction costs, conserve natural areas, provide community recreational space, and promote watershed protection. Relaxing side-yard setbacks, allowing narrower frontages and shared driveways, and providing shared parking arrangements are all techniques for cluster development.

✓ **Require stormwater detention that effectively controls the full range of flood events.**

Local standards for stormwater ordinances are usually intended to prevent increases in flood damage. Drainage and detention facilities should be designed to minimize runoff volumes and rates, so that the natural hydrologic and water-quality functions of streams, wetlands, and floodplains are protected.

✓ **Promote natural drainage as an alternative to storm sewers.**

Where density, topography, soils, and slopes permit, open vegetated swales and constructed wetlands should be used to temporarily detain, convey, and treat runoff from a range of storm events. New stormwater outfalls should not discharge unmanaged stormwater into jurisdictional wetlands, aquifers or sensitive areas.

✓ **Create buffer strips and greenways along streams.**

Riparian stream buffers are variable-width strips of land continuously vegetated with native plants. They encompass environmental features such as wetlands, steep slopes, the 100-year floodplain, multiple-use greenways and trails, wildlife corridors and additional safety widths adjacent to high-impact, high-density development. Buffers should be maintained throughout the stages of plan review, construction, and post-development.

✓ **Acquire additional land for conservation.**

Results of open space referenda in several Chicago Wilderness counties showed that the public gener-

ally supports acquisition of new parks and forest preserves for multiple benefits, including recreation, aesthetics, wildlife habitat, clean air, and clean water. Additional open space, with its protection of trees and other deep-rooted vegetation, enhances stormwater infiltration and groundwater recharge, and it can help to mitigate damages caused by flashy stream flows.

✓ **Develop stormwater management plans.**

Stormwater management plans establish a framework of standards for minimizing storm damages to structures, public health, and safety. They should identify, protect, and improve waterways and groundwater recharge areas by requiring all new development to minimize or reduce stormwater damages. The plans should protect and improve water quality, promote public awareness of stormwater issues, and identify revenue sources for the adopted program.

✓ **Enforce erosion-control measures on new construction.**

Many effective practices for controlling erosion and sediment have been developed specifically for use on construction sites. Developers and local officials should work together to choose the best techniques to minimize off-site sedimentation. For this to happen, building inspectors, contractors, and engineers must all understand the principles, benefits, and limitations of best management practices for erosion and sediment control.

✓ **Create or restore streamside wetlands.**

Streamside wetlands are complex ecosystems that provide many ecological functions beneficial to their adjoining streams. They are biologically productive systems that provide fish and invertebrate habitat, water pollution control, sediment control, water supply, floodwater storage, and barriers to erosion. In addition, streamside wetlands provide habitat for threatened and endangered species such as the spotted turtle and river otter.

✓ **Educate decision-makers about development patterns and the effects of land uses on streams.**

Elected officials and local governments should be aware of model watershed-development principles and how they apply to their watersheds. Officials should evaluate their zoning codes and subdivision ordinances based on those principles. The Center for Watershed Protection (1998a), NIPC (1992) and Dreher and Price (1997) give details on model development principles.

- **Reduce deterioration of habitat quality**

- ✓ **Remove unnecessary dams.**

Many dams in the region impede the movement of fish and other aquatic life up and down the waterway. Dams can cause degradation of habitat in upstream areas and can have dramatic negative effects on water quality. Consequently, high-quality streams sometimes abruptly deteriorate above or below a dam. Where dams are not needed for water supply, flood control, or recreation, they should be removed or fitted with structures that effectively permit the passage of aquatic species. By removing a dam, the owner can often eliminate the cost of repairing the dam while improving the stream's biodiversity. State and federal agencies should develop guidelines and policy for dam removal activities, which at a minimum should require study of a removal alternative for any dam repair or rebuild proposal, including economic and environmental analysis.

- ✓ **Retain or restore emergent and near-shore vegetation.**

A thriving, diverse vegetative community is an important component of a functioning stream or streamside wetland. If a degraded stream's hydrology and water quality can be stabilized, vegetation can be re-established by planting seedlings, root stocks, bulbs, or transplants. Native plant species should be used in riparian buffer areas to protect and restore important functions such as bank stability, wildlife habitat and forage areas, runoff filtering, and shading. The choice of native plants depends on local needs and conditions. The USDA (1997) has published information on local species that are best adapted for stream conditions.

- ✓ **Re-meander channelized streams.**

Meanders are naturally occurring bends in a stream that help dissipate energy of flowing waters. They create a variety of flow velocities and provide important habitat features for some aquatic species. There are many opportunities to recreate meanders in artificially straightened streams in the Chicago Wilderness region.

- ✓ **Restore riffles, pools, sandbars, and other elements of in-stream habitat.**

A riffle is a shallow rocky area that separates deeper pools in a stream. Riffles enhance water aeration while providing habitat for many aquatic species such as darters and stoneflies. In channelized streams, riffle sequences are typically diminished or eliminated altogether. Sandbars and mud flats provide valuable habitat for a variety of birds and invertebrates.

- ✓ **Study the effects of riparian management.**

Unfortunately, relatively little monitoring has been conducted on managed riparian lands. Experimental model projects, such as the one at Melody Farm Nature Preserve on the Middle Fork of the North Branch of the Chicago River, should be carefully studied to evaluate the biodiversity benefits to the stream.

- ✓ **Survey how people use aquatic resources and study the economic impacts of uses such as fishing and recreational boating.**

Surveys, like the one conducted by the Chicago River Demonstration Project, should be taken to help describe and understand how user and interest groups currently perceive and use streams of Chicago Wilderness, and how they would like to see the corridors improved for recreation and related values.

- ✓ **Use bioengineering solutions to control streambank erosion.**

Bioengineering methods combine live plant materials with built structures to stabilize eroding stream banks, resulting in a living and sustainable erosion-control system. By using native plant species and with considerable care and maintenance in the first few years, bank stabilization can become self-sustaining and, to an extent, self-repairing since the plants are adapted to growing and reproducing in the stream environment.

- **Reduce deterioration of water quality**

- ✓ **Rigorously enforce non-degradation standards.**

Pollution-control agencies such as the Illinois Environmental Protection Agency (IEPA) have been criticized for failing to adequately enforce rules that prohibit adverse impacts of discharges on streams as called for in the Clean Water Act. Effective anti-degradation policies and enforcement procedures will ensure that pollutant levels in wastewater and stormwater discharges do not exceed levels that are damaging to stream biodiversity, especially in high-quality streams.

- ✓ **Develop and implement best management practices to control soil erosion, sedimentation, and storm water runoff.**

Effective efforts to protect streams and their watersheds usually include the use of best management practices. These are actions or structures that are needed to control runoff pollution and flooding. Examples of some commonly used practices are use of vegetative buffers, streambank stabilization,

wetland creation or restoration, use of grassed swales or waterways, sediment basins, diversions, keeping streams above ground, remeandering streams, and wildlife plantings.

✓ **Find alternatives to new and expanded effluent discharges to high-quality streams. For example, route sewage flows to regional facilities and use land treatment.**

Organic matter, nitrogen, phosphorus, and micronutrients in storm water and wastewater are generally harmful when discharged to high-quality streams and lakes. Land treatment systems and detention facilities should be designed to ensure that pollutants do not reach streams, especially high-quality streams.

✓ **Re-examine standards and practices for sewage treatment.**

There is a need to establish sewage-treatment policies that ensure protection for high-quality streams and that allow restoration of low-quality streams. While improvements to sewage-treatment plants have improved quality in degraded urban streams, the same standards and discharge limits are proving insufficient to protect high-quality streams in non-urban areas. Aging sewage-treatment facilities eventually develop structural problems or worn-out mechanical systems that are difficult or uneconomical to replace. Plant managers should, to the extent of their authority, assess downstream aquatic biodiversity when determining how to meet permit limits and water-quality standards for pollutant removal and when establishing policies for new plants and updated equipment.

✓ **Promote effluent polishing through constructed wetlands for all discharges to moderate- and high-quality streams.**

Wastewater effluent should not be directly discharged to streams, especially high-quality streams. Instead, treatment trains should include tertiary constructed wetlands or provide reuse options such as irrigation, industrial processing, groundwater recharge, fire protection, and/or limited-contact recreation.

✓ **Encourage pollution-control regulators to use biocriteria for water quality standards.**

Biocriteria are measures of the quality of streams based on living organisms. Standards for pollution discharges are based on the impact of the discharge on these living elements. Water-quality metrics used by the Illinois Environmental Protection Agency, for example, do not recognize the graded continuum of stream systems and do not give

recognition to unique areas of biodiversity. The state of Ohio, on the other hand, has developed a set of metrics that have given a higher measure of protection to many of the high-quality streams there.

✓ **Gain community support for watershed management.**

Watershed planning and management are perhaps the most important stream-protection tools. Management plans should be developed with community consensus on the goals for water resources and the techniques and practices needed to meet those goals. Techniques may include overlay zoning, cost-share incentives, growth boundaries, and conservation easements. See Section 0 (especially 8.3.3) for further discussion.

✓ **Evaluate aquatic insects as indicators of water quality.**

The presence or absence of indicator organisms is an indirect measure of water pollution. Benthic macroinvertebrates, including aquatic insects (such as mayflies, stoneflies, caddisflies, midges, and beetles), snails, worms, freshwater clams, mussels, and crayfish are sensitive to changes in a stream's ecological integrity. However, the relationship between benthic macroinvertebrates and other water-quality indicators, such as fish and water chemistry, has not been clearly established.

✓ **Evaluate the need for improved water quality standards.**

The state of Illinois does not have numerical standards for two major causes of stream degradation: phosphorus and sediment. The State should evaluate and develop appropriate standards that are protective of designated stream uses.

✓ **Encourage volunteer monitoring.**

In the State of Illinois, the goal of the Critical Trends Assessment Program to track changes in stream habitats over time can only be met with a combination of volunteers and scientists working in collaboration. Volunteer monitors enable the state to collect large amounts of information economically, and this information is providing an important bank of knowledge about local conditions in streams and other ecosystems. Currently, there are unlimited opportunities for volunteer monitors to become trained citizen scientists through the Illinois EcoWatch Network. The Conservation Foundation also participates in these monitoring programs. In Indiana, a similar program entitled Hoosier Riverwatch involves citizens in efforts to care for and monitor the health of streams and rivers.

The Northeastern Illinois Planning Commission’s “Restoring and Managing Stream Greenways” (1998) further explains some of the actions described above. This handbook addresses landscape buffers, channel maintenance, stream bank stabilization, and techniques for restoring in-stream habitat.

6.3

Lake communities—status, recovery goals, and recommended actions

6.3.1 Lake classification

In addition to Lake Michigan, three types of natural lakes occur in the Chicago Wilderness region: bottomland lakes, vernal ponds, and glacial lakes. *Bottomland lakes* are shallow lakes adjacent to large streams and are seasonally flooded. There is seasonal recruitment of species in bottomland lakes. *Vernal ponds* are small, seasonally inundated depressions that have no fish species. *Glacial lakes* are divided into two types: kettle and flow-through. *Kettle lakes* are isolated basins, while *flow-through lakes* are connected to a stream system. Glacial lakes are the most biologically diverse of the lake types. In addition to the natural lakes, the region has a number of manmade lakes.

In planning for biodiversity recovery, the classification system for lakes is less useful than the terrestrial classification system. The glacial lakes are the most ecologically important of the lakes, and are thus the primary focus for conservation attention, although other lakes do contribute to the region’s biodiversity. To help establish priorities for conservation efforts and recovery goals, a working group for lake recovery plans developed a system to assess the status of the lakes’ biodiversity.

6.3.2 Lake assessment and prioritization

The method to assess the current condition of biodiversity in the region’s lakes is in part based on Vermont’s system (Garrison 1994–1995). This system defines four categories for lakes. The categories are intended to be operational and to promote various conservation actions for the region’s lakes, rather than to be rigid or restrictive. The four categories are *exceptional*, *important*, *restorable*, and *other*. The criteria used to place various lakes in a category are driven solely by the biodiversity in the lake. We recognize that other features of lakes such as water quality are important indicators of environmental qual-

Table 6.2
Preliminary assessment showing exceptional lakes

County	Lake name	No. of native fishes	No. of E/T species
Cook	Wolf Lake	28	5
Lake	Bangs Lake	22	5
Lake	Cedar Lake	27	9
Lake	Cross Lake	>14*	5
Lake	Deep Lake	18	5
Lake	Deer Lake-Redwing Slough	>14*	1
Lake	East Loon Lake	23	5
Lake	Fourth Lake	>14*	2
Lake	Gray’s Lake	15	2
Lake	Timber Lake	>14*	1
Lake	Lake Catherine	21	1
Lake	West Loon Lake	23	8
Lake	Mud Lake	>14*	1
Lake	Petite Lake	17	1
Lake	Sullivan Lake	>14*	2
Lake	Sun Lake	>14*	1
Lake	Turner Lake	22	1
Lake	Wooster Lake	>14*	3
McHenry	Crystal Lake	23	2
McHenry	Elizabeth Lake	19	6
McHenry	Lake Defiance	18	1
McHenry	Lake Killarney	19	2
McHenry	Lily Lake	16	2

* For these lakes, data on number of native fishes was not available, but experts at the workshop expect high native fish diversity based on overall lake condition.

ity, but we believe that biodiversity provides the most direct measure.

The criteria for the lake status assessment are as follows:

Exceptional lakes

- Must have threatened or endangered species of flora or fauna
- May have other watch species
- Have more than eight native plant species and more than 14 native fish species.

Table 6.3
Preliminary assessment
showing important lakes

County	Lake name	No. of native fishes
Cook	Axehead Lake	14
Cook	Beck Lake	16
Cook	Busse Woods Lake	22
Cook	Maple Lake	15
Cook	Marquette Park Lagoon	16
Cook	Midlothian Reservoir	15
Cook	Tampier Lake	18
DuPage	Mallard Lake	18
DuPage	Pickereel Lake	18
DuPage	Silver Lake	18
Lake	Channel Lake	22
Lake	Diamond Lake	20
Lake	Fox/Nippersink	23
Lake	Gages Lake	22
Lake	Lake Marie	22
Lake	Lake Zurich	22
Lake	Long Lake	21
Lake	Old School Pond 2	20
Lake	Pistakee Lake	18
Lake	Sand Lake	14
Lake	Sterling Lake	25
McHenry	Griswold Lake	18
McHenry	Lac Louette	16
Will	Braidwood Lake	38
Will	Lake Milliken	19

Important lakes

- Have more than eight native plant species and more than 14 native fish species
- May have exotic species present, but not dominant
- May have watch species
- According to historic records, have had threatened or endangered species of flora or fauna

Restorable lakes

- According to historic records, have had threatened or endangered species of flora or fauna
- Are glacial lakes with physical characteristics that would support reintroduction of endangered and threatened species

- May be currently dominated by exotics that could be controlled with appropriate management

Other lakes

- Are unlikely to support sensitive species and may be better managed for purposes other than biodiversity conservation.

We conducted a preliminary assessment of the region's lakes. Tables 6.2 and 6.3 show preliminary results for exceptional and important lakes. Information used for this assessment includes data from the Illinois Natural Heritage Database, the Illinois Department of Natural Resources, The Nature Conservancy, and the McHenry ADID study, as well as expert opinion. It should be noted that the data used did not include information on native plant species present, and in some cases numbers of native fish species are not recorded. In cases where complete information was not available, scientist and land managers made a determination based on what they did know about the lake. As new information becomes available, the status of the lakes may change.

6.3.3 Long-term vision and recovery goals

Exceptional lakes: The vision for these lakes is to manage all of them for maximum aquatic biodiversity. This will include allowing native vegetation to dominate shorelines and keeping littoral-zone disturbance to a minimum. A goal is for no exceptional lake to lose any native species, particularly endangered or threatened species. Over time, the number of exceptional lakes should increase due to improvement in the condition of important lakes, yet none of the exceptional lakes should decline in condition. A goal is to manage exceptional lakes as part of their watershed. To achieve this, watershed plans should be developed, implemented, and changed as needed to maintain the exceptional status of a lake. To help achieve these goals, all historical biodiversity data should be retained. Additionally, the state laws on endangered and threatened species should be strengthened to provide adequate protection for these aquatic species. More research is needed on the life histories of endangered and threatened aquatic species. For priority species, specific recovery plans should be developed and implemented.

Important lakes: The goals for these lakes are similar to the goals for exceptional lakes. The vision for important lakes is to improve their condition so that most of the important lakes move up to the category of exceptional lakes. Management plans need to be implemented not only to improve the conditions of these lakes but also to prevent them from falling into a lower category. A goal

is to have landowners value the natural state of a shoreline and play an active role in conserving and preserving lakes.

Restorable lakes: For these lakes, the goal is to control invasive species and sources of impairment effectively. Many of these lakes can and should be restored to the point where endangered and threatened species can be reintroduced. With proper restoration efforts, native species should be surviving the challenge of exotics. A goal is for most restorable lakes to move up to the category of important lakes through restoration efforts. Demonstration projects that clearly show how it is possible to restore a lake to exceptional condition should be conducted as part meeting this goal. The goal of restoration efforts is to return lakes to a condition in which they can retain their historical native species.

Other lakes: Lakes that are not viewed as restorable (from a biodiversity perspective) should provide recreational and cultural services that do not jeopardize the biodiversity goals of other lakes. These lakes may serve important educational purposes, and natural habitats should be encouraged in these lakes. A goal for these lakes is to have all of them contribute positively to their watershed's overall quality, either through water-quality or stormwater management. Fisheries management needs to be better understood, and anglers and other recreational users should have a better understanding of the importance of biodiversity. The goal is for the public to understand the limitations of a finite resource and to adjust their expectations accordingly.

6.3.4 Threats

The most severe threats to lakes are invasive species, nutrient loading, sedimentation, loss of native submerged and emergent vegetation, and management actions focused on only a narrow range of species (such as game fish). While invasive species, hydrologic change, and loss of native vegetation are common threats to both aquatic and terrestrial systems, aquatic communities are much more sensitive to sedimentation, toxic substances, and excess nutrients.

Problematic invasive species include Eurasian water milfoil, carp, and zebra mussels. Species most often invade lake communities either through human introduction (knowingly or not) and through hydrological connections. Therefore, lakes without significant public access and with few or no hydrological connections are more resistant to invasion than other lakes.

Nutrients enter lakes through a variety of sources. These sources include effluent from sewage-treatment plants, agricultural runoff, lawn fertilizers, and waterfowl.

Causes of erosion resulting in turbidity and sedimentation include carp, shoreline development, upland development, agricultural runoff, and other man-made disturbances.

Submerged and emergent vegetation can be lost either through turbidity and siltation, deliberate removal, shading by excess algae caused by nutrients, or from the effects of invasive species. The loss of submerged vegetation is particularly important, because of its value as habitat for fish and other organisms and its role in settling sediments.

Different from terrestrial communities, which are significantly threatened by the lack of management, lakes often suffer from narrowly focused management activities, which are generally not aimed at protecting biodiversity. Lakes are often "managed" for recreational purposes or for particular species of game fish. This type of management tends to disregard biodiversity and hence becomes a threat to the region's lake communities. For recreational reasons, native aquatic plants are often removed either through harvesting or herbiciding, which can be extremely detrimental to biodiversity. These activities are particularly damaging to the littoral zone. Water-level manipulation and dredging, if done solely for recreational purposes, are also very damaging to the lake biodiversity. Recreational motor boats and jet skis are also problems because they create waves and turbulence in excess of natural frequency and intensity. This affects both shore erosion and the bottom in shallow areas. Additionally, motor boats and jet skis disrupt lakebed and shoreline soils, require large open-water areas that are often created by removing emergent vegetation, and harm the vegetation that does remain.

When fisheries are managed for a few particular species or when there are uncontrolled levels of stocking, the overall lake biodiversity often suffers. Not all management for game species conflicts with biodiversity goals, and lakes important for biodiversity can also support recreational fishing activities. The challenge is for managers to explicitly consider and address biodiversity issues in sports fisheries management activities, particularly in high-quality lakes.

Lakes also face several other threats. Lake hydrology is often interrupted through disconnection between lakes and other hydrological breaks. The introduction into lakes of contaminants, such as heavy metals, pesticides, and salt, has detrimental effects on the biodiversity. Finally, the loss of vegetation and overhanging canopy around a lake can lead to loss of essential habitat and fish species.

6.3.5 Recommended actions

Lakes are very different from the terrestrial communities in Chicago Wilderness, in that most lakebeds are largely in private ownership. Consequently, conservation of lake biodiversity cannot be focused just on the efforts of the Forest Preserve and Conservation Districts and other land-owning public agencies. Some specific actions can be taken to manage directly for biodiversity. Some management needs will require additional research and an adaptive management approach. However, the fate of lakes lies more directly in the hands of the private citizen. Therefore, there are numerous recommendations to improve conservation of lake biodiversity through both regulations and volunteer activities by the public. Both regulation and incentive tactics will require better knowledge of the laws and issues by the general public. Creating a balance among the multiple uses of lakes is an overarching need and goal of many recommended actions. Progress can be made in reaching this balance through better guidelines and laws regarding human activities around and in lakes. Most important, extensive public education and communications are needed to create a heightened awareness of issues affecting lake biodiversity. All of the preceding recommendations in 6.2.7 for protecting the hydrology and water quality of streams also are appropriate for lakes.

Recommendations

- ✓ **Develop specific recovery plans for species and lakes of concern**
It is recommended that recovery plans for specific species be developed and implemented. Some priority species for specific recovery plans include pugnose shiner, fern pondweed, white-stemmed pondweed, water star grass, grass-leaved arrowhead, and water celery. Of all the fish species, pugnose shiner serves as a good indicator species; if recovery actions restore viable populations of pugnose shiner, then other species will be helped as well. In addition to specific species, recovery plans for specific lakes are recommended. A first step is to develop criteria to identify priority lakes for lake-specific recovery plans.
- ✓ **Develop better mechanisms to control the invasion of exotic species**
Better control mechanisms are needed for invasive species, particularly Eurasian water milfoil and carp, and this will require research. Biological controls such as beetles and weevils to control Eurasian milfoil hold promise as the best long-term solutions, but great care must be taken to prevent introduction of controls that could themselves become problems.
- ✓ **Plan, protect, and manage lakes at the watershed level**
For exceptional and important lakes, opportunities for public acquisition of shoreline and upland areas should be identified and prioritized. Critical watershed areas also should be identified. In general, lakes should be managed as part of their watershed, and watershed-planning efforts should account for the biodiversity needs of lakes.
- ✓ **Develop a region-wide process to track and study threats to lakes**
A region-wide recording system should be developed that collects information about the types of pesticides being used in the region and specifically where they are applied. The system should also track the status of lakes. These records are needed to better understand the threats to lakes and to adapt management and policy accordingly.
- ✓ **Conduct research to better understand habitat requirements of aquatic species**
To better manage for fish diversity, more research is needed on environmental partitioning by fish species. There is more to learn about how fish use their habitat. Additionally, very little is known about the status and habitat requirements of many invertebrate and algae species. To manage for biodiversity, more information is needed on these poorly understood species.
- ✓ **Investigate and mitigate the threat of salinization**
While salinization is a known threat to lake communities, more research is needed on the specific effects and impact thresholds of salt on lake biodiversity. Until more is known about the effects of salt, the general practice should be to minimize loading of salt to lakes, especially those not having outlet flows that relieve accumulation.
- ✓ **Investigate and prepare for the possibility of reintroduction of native species**
As conditions of restorable lakes are improved to the point where they can support a variety of species, it is recommended that species be reintroduced to these lakes. However, protocols and models should be developed to ensure that reintroductions will be effective and efficient.
- ✓ **Strengthen laws protecting species and their habitats**
Laws on endangered and threatened species need to be strengthened and enforced to provide adequate protection for these species. Another recommended action

is to strongly encourage naturally vegetated shoreline zones, particularly in critical watersheds. The exceptional lakes are of particular importance to the conservation of the region's aquatic biodiversity. Therefore, rules and regulations to limit uses of the exceptional lakes and mitigate negative impacts warrant additional discussion.

✓ **Integrate biodiversity concerns into laws, policies, and guidelines**

State laws, particularly those dealing with the use of pesticides and herbicides, need to be improved to integrate biodiversity issues. State policies on aquatic-plant management should ensure that plant management both respects property rights and encourages diverse plant communities. Guidelines for land-use planning that recognize biodiversity and improve water quality should be developed. In general, biodiversity concerns need to be much more broadly incorporated into land-use and wastewater-treatment plans. Model ordinances for alternative development around lakeshores should be enhanced and promoted, and conservation easements around shorelines should be promoted. In short, alternative methods that reflect biodiversity needs should be enhanced and presented to the public. Additionally, Chicago Wilderness should work directly with municipal governments in lake areas.

✓ **Clarify ambiguous laws relating to lakes and their management**

One particularly problematic legal issue is Illinois's water law. How this law relates to water use, ownership, and management is unclear and inadequate. There are numerous legal interpretations of the law, and this confusion currently stands in the way of restorative issues and actions. It is recommended that Chicago Wilderness take a leading role in working to help resolve this issue.

✓ **Increase public understanding of lake biodiversity issues**

For the conservation of lake biodiversity, the most important action is to balance human uses with ecosystem constraints. Public recognition of the value of lake biodiversity and appreciation that lakes are a limited resource will be important to achieving conservation goals. Recreational and other human uses must not exceed what lakes can support. As a first step, the negative environmental impacts of development, recreation, and misuse should be documented, as well as the positive effect of management practices. Public information and education should make these well known, particularly to lake association members

and other potential supporters. Revisions to incentives, programs, laws, and regulations should then follow together with appropriate public hearings.

✓ **Increase public involvement in lake management and protection**

There are already a number of volunteer lake monitors and stewards, but their numbers should be expanded, not only to increase the amount of data collected and the number of lakes monitored, but also to create a broader network of people knowledgeable about lakes. It is recommended that Chicago Wilderness promote cooperation and communication among lakefront owners and users. Active lake users need to learn the full impacts of their collective uses of the lakes on biodiversity and realize the ecological limits to their uses. Lake-use plans that offer a range of recreational uses consistent with a balanced, diverse ecosystem need to be developed. Development of these plans will require the input of knowledgeable citizens and consumers. Additional funding for biodiversity conservation and non-consumptive uses should be generated, at least in part, from consumptive uses of the lakes.

6.4

Near-shore waters of Lake Michigan

Lake Michigan is a vast aquatic ecosystem in its own right, and its near-shore waters in the Chicago Wilderness region function primarily as part of that system. However, they are an important part of Chicago Wilderness, both in their impact on adjacent ecological communities and intrinsically as an important ecological community. Lake Michigan provides climatic diversity and supplies sand to nourish its changing beaches and dunes. The seasonal and year-to-year changes in water level support lakeshore wetland communities. Its near-shore waters provide habitat for many fish and other aquatic species and are used by migrating waterfowl and shorebirds.

Much of the shoreline in the Chicago Wilderness area has been filled for buildings, parks, and marinas, eliminating coastal wetlands. The areas that remain in near-original condition tend to be beaches with relatively high-energy wave systems and relatively little organic substrate to support ecological communities. Structures installed to protect harbors and lakefront development have in many cases interrupted movement of sand or deflected it into deep water where it is lost from the beach-nourishment process.

The fish communities are in a state of flux due to many changes throughout Lake Michigan. Major factors include:

- historic invasion by lamprey and alewife and introduction of Pacific salmon
- excessive fish harvest
- recent invasion by zebra mussels, which are changing abundance and species mix of algae and zooplankton (including algae that create taste problems in drinking water)
- ongoing invasion by gobies and other species

Historic problems with excessive nutrients, acute toxicity, and floating materials have been solved, but problems with persistent toxic substances that bioaccumulate in fish are still a problem for human health, although effects in the ecosystem are not apparent.

Wanton filling of shallow areas and gross pollution has ended, but care must be taken not to allow additional filling and not to allow structures that interrupt currents and supplies of sand. A major current fishery problem is the decline of lake perch, which is being addressed by the fish-management agencies in the respective States.

There are opportunities that should be addressed locally to restore aquatic habitat and biodiversity in some sheltered areas such as harbors, river mouths, and lagoons. Even intensely urban settings offer opportunities to create incidental habitat while designing projects focused on other purposes such as shore stabilization or brown-field redevelopment.

Recommended actions

- Identify information gaps concerning the Lake Michigan shoreline in the region with respect to surviving habitat, and opportunities for habitat restoration, so that practical goals can be developed.
- Identify key site-specific aquatic habitat restoration opportunities to support local and lake-wide biodiversity.
- Identify site-specific opportunities to provide shoreline protection that also provides improved habitat.

Chapter 7

Status of Endangered and Threatened Species: Assessment and Recommendations



7.1

Importance of endangered and threatened species to the Chicago Wilderness recovery plan

This plan is concerned with the conservation of biodiversity at all levels—natural communities, species, and genes. The process of assessing this nested diversity seeks to answer basic questions about its status: how much is there or how much remains, what is its quality and viability, what are the trends—stable, increasing, or decreasing? The ultimate goal of assessment is to develop programs that ensure recovery of all the elements of biodiversity. Except for the few species that have been the subject of intensive research or recovery programs, usually those on the federal list of endangered and threatened species, we are just beginning to answer these questions for individual species.

Endangered and threatened species are recognized by federal or state governments as being in danger of extinction or being sufficiently compromised that they are at risk of becoming endangered, either nationally or in a state. Some states, including Wisconsin and Indiana, also categorize species as rare or of special concern.

Because of their rarity, endangered and threatened species possess an aesthetic appeal to the public that cannot be overestimated. In general, rare organisms are valued, the sight of them is genuinely thrilling, and their loss is mourned. A beautiful and conspicuous endangered plant like the eastern prairie fringed orchid can serve as a symbol to enlist public support for all rare species. The recovery of a species can be a success for all to celebrate. A spotting of the rare upland sandpiper can bring birders

from considerable distances simply for the opportunity to view it. (However, caution must be used in providing public access to these organisms so as not to create additional threats to their survival.)

Some species are of special interest because they are relicts, surviving in the region after climatic change. Many more plant species are regionally significant because they are members of characteristic, and often imperiled, natural communities of the region. Additional species are significant because they play key roles in local ecosystems (such as canopy trees or obligate food plants for insects) or simply add to the direct human value of such systems.

Endangered and threatened species make up a substantial component of the region's biodiversity. For example, the 237 plant species listed as endangered or threatened at the state level represent nearly 15% of the region's native plant species. Twelve of these species occurring within Chicago Wilderness are ranked as globally significant, because they occur only within the region and adjacent regions (called "near endemics") or because they are highly rare and imperiled. Of these, five are currently recognized by the US Fish and Wildlife Service as threatened or endangered at the national level.

Among the mammals, birds, reptiles, amphibians, and fish there are 114 state level endangered or threatened species. Five of these are federally listed and several more are federal candidate species.

Quantitative data are available for some aspects of the status of endangered and threatened species, such as numbers of occurrences of populations or subpopulations (known as element occurrences), amounts and types of monitoring being done, and levels of protection. Much of the assessment of their status and future viability is qualitative; nevertheless, it is based on the com-

bined best judgement of researchers and land managers experienced both in studying and managing these taxa. As part of the recovery plan process, the Science and Land Management Teams Endangered Plants Task Force developed a list of endangered and threatened species meriting additional conservation attention. This list is in Appendix 6.

7.2

Endangered and threatened species within a community context

In Illinois, the 1978 Natural Areas Inventory found that less than 1% of the original Illinois landscape (forests, prairies, savannas, wetlands, lakes, and ponds) remained in relatively high-quality, undisturbed condition. Indiana and Wisconsin lands have suffered similarly. This level of community disturbance has had a direct impact on animals and plants. Instead of being dispersed across the landscape, these organisms have retreated to—or survive in—the few remnant areas. Once widespread, native species have become scarce and naturally rare species have become increasingly rare if not extirpated.

This plan focuses on the assessment and appropriate management of communities in order to preserve and enhance the biodiversity occurring within them. The majority of endangered plant and animal species fall within this overall community perspective. The sound management of communities outlined in the Recovery Plan will, therefore, work toward their preservation and eventually their recovery. However, special considerations and concerns arise for endangered and threatened species. This chapter addresses those considerations.

7.3

Why are organisms rare?

Some plant and animal species were always rare in our region because of geographic distribution, narrow habitat requirements, and low-density populations. It is important to ensure that the conditions that support these species persist despite radical changes in land and resource usage.

Many species were once widespread, but have become rare because of habitat loss or fragmentation, fire suppression, encroachment of invasive species, and other

human disturbances. Their plight mirrors that of region's biodiversity in general. Many more native species are also dwindling—the more common species of today could well become the threatened species of tomorrow. By documenting and researching the region's endangered and threatened species, we can learn about the biological and ecological needs of a broad spectrum of flora and fauna. This information also contributes overall to the field of conservation biology.

Many plant species are rare because of their dependence on specialized biological or environmental factors such as specific pollinators, soil microorganisms, hydrological conditions, soil chemistry, or soil parent materials. Many of these factors have been adversely affected over the last century of intensive development. In the case of self-incompatible plants, small, isolated populations lack the pollen from other populations needed for reproductive success. In some cases, rare animals are dependent on a common plant for food, or a rare plant may parasitize another more common plant. Understanding the complex interdependence among organisms is critical to a full understanding of regional biodiversity and its recovery. Recognizing these specialized life histories and the requirements that vary from species to species can help in creating effective plans for their recovery within a community context.

Many species are rare because they are restricted to and are sometimes characteristic of rare and regionally or globally significant habitats such as fens, bogs, seeps and springs, pannes, dunes, dolomite and sand prairies, oak savannas, and shrublands. Some of these habitats may be remnants from earlier climatic or geophysical regimes such as glaciation. The continued presence of healthy populations of these rare species and their associates reflects the quality of these areas today.

Some species are rare within a region because they are at the limits of their range here, but they may be abundant or stable in other areas. These species contribute to biodiversity in important ways, but have less priority in a Chicago Wilderness Recovery Plan because they are less at risk throughout their range.

Some rare plant species require early successional habitats or natural disturbances, such as fire, grazing, drought, soil disturbance, or periodic flooding. These disturbances cause their appearance in sporadic and random ways and give them a niche within high-quality areas. These disturbance requirements must be understood and incorporated into management plans and practices to ensure the survival of these species.

7.4

Threats and stresses to endangered and threatened species

By definition, endangered and threatened species are at risk of being lost from the region. Both state and federal governments recognize the plight of these species and their need for special attention and protection by placing them on endangered and threatened lists. As outlined above, a variety of causes lead to rarity, some of them intrinsic to the biological nature of the species. However, many threats and stressors are strongly correlated with human impacts, which have greatly escalated over the past several decades. Most of these factors negatively affect the region's natural biodiversity, both at the community and species levels. In general, threatened and endangered species are the first to be at risk under these pressures. Threats are imminent problems that have potential to radically change or eliminate a habitat or population. Stressors are the chronic problems that erode diversity and quality of habitats and species over time. As described in Chapter 3, threats and stressors include loss of habitat, fragmentation, fire suppression, invasive species, imbalances of native species, collecting pressures, hydrological change, and other environmental and abiotic factors, including pollution, erosion, and contaminants. Often, rare species have declined due to an interaction of factors. For example, habitat loss multiplies the problems of habitat fragmentation. Fire suppression leads to habitat alteration, invasion of exotic species, and finally to habitat loss. In conjunction with these general threats to communities, individual rare organisms may have additional stressors particular to their life history and requirements. These circumstances must be dealt with in greater depth in any recovery plan for a listed species.

7.5

Protection status of listed species

Protection status is a rough but useful guide to determine priorities. Species that are protected (within Nature Preserves or in some portions of national parks) or semi-protected (on publicly owned conservation lands that may have multiple purposes) have a better chance of being adequately managed or monitored. If 50% or fewer of the sites on which a species occurs are protected, the species is at much greater risk of being lost. Animals, unlike plants, are mobile and in many instances can

move from site to site and are protected while they are on a protected site. On the other hand, as property of the state, animals receive more protection than do plants wherever they are.

Plants

Illinois

- 28.7% of element occurrences (EOs) (209 of 728) have no protection or semi-protection. Most of the unprotected EOs occur on privately owned property.
- 26.8% of the listed species (40 the 149) have 50% or fewer of their EOs protected or semi-protected.

Indiana

(based on records documented since 1979; an additional 39 listed species have not been documented since 1979 or are considered extirpated)

- 44.8% of EOs (189 of 422) have no protection.
- 47.9% of listed species (47 of 102) have only 50% or fewer of their EOs on public lands.

Animals

Illinois

- 58.7% of EOs (285 of 485) of listed animal species are unprotected: 81.1% of fish, 85.7% of mammals, 23.1% of amphibians and reptiles, 57.5% of birds, and 4.3% of invertebrates.
- 60% of listed animal species (33 of 55) have only 50% or fewer of their occurrences protected.

Indiana

(from records documented since 1979)

- 60% of EOs (138 of 238) of listed animal species are unprotected: 100% of fish, 80% of mammals, 43% of amphibians and reptiles, 64% of birds, and 42% of invertebrates (Lepidoptera reported).
- 58% of listed animal species (18 of 31) have only 50% or fewer of their occurrences protected.

7.6

Management and recovery recommendations

Natural-area scientists and restorationists have long since learned that mere protection is not enough to preserve systems and their species adequately. For these rare

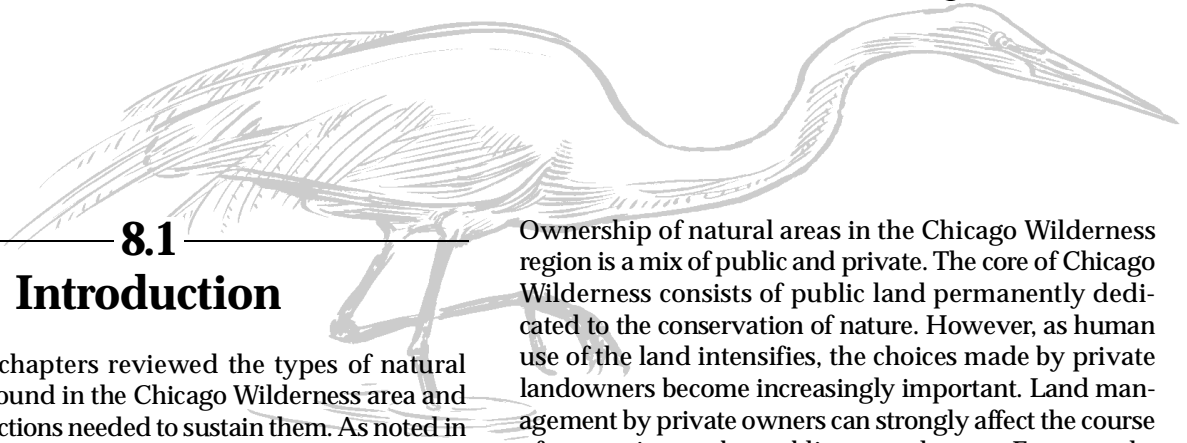
species to continue at present levels or to increase, sound management and restoration programs are essential, involving knowledge of the make-up of communities that include rare species and of the means of maintaining their structure and function. While sound community management plans will go a long way towards the conservation and recovery of many endangered and threatened species, some species will always require special management attention, accompanied by a well-designed monitoring program.

Recommendations

- ✓ Acquire more public land to increase the size and number of available habitats. Among the criteria to consider in purchasing land should be the presence of endangered and threatened species; greater emphasis should be placed on land acquisition as a means of protecting rare species. Priority should be given to creating complexes of communities, since many animal species depend on a variety of habitats.
- ✓ Legal protection of plants, in contrast to that of animals, is weak. Enact stronger legislation for the protection of rare native plants.
- ✓ Enlarge and consolidate existing natural communities by creating buffers, or by restoration, to counteract the effects of fragmentation, particularly the isolation of populations of rare species. For some species, such as insects, it is more important to enlarge sites than to create new ones.
- ✓ Increase the levels of protection for unprotected or semi-protected sites with known occurrences of endangered and threatened species. For example, incorporate such sites into the Nature Preserves system.
- ✓ Work with private landowners, either individual or corporate, to protect the endangered and threatened occurrences on their property. Use conservation easements and other incentives to protect endangered and rare resources on private land.
- ✓ In management plans for all sites with endangered and threatened species, include specific provisions to eliminate stresses and threats and to enhance recovery of these species.
- ✓ To measure effects of management activities on rare species, design monitoring programs (for representative populations) to provide feedback to adapt management activities and approaches.
- ✓ Institute a region-wide monitoring program for rare species, implemented by trained volunteers as well as agency staff, to enhance and coordinate current efforts to measure population trends. Protocols should be species-based.
- ✓ Rotate and diversify management treatments in order to maintain a variety of habitats needed by many species.
- ✓ Create a common Chicago Wilderness database. To avoid duplication of research and effort, managers should have access to centralized information about the needs of rare species and management practices related to them for adaptation to their own sites. Linking with Natural Heritage Databases in Illinois, Indiana, and Wisconsin is critical to this process.
- ✓ Expand *ex situ* programs for endangered and threatened plant species so that adequate seed or plant material is available for appropriate reintroduction as more sites are restored.
- ✓ Develop recovery plans for both federal-listed species and state-listed species that have been identified as priorities. The Chicago Wilderness Endangered and Threatened Species Task Force has identified approximately 150 species as priorities for recovery in the region, assigned to six categories (see Appendix 6). The plans should be realistic, suited to the CW region, and workable within county and other regional structures and agencies. Reference should be made to recovery plans already developed or in process for federally listed species as models to be adapted and simplified for state-listed species. Essential elements of these recovery plans include:
 - Historical and present extent of populations (using GIS-based mapping)
 - Occurrences on private and public lands
 - Life history characteristics
 - Identification of stressors, threats, and trends
 - Ecological requirements and availability of appropriate habitats for reintroduction
 - Identification of seed sources and germination and nursery facilities for reintroduction of plant stock; identification of source populations and rearing facilities for reintroduction of animal stock
 - Outline of appropriate management practices
 - Monitoring the effects of management practices as part of a species-based monitoring program
 - Identification of research needs

Chapter 8

Preserving Land and Water Resources for Biodiversity



8.1

Introduction

The previous chapters reviewed the types of natural communities found in the Chicago Wilderness area and the goals and actions needed to sustain them. As noted in Chapter 3, the natural areas of the region can be seen as shrinking islands in an increasingly non-natural landscape. To overcome this, two categories of action stand out: 1) enlarging natural areas by protecting the land and 2) managing the land to sustain native ecological communities. This chapter discusses the first of these two actions; Chapter 9 discusses the second.

Before the remaining unprotected natural areas disappear from the Chicago Wilderness region, it is essential that we identify and protect the land that is important to sustaining our natural ecological communities. Acquisition and other protection must be accomplished as soon as possible and must be focused on high-priority sites. Also, natural areas within publicly owned land must be protected from conversion to intensive uses such as golf courses and playing fields.

The landscape is being shaped by market forces, and conservation needs to take account of and function within the economic and regulatory processes. Consumption of land has accelerated faster than population growth, but consumers are showing increasing preference for environmentally sensitive developments with well designed open space and natural areas. And as development covers the remaining open areas of Chicago Wilderness, the public is supporting referenda for acquisition of additional natural areas. Acquisition by entities devoted to conservation is the most direct and certain form of protection and should be strongly supported. But many other methods can help provide protection. The following sections describe these methods.

Ownership of natural areas in the Chicago Wilderness region is a mix of public and private. The core of Chicago Wilderness consists of public land permanently dedicated to the conservation of nature. However, as human use of the land intensifies, the choices made by private landowners become increasingly important. Land management by private owners can strongly affect the course of events in nearby public natural areas. Fortunately, every year more citizens and public officials inquire about techniques for, and become more adept at, preserving open space and restoring habitat.

8.2

Private landowners: initiatives for conservation

8.2.1 Introduction

Private property owners can play a critical role in Chicago Wilderness. Especially important are those who own:

- lands that harbor significant habitat
- critically situated lands with important restoration potential
- lands that adjoin high-quality habitat

Property owners with lands meeting any of these descriptions can make a long-term commitment of all or part of their property to the overall fabric of large-scale ecosystem restoration. The privately owned properties that can play an especially important role in Chicago Wilderness are those that include remnant habitats of good to high quality, those with lesser-quality habitats that could be improved by restoration of missing species, and those on which degraded habitats can be replaced or soil hydrology can be restored.

Typically, the larger the property the better, but also important are clustered, separately owned, smaller sites with cooperative neighbors and also all sites that adjoin or directly affect properties with threatened or endangered species or rich natural communities. In addition, all properties in critical watersheds have a role to play. The critical watersheds are those of very high-priority and high-priority streams, and those of exceptional and important lakes, as defined in Chapter 6. Types of privately owned property most likely to play an important role in Chicago Wilderness are include residential lots three acres and larger, golf courses, corporate campuses, commonly owned open space in planned unit developments, hunt clubs, undeveloped investment properties, and recreational lands owned by individuals and corporations.

Recommendations for private property owners

- ✓ Property owners who believe they own important habitats should have inventories of their land made by the staff of local, state, or federal agencies or by experienced citizens associated with local conservation organizations.
- ✓ Property owners who wish to commit to long-range protection and enhancement of their habitats should first assess the various methods of legal protection (listed in detail below).
- ✓ Property owners who do not wish to encumber or sell their land, but recognize its habitat value, should pursue habitat-enhancement techniques, participate in larger landscape restoration efforts, inspire neighboring property owners, and share information on uncommon species observed on their property.
- ✓ Property owners who have already established a strategy to protect and restore their property should assess potential impacts on their habitat from changes to land use on neighboring properties and, based on that assessment, pursue strategies with neighboring property owners to insure protection and expansion of the habitat resources.
- ✓ Corporate property owners should restore native plant and animal communities on their lands or expand existing restorations wherever possible to expand, link, or enhance nearby habitats. This can provide employee and community benefits and, in some cases, can achieve significant savings on land management.
- ✓ Chicago Wilderness should map and catalog the extent of private properties in the region that could play an important role in broader ecosystem restoration efforts.

- ✓ Chicago Wilderness should establish a process whereby private property owners can become effective participants in broader efforts to restore ecosystems.

Conservation strategies available to private property owners are described in the remainder of section 8.2.

8.2.2 Conservation easements

Illinois statutes allow private property owners to donate conservation easements to governmental bodies or not-for-profit conservation organizations certified as 501c3 by the IRS. The property owner retains title to the property, but the easement is granted in perpetuity, to protect the natural resources from major changes in land use, such as the building of structures, removal of native flora or fauna, grading or disruption of soils, or similar restrictions specific to each property. The management of the property to enhance natural resource values, or the role it would play in a larger ecosystem restoration, is normally spelled out in a separate management agreement, which can be amended periodically to respond to changing conditions.

Approximately 2000 acres of land have had conservation easements applied by private property owners. The key not-for-profit organizations who hold conservation easements include: Corlands (1400 acres), the Conservation Foundation of Du Page County (200 acres), the Land Foundation of McHenry County (150 acres), Lake Forest Open Lands 300 acres, plus 220 acres in easements 170 acres managed for others under lease agreements.), and the Fox Valley Land Foundation (50 acres). Examples include the Weers easement in McHenry County, the Merit Club in Lake County, the Shaw easement in Kane County, and the Barbara and Allan Wilson easement in Lake in the Hills.

8.2.3 Illinois Nature Preserves

Illinois Nature Preserves can be established on properties that hold threatened or endangered species or especially high-quality habitats. Sixteen privately owned Illinois Nature Preserves have been established in the Chicago Wilderness area. They constitute some of the richest concentrations of biodiversity that have survived since presettlement times. Examples include the Parker Fen in McHenry County and the Bystricky Prairie in McHenry County.

However, the integrity of Nature Preserves can still be compromised by impacts from surrounding land uses. Thus, continuing efforts are needed to expand and buffer these preserves, as well as to link them to a broader restored landscape. Buffer zones can be established with any of the other mechanisms described in section 8.2.

8.2.4 Illinois Land and Water Reserve

Illinois Land and Water Reserves are approved by the land owner and registered with the Illinois Nature Preserves Commission and the Illinois Department of Natural Resources. Eligible sites include high quality habitats, large blocks of habitat that support area sensitive species, natural community restorations and endangered species relocation sites. Land and Water Reserves may also be used to buffer nearby or adjoining Illinois Nature Preserves. Examples include the Brooklands Wood Reserve in Antioch Township, Lake County, Illinois; and the Webber Reserve in Antioch Township, Lake County, Illinois.

8.2.5 Transfer to restricted trust

A property owner may establish a limited trust that owns the property and has trustees who operate the trust with specific instructions to preserve and manage the trust. The trust can take ownership during the owner's lifetime, allowing the owner to continue residence on the property, or it can come into existence upon the death of the owner. Such a trust needs to be funded in perpetuity in order to pay taxes, insurance, normal maintenance, and natural-area management. This is not a common method of land preservation because of the commitment needed from the trustees, but it is a possible strategy in certain situations.

8.2.6 Commitments, less than perpetuity

The vast majority of property owners in the Chicago Wilderness area who maintain their lands in a natural condition have not made long-term, legally binding commitments to restrict changes or development of their property, nor have they participated in coordinated efforts to restore habitat within their local watershed or their neighborhood. Yet thousands of private property owners actively enhance or restore their lands for habitat purposes because of a personal commitment.

Because of the positive news reports of native landscape restoration, as well as the educational initiatives of environmental advocacy groups and individuals, more property owners every year are attempting to restore communities of associated native flora and fauna (prairie, woodland, wetlands) or to enhance habitat for individual species (butterfly gardens, bluebird boxes, bat boxes). Their level of success in establishing optimum biological integrity depends wholly on the quality of information and advice they receive.

Many of these properties can perform very important roles within the Chicago Wilderness because of their location within large potential bioreserves. These properties also are the primary source from which future conservation easements, Illinois Nature Preserves, and Land and Water Reserves will be drawn. Because of their growing and dispersed nature, an important task for Chicago Wilderness members will be to catalog their extent, to determine their roles in larger preservation and restoration efforts, and to establish a process through which property owners can participate in the overall effort. Examples include the Abbott Laboratories prairie restoration and native orchid habitat protection in North Chicago, the Perle Olsson prairie and woodland restoration in Ringwood, and the Joan and John Knoll prairie restoration in Bull Valley.

8.2.7 Landscape restoration to serve a corporate purpose

An increasing number of corporations are using native landscape restoration to minimize groundskeeping costs, to provide areas of interest for employees, and to achieve good public relations with a conservation-minded local community. In most cases, these restorations have no underlying long-term commitment, but nonetheless they open up such a possibility. These restorations can play a strategic role in protecting on-site habitat, buffering or linking nearby habitats, or increasing stormwater absorption. As one example, Commonwealth Edison has seeded prairie plants into its rights of way in Cary, Orland Park, Zion, Mokena, and the south side of Chicago. As another example, Modine Corporation has seeded prairie plants on its property in Ringwood. For discussion of natural landscaping, see section 11.3.2 and Appendix 9.

8.2.8 Transfer of private property to public ownership or to conservation organizations

Property owners who wish to preserve their lands for habitat protection and public use have various options for transferring their property to a public land-holding body or to a not-for-profit conservation organization in the region. Each of these agencies operates under financial limitations as well as a strategic acquisition plan or set of criteria for purchases or acquisitions. In certain cases, property owners may find no agency willing to purchase property or to accept a donation. This is a region-wide issue that needs to be resolved. One source of information on local public agencies and land trusts is the OpenLands Project.

Donation by property owner

Outright donation: Full title and ownership of property is donated to a conservation agency. Income tax deductions are usually available for this charitable donation.

Donation by devise: A gift of land to a conservation agency is accomplished through a will, expressly stating that, if accepted, the land will be used for conservation purposes and not sold or developed. An income tax deduction is not received, but estate taxes may be substantially reduced.

Donation with reserved life estate: Land is donated to a conservation agency, but with a provision that the donor retains a right to live on it or otherwise use it. The charitable contribution is computed based on the fair market value of the donation minus the value of the life interest in the property as determined using IRS actuarial tables.

Sale by property owner

Sale at fair market value: A conservation agency pays the fair and reasonable appraised value for property if it falls within its strategic acquisition area, and if the agency has the funds to make such a purchase. The seller is liable for income tax on the capital gain.

Bargain sale: The seller sells the land for less than the appraised market value and gains a charitable IRS deduction, thus avoiding some or all of the capital-gains tax.

Installment sale: A portion of the land is sold yearly rather than all of it at one time, lessening the capital-gains tax.

Sale with reserved life estate: Property is sold to a conservation agency while the seller retains the right to live on the property for all or a portion of his or her lifetime. This mechanism can provide the means to meet both the needs of the seller and the long-term objectives of the buyer.

Lease-back: Property is sold with a pre-established right of the seller to retain its use through a lease for an agreed-upon period of time. It is similar to a life estate in meeting the needs of the seller while satisfying the objectives of the buyer.

Right of first refusal: A conservation agency is usually negotiating with several property owners at any given time, and its yearly budget may not allow it to purchase all potential properties on the market. Or the agency may not offer a seller as much as the seller wishes to receive. In these situations, a conservation-minded property owner can assign a right of refusal to the conservation agency. This guarantees the agency the right to match a price offered by another potential purchaser.

Recommended actions for Chicago Wilderness member organizations to facilitate transfer of private property

- ✓ Educate the land-owning public about the options and incentives available for transferring open space to public and not-for-profit conservation agencies.
- ✓ Assure that all areas within the Chicago Wilderness region are served by one or more organizations that will take title to important habitats in order to manage them.
- ✓ Look for funding mechanisms so that lack of resources for ongoing ecological management is no longer an impediment to the donation of important habitat.

8.3**Local governments: plans, ordinances, contracts, and strategies**

Local governments already have the framework for preserving and restoring habitat in their codes. In most cases, standards for protecting and restoring habitat may need to be added, but rarely do new approaches need to be created. However, a well-implemented policy for preservation and restoration of habitat by a local government will include evaluating and amending all plans, ordinances, contracts, codes, and strategies and making amendments where needed. *Protecting Nature in Your Community: A Guidebook for Protecting and Enhancing Biodiversity* was prepared by NIPC to educate local governments on the importance of biodiversity, and to provide tools for restoration and protection. Additional roles for local municipalities are discussed in Section 11.2.2.

Recommendations for local governments

- ✓ Encourage local citizens to offer ideas for habitat preservation and restoration in community visioning exercises.
- ✓ Identify lands with high habitat value and lands with good restoration potential and designate them as natural resource preserves in comprehensive, strategic, and special-area plans. Consider municipal ownership and management of these lands for open space and biodiversity values.
- ✓ Designate stream corridors, swales, and hydric-soil networks as open-space links in comprehensive plans and in strategic and special-area plans.

- ✓ Develop five-year capital improvement programs for stormwater management that minimize infrastructure investment, replacement, and maintenance by using best management practices that:
 - Use natural swales
 - “Daylight” storm sewers by converting them to open swales
 - Encourage infiltration with perforated pipe
 - Adopt zero-discharge standards when appropriate
 - Plant deep-rooted native vegetation on the banks of streams and detention ponds to control erosion
 - Develop programs to minimize use of pesticides and fertilizers on municipal lands through Integrated Pest Management policies or other means.
 - Use other best management practices such as those identified by NIPC (1992, 1994, 1997)
- ✓ Develop five-year capital improvement programs for sewage treatment that minimize infrastructure investment, replacement and maintenance costs by using best management practices that:
 - Use land-treatment systems
 - Use restored wetlands as absorption fields
 - Use created wetlands for “polishing”
 - Use other best management practices such as those identified by NIPC (1992, 1994, 1997)
- ✓ Develop general-purpose capital improvement programs that minimize infrastructure investment, replacement, and maintenance using best management practices that:
 - Use native plants to landscape rights of way
 - Encourage stormwater infiltration via swales, vegetated filter strips, and perforated pipe
 - Make roadway widths no wider than necessary to ensure public safety and to accommodate other modes of travel such as bicycling
 - Avoid seeps, springs, and organic soils when locating new roads and facilities
- ✓ Adopt zoning ordinances that incorporate natural-resource overlay zoning districts and hydric-soil overlay districts, which supplement other zoning requirements that apply to specific areas. Adopt zoning ordinances that require developers to protect and restore natural resources, to provide buffers for wetlands and streams, to minimize impervious surfaces, and to cluster home sites.
- ✓ Adopt subdivision regulations that require:
 - Inventory of natural habitats, designation of hydric soils, and location of underground tiles at the sketch-plan stage
 - Design of detention areas to achieve or approach zero discharge for two-year storms
 - Preservation of habitats and hydric soil systems
 - Buffers for wetlands, streams, and drainage corridors
 - Designation of lands with conservation easements or dedication to local government at the preliminary planning stage.
- ✓ Use engineering standards and practices that incorporate measures to protect and restore natural resources, that emphasize infiltration over discharge of storm water, and that are flexible enough to respond to varying environmental situations.
- ✓ Insure the municipal code allows and encourages the restoration of natural plant communities and habitats for native wildlife in residential and commercial landscaping.
- ✓ Use native landscaping on municipal lands and restore existing natural areas to create wildlife habitat, protect water quality, and demonstrate these landscaping practices for residents and businesses.
- ✓ Creatively design annexation and development agreements to protect and restore natural resources to the highest possible degree, including immediate identification and protection of major resources and a process for identification and protection of other resources in later stages
- ✓ Use TIF districts to acquire or restore natural habitats and community open space as part of redevelopment, to provide habitat and implement hydrological best management practices such as those recommended by municipal consultants and by NIPC (1992).
- ✓ Adopt intergovernmental agreements between or among neighboring communities to coordinate protection and restoration of natural resources and of hydrology.
- ✓ Undertake municipal conference initiatives that focus on the protection and restoration of natural resources, the identification of local ecosystems, and the modification of stormwater systems as described above in this section.
- ✓ Chicago Wilderness organizations should develop a training and technical assistance program for municipal and county officials by which they would receive information on how to incorporate biodiversity in their plans, programs, ordinances and regulations.

8.3.1 Examples of public and private initiatives for open space and habitat

Parkland dedication: Nunda Township accepted title to 30 acres of drained hydric soils from the developer of adjoining land. The township converted a portion to a prairie restoration, created several soccer fields, and left the remainder as passive open space.

Watercourse dedication: The Kane County Forest Preserve District obtained title to Otter Creek and adjoining wetlands from the developer of the Thornwood development in South Elgin.

Greenway dedication: The Kane County Forest Preserve District obtained a broad greenway through the Mill Creek development, which includes Mill Creek and adjoining wetlands and uplands.

Road corridor dedication: Most roads in the Village of Long Grove include habitat easements that are dedicated as part of the process of reviewing development plans.

Wetland dedication: The Valley Hill Estates developer in the Village of Bull Valley established a conservation easement on the Boone Creek Fen, an Illinois Natural Area Inventory site, and an adjoining oak ridge that acts as a buffer.

Habitat dedication: Due to planned-development agreement, annexation agreement, or other development agreement, 120 acres of a 191-acre, 74-lot development were preserved as open space and for habitat restoration through an agreement among seven different parties, including the Lake Forest Open Lands Association, Lake County Forest Preserve, and City of Lake Forest.

Cooperation between government units to protect habitat: The Village of Inverness postponed consideration of an annexation proposal for 90 days to allow the Cook County Forest Preserve District to purchase a five-acre buffer to the Baker's Lake Nature Preserve.

Open space associated with sewage treatment for buffering effluent: The Northgate development in Huntley will use a land-treatment system that pipes treated effluent to dedicated open space. This avoids discharge from a sewage-treatment plant into the Class-A-rated Kishwaukee River system, while also providing expanded habitat for the upland sandpiper in a portion of the treatment area.

Habitat as part of common private ownership of open space: The 667-acre Prairie Crossing development in Grayslake retains 463 acres of open space, including 160 acres of restored wetlands, restored prairie, fields, mead-

ows, and parks. The development is designed to have zero discharge for two-year storms.

Habitat associated with golf courses: The Ruffled Feathers Golf Course in Lemont incorporates 29 acres of restored wetlands and uses the design principles advocated by Audubon International for habitat protection. The Village of Lakewood purchased a bankrupt 18-hole golf course in 1992; learned that it included a 36-acre, high-quality fen, and dedicated it in 1995 as the Kishwaukee Fen Illinois Nature Preserve.

Restoration projects funded with fines from regulatory enforcement actions or mitigation agreements: The Oak Lawn Park District recreated meanders for three quarters of a mile of Stoney Creek into a broader floodway, restored riparian native vegetation, and established a public greenway and trail in place of a deeply incised, overgrown stream channel with little public access. Fifty species of birds, fish, and other fauna have rediscovered the area. See box for case study from Northwest Indiana.

8.3.2 Regulation

Short of purchasing or leasing a piece of land or acquiring some of the rights that constitute land ownership, governments at all levels have various rights to regulate the development or use of land. This authority is most commonly delegated by state governments to counties and municipalities, whose zoning regulations are the principal local tool for regulating the use of land. Zoning ordinances often require specified amounts of permanent open space, typically in the form of lot-size requirements, setback requirements, or maximums for a building's site coverage. These ordinances can be applied to preserve small natural areas.

Counties and municipalities may also regulate development to prevent specific environmental impacts. For example, many of the local governments throughout the Illinois portion of Chicago Wilderness have adopted model local ordinances for stream and wetland protection, erosion and sedimentation control, floodplain management and stormwater drainage and detention, or they have developed and adopted their own codes. NIPC has prepared model ordinances for use by local governments, including the *Model Floodplain Ordinance*, *Model Stormwater Drainage and Detention Ordinance: A Guide for Local Officials*, *Model Stream and Wetland Protection Ordinance*, and the *Model Soil Erosion and Sediment Control Ordinance: A Guide for Local Officials*.

Regulations affecting the development of flood plains may aid in the preservation of natural communities. However, these regulations usually do not preclude development unless it diminishes flood storage capacity

Conservation and restoration of Karner blue butterfly habitat

A case study at National Steel Corporation's Midwest Division in Portage, Indiana

In July of 1992, National Steel Corporation, Midwest Division (Midwest Division) applied to the United States Environmental Protection Agency (U.S. EPA) and Indiana Department of Energy Management (IDEM) for a Class 3 Resource Conservation and Recovery Act (RCRA) permit modification to expand the existing Greenbelt Hazardous Waste Landfill currently in operation on its property in Portage, Indiana. As part of permitting requirements, U.S. EPA and the United States Fish and Wildlife Service (U.S. F&WS) conducted several site visits to determine whether the landfill expansion would negatively impact any state or federal, proposed/listed threatened or endangered species.

During a U.S. EPA site visit to the project area (known as "Greenbelt II") in 1992, lupine plants were discovered growing in the area to be impacted. This plant serves as the sole larval host for the Karner blue butterfly, which was known to occur nearby in the Indiana Dunes National Lakeshore. On a subsequent visit with personnel from the Indiana Department of Natural Resources, one adult male Karner blue butterfly was observed at the impact site. Due to rapid population declines over the past 15 years, this butterfly species is listed as federally endangered under the Endangered Species Act.

All permits issued under RCRA must be in compliance with other federal laws, including the Endangered Species Act. As part of this requirement, U.S. EPA must consult with U.S. F&WS if any actions under its jurisdiction have potential to impact any proposed/listed threatened or endangered species. Because a Karner blue butterfly population occurred in the impact area, U.S. F&WS required that U.S. EPA provide a Biological Assessment to determine if the proposed landfill expansion would adversely affect the Karner blue butterfly or its habitat. Midwest Division prepared the Biological Assessment and provided it to U.S. EPA and U.S. F&WS for review

From data gathered during the Biological Assessment, it was determined that approximately 17 acres of moderately suitable habitat for the Karner blue butterfly would be impacted by the 30 acre expansion of the existing Greenbelt landfill and clean-up of the Eastside Solid Waste Management Unit (Eastside SWMU). Pursuant to the Endangered Species Act, the U.S. F&WS prepared a Biological Opinion and Incidental Take Statement, outlining the expected damages to the Karner blue butterfly and measures for mitigating these disturbances. An unused portion of Midwest Division's property (known as the Conservation Area) was selected as the mitigation site because of the presence of relatively undisturbed oak savanna habitat, lupine, and a variety of Karner blue butterfly nectar sources. The Conservation Area totaled 45 acres in size, of which approximately 25 acres was relatively undisturbed oak savanna with a dense understory of young black oak, sassafras and cherry trees. The remaining 20 acres consisted of old agricultural fields, black locust thickets, and areas recovering from previous sand mining operations.

Part of mitigation for the loss of habitat required by the Greenbelt expansion permit included translocating lupine plants from the Greenbelt II site to the Conservation Area. It was thought that any over-wintering Karner blue butterfly eggs would also be translocated with the lupine plants. In March and April of 1993, 759 plugs of soil containing 1,610 lupine plants were moved from the Greenbelt II landfill expansion site to the Conservation Area. Each of the soil plugs containing lupine was placed in one of 13 "Lupine Translocation Areas" located on the edges of the wooded portions of the Conservation Area. Each lupine plant was marked with a metal tag and a colored pin flag. In May and June of 1993, 7,987 additional lupine seeds and 2,063 lupine seedlings were planted on the translocated plugs. This was done to ensure that Karner blue butterfly larvae occurring there would have sufficient food sources. In addition to the translocated lupine, seeds and seedlings, dense native populations of lupine (over 30,000 plants) already occurred throughout the Conservation Area.

(Continued on next page.)

Following lupine translocation, Midwest Division was required to conduct habitat restoration activities at the Conservation Area. The Karner blue butterfly requires a mosaic of open to partially closed canopy oak savanna with a ground cover dominated by lupine (the only known foodplant for the larvae of this species), grasses and adult nectar sources. Lupine and many of the adult nectar sources are dependent on fire for their continued survival. Fire suppression over the past 20-30 years had resulted in the growth of a dense understory of young trees at the Conservation Area. These trees shaded out the herbaceous layer, making much of the area unsuitable as Karner blue butterfly habitat. Over 35,000 young trees and shrubs were removed manually in the winters of 1993 and 1994. In addition, more than 9,000 black locust trees and saplings were cut and treated with herbicide.

Midwest Division was also required to implement biological monitoring programs to track shifts in various habitat characteristics following restoration. They were also required to monitor the survivorship of translocated lupine and any Karner blue butterflies that may have been moved to the Conservation Area. Over 65 percent of the translocated lupine plants had survived as of 1997 and 75 percent of the plugs had at least one lupine plant present. Initial butterfly surveys in the spring of 1993 found that no Karner blue butterflies were translocated to the Conservation Area. However, these surveys did identify a previously unknown population of the butterfly already occurring at the Conservation Area. Between 1993 and 1997, this population steadily increased in size from approximately 160 individuals to more than 1,000. In 1998, the Conservation Area was deeded to the Indiana Dunes National Lakeshore (IDNLS) for inclusion in their West Beach Subunit.

In addition to the Conservation Area, Midwest Division also purchased a privately-owned, 50 acre parcel of land along Stagecoach Road and adjacent to the Inland Marsh Subunit of IDNLS. This parcel of land is known to contain a viable Karner blue butterfly population and numerous plant species considered very rare in the greater Chicago region.

or exposes structures to flood damage. Thus without added specific habitat protection regulations, flood plain ordinances alone are insufficient.

State and federal rules also apply to development affecting wetlands. Permits to dredge or fill wetlands are subject to the approval of the U.S. Army Corps of Engineers and state agencies. However, other damaging impacts, such as excavation or vegetation removal, may not be covered by federal or state regulations. The permit can be obtained only if appropriate mitigation measures are taken. For high-quality wetlands, mitigation may not be permitted. Often, developers search for an entity to which they might donate wetlands as permanent open space. This search is often frustrated by a lack of local conservation management organizations or their inability to take on the management of small or fragmented wetlands unless adequate long-term funding is provided.

Development projects using federal dollars may be subject to an environmental impact statement (EIS). An EIS has, in some instances, provided the impetus for compromises or adjustments to the design of a project for the benefit of natural-area preservation. Projects that pose a

hazard to threatened or endangered species can be challenged under both federal and state law.

In the area of wastewater management in Illinois, the Environmental Protection Agency has authority to set boundaries for systems that collect and treat wastewater. A natural area lying outside any designated service area thus enjoys a limited form of protection from development that would normally require sewers. The Illinois Environmental Protection Agency has been reluctant to limit the expansion of wastewater service areas upon request, even if the expansion would expose high-quality streams to discharges of treated wastewater. It is recommended that the Illinois EPA establish a process for reviewing and approving the expansion of wastewater service areas that takes into consideration the impacts on the total natural environment within affected watersheds.

One of the best tools available to local governments for protecting natural areas is their power to prepare and adopt comprehensive plans. While such plans carry only advisory authority, they can set the stage for action to protect important areas long before development could cause harm or destruction.

A more specialized type of plan that has proven beneficial for preserving natural areas is one specifically addressing future needs and opportunities for parks, open spaces, and greenways. The forest preserve and conservation districts in Illinois, the Illinois Department of Natural Resources, and a growing number of park districts and townships have adopted plans that identify key areas to be protected.

An increasing number of local governments and organizations have been actively planning and implementing greenways (generally defined as open space corridors with multi-functional values). Many greenways are based on river and stream corridors and on abandoned rail lines, which often encompass one or more natural communities. The Northeastern Illinois Planning Commission and the OpenLands Project have jointly sponsored a Regional Greenways Plan for the six Illinois counties in the Chicago Wilderness region.

8.3.3 Watershed planning and management

Recent attention has been focused on the unfulfilled potential of comprehensive watershed planning, involving multiple government units and addressing all aspects of managing water resources. This concept brings together the various aspects of water management, which have heretofore been planned separately, if at all. Watershed management includes regional management of storm water, of flood plains, of water supply, and of water quality, covering both non point source and point source water pollution.

This more comprehensive approach to planning has arisen, in part, because many of the costly flood control projects of past years not only have failed to eliminate

flooding but also have often resulted in severe environmental degradation. By the same token, water-quality management planning has tended to focus solely on wastewater collection and treatment and has typically failed to achieve the original national purpose of attaining streams, lakes, and rivers fit for swimming and fishing.

Examples of integrating various aspects of water management are evolving in several parts of the region, most notably where local governmental and citizen-based groups have taken an active interest in addressing their local problems in a comprehensive fashion. A Vision for Butterfield Creek (Prepared by Johnson, Johnson, and Roy for the Butterfield Creek Steering Committee, 1994) is an excellent model for local action. Countywide agencies also have played a lead role in organizing stormwater planning. Local councils of governments have also provided leadership such as with the South Suburban Mayors and Managers Association's South Suburban Stormwater Strategy: A Plan for Watershed Management (1998).

8.3.4 Best management practices for new urban and suburban development

NIPC (1992) gives a survey of best management practices for the process of urban and suburban development is contained in the NIPC publication. Among the topics covered are site planning and design, soil erosion and sediment control, stormwater drainage and detention, and the protection of water bodies and wetlands. Each of these topics is directly related to the preservation of the region's biodiversity. Further information can be obtained from the Center for Watershed Management, located in Silver Spring, Maryland.

Chapter 9

Ecological Management, Research, and Monitoring



9.1

Introduction

A major conclusion of this plan is that increased management is essential if the biodiversity of the region is to be preserved. To balance the losses being caused by disturbance of natural processes, ecological restoration and management of this region's natural communities must increase substantially. Years of experience and research have demonstrated that certain basic management activities are necessary and effective for the health of natural communities and the conservation of biodiversity of the region. While continuing research is important to improve management techniques, ongoing management is essential for all of our natural communities. Applying adaptive management in a context of monitoring and research is the best way to improve on existing techniques while reducing and reversing the ongoing rate of loss.

9.2

Techniques and guidelines for ecological restoration and management

9.2.1 Purpose of the guidelines

To facilitate increased management in the region, the Chicago Wilderness Land Management Team has begun the task of developing Ecological Restoration and Management Guidelines. These guidelines will function at two levels. First, they will provide general information about why, how, when, and where certain techniques are used. Second, the guidelines will provide more detailed information that will summarize the state of knowledge about various techniques to aid land man-

agers in planning, training, and working with other land-management agencies and volunteers.

The objectives of the guidelines are:

- To endorse the use of effective restoration and management techniques
- To identify appropriate (safe, efficient, economical, and effective) approaches and solutions for typical management problems
- To identify gaps in knowledge and to develop and prioritize related research questions
- To inform planning efforts with practical information on techniques, costs and benefits, and expected results
- To identify situations that require discussion and information-sharing among land managers
- To foster communication among agencies on issues that require collaborative decisions
- To provide regional support for good land-management decisions
- To provide information to decision-makers with jurisdiction over natural resources

Guidelines cannot identify the specific practices or techniques to be applied at any given site. No single best method or combination of methods can be applied across the region for all situations. Instead, management plans need to be developed for each site using management practices adapted to site conditions and appropriate to the goals for the site. However, guidelines can point out factors and concerns that are helpful in thinking through site plans and use of various practices throughout our region.

Guidelines can help in selecting management techniques to eliminate an ecological stress from a natural community. Some sites with invasive brush can be managed with prescribed fire alone, while others may require hand

clearing, and still others will warrant mechanical clearing. The goal of all of these treatments is to maintain the site using only prescribed fire. But due to different densities of brush and other site conditions, different restoration techniques are needed to get to this stage. In this example, the effectiveness of the restoration technique can be measured in more than one way. First, one can check the reduction of the invasive brush. Second, one can see the intensity and coverage of the prescribed burn. A third, longer-term measure would be the recovery of the natural community.

In most cases, land managers are trying to correct damage done from as many as 200 years of neglect. Restoration is a process that requires time, and some sites may take several years before beginning to show significant signs of progress. It is advisable to fully inform the public of what can be expected and, where possible, to include practices that yield short-term as well as long-term results.

In developing guidelines, the Land Management Team has assigned high priority to specific practices. The following sections explain why these techniques are important, give basic prerequisites for their use, and offer recommendations for enhancing their use across the region.

9.2.2 Prescribed burning

Chapters 3 and 5 have identified fire as a fundamental tool in the restoration and management of natural communities in our region. This tool allows land managers to effectively and economically manage sizable natural areas using a natural process. It is by far the single most important management technique at their disposal.

Planning is the key to successful use of fire as a management tool. Although prescribed burns are essential to long-term health of natural areas, they can have short-term impacts upon some plant and animal (primarily insect) life. For this reason, sites are either burned in portions or on a landscape level that allows natural patchiness to provide refuge. More research needs to be conducted to see how several key species and groups respond to prescribed burns of various intensities, coverages, and frequencies.

Prescribed burns as applied today have several beneficial effects upon degraded natural communities. One of the most important effects is controlling brush by setting small saplings and seedlings back. A second important effect is stressing plants that are not adapted to fire. This allows native species to compete better with the invasive species. A third effect is the recycling of nutrients, which are released from dead vegetation by the fire. Studies have shown that immediately after a fire, plants

grow taller, they flower more and longer, and they produce more seed. Fourth, fire exposes the soil and sprouting plants to sunlight and warmth earlier in the year than in unburned areas, allowing earlier growth and more robust plants (Pauly 1997).

A good burn plan includes a clear statement of goals and objectives, a map of burn units, and a prescription that defines the safety parameters: required limits for wind direction and speed, relative humidity, and temperature. The plan also should include optimum timing and conditions, and it should describe the tools and personnel required. Typically, it includes a smoke-management strategy, a notification list, and evidence of all required permits.

Some important references for developing prescribed-burn plans are Collins and Wallace (1990), Henderson and Statz (1995), Hulbert (1988), Wright and Bailey (1982), Packard and Mutel (1997), Ladd (1991), and McClain (1994).

While all land managers for major natural areas in Chicago Wilderness currently use burning in their programs, some actions that would increase the capacity of all managers to use prescribed burning as a management tool. These include the following.

Recommendations

- ✓ Land-management agencies should develop a comprehensive training program for crew members and burn leaders that emphasizes prescribed burning in Midwest ecosystems and burning in metropolitan settings.
- ✓ Land-management agencies should procure sufficient equipment and workforce so that enough natural areas can be burned within the appropriate time periods to achieve the goals of this plan.
- ✓ Chicago Wilderness members should work with the Illinois Nature Preserves Commission to monitor and participate in the development of new legislation that affects prescribed burning in Illinois. Similarly, members should work with state Environmental Protection Agencies as they develop air-quality regulations to facilitate prescribed burns.
- ✓ Land-management agencies, in conjunction with other Chicago Wilderness members, should develop outreach programs to educate local officials, fire chiefs, preserve neighbors, etc., about the use of fire in managing natural ecosystems.
- ✓ Chicago Wilderness members should cooperate to improve knowledge about research questions such as:

- What are the positive and negative effects of prescribed burning on endangered, threatened, and watch species?
- What is the optimum timing and frequency of fire to conserve designated ecological targets?
- What are the effects of various prescribed-burning regimes on native shrubs?
- What are the best uses of fire to control invasive species?

9.2.3 Restoration and management of hydrology

Hydrology includes surface water (ponds and wetlands), groundwater (springs, seeps, and subsurface flow), and riparian systems (streams and rivers). A comprehensive approach to restoring and managing the natural communities of any site should include a thorough review of that site's hydrology, both historic and present. Chapters 3, 5, and 6 describe ways in which the hydrology throughout the region has been altered, typically by the installation of subsurface drain tiles, the channelizing of streams, the construction of dams, dikes, and ditches, the filling of wetlands, and the construction of impervious surfaces.

Modifications to hydrology in the past century and a half were usually attempts to make land more suitable for farming and development, or to convey water off site as quickly and efficiently as possible. Changes in drainage by ditches, tiles, storm sewers, and other means have greatly altered the habitats and ecology of the region. Instead of infiltrating into the soil and then moving as groundwater through the natural communities, most storm water and melt water now run off the surface, changing the quantity and timing of water availability. Hydrologic alteration eliminates some communities and degrades the quality of others.

A review of historical information and a field inspection should determine whether a site has undergone hydrological modification by human actions. A number of information sources can be useful. These include soil analysis, physical evidence of drainage alterations such as field tile or straightened stream channels, aerial photos, topographic maps, and personal contacts with previous owners and local officials. The analysis should also consider the effects of off-site alterations to hydrology.

Before recommending the restoration of hydrology, a land manager must determine if proposed alterations comply with state drainage laws. For example, will they affect surrounding or downstream property owners? This information is essential for obtaining necessary federal, state, and local permits.

Examples of management techniques include removing drain tiles, either in part or in their entirety; filling ditches; removing berms and spoil piles; removing water-level control structures; re-meandering streams; controlling invasive species; and reintroducing native species. Monitoring of groundwater levels before and after restoration is an essential component of a successful project.

Some important references in planning hydrological restorations are Brooks et al. (1997), Payne (1992), Mitsch and Gosselink (1993), Galatowitsch and van der Valk (1994), and Hammer (1992).

Recommendations

- ✓ Chicago Wilderness members and local agencies should create a database of current hydrological data from restoration and mitigation projects and make it available on the Internet.
- ✓ Chicago Wilderness members and local agencies should standardize the methods for collection of hydrological data, including the use of remote data-sensing equipment.
- ✓ Chicago Wilderness members and local agencies should provide training to land owners and land managers in techniques for identifying hydrological disturbances, locating and removing agricultural field tiles, and installing groundwater monitoring wells.
- ✓ Local agencies should identify large, artificially drained wetlands and prioritize them for restoration.
- ✓ Chicago Wilderness members and local agencies should further develop education and outreach programs on wetland ecosystems, making use of demonstration and restoration projects.
- ✓ Chicago Wilderness members and local agencies should address key research questions, such as:
 - How do offsite factors affect hydrology at a site, and what are the implications for restoring the site's hydrology?
 - What are the best methods for restoring hydrology, and when should they be implemented?

9.2.4 Reestablishment of native species

Most restoration management is not focused on individual species. Instead, management seeks to improve diversity and health in general through removal of invasive species, reintroduction of fire, etc. The goal is to improve and enlarge habitat for native plants and animals and to ensure long-term regional viability of native species. In some circumstances, however, the appropriate management technique is the reintroduction of native

species previously lost from a site. Five possible objectives for the reintroduction of native species are:

- To restore natural biodiversity
- To provide expanded habitat for listed or critical species
- To promote conservation awareness
- To develop expanded sources of native plants and seeds and native genetic diversity
- To provide better infiltration of storm water

Species reintroduction can reverse the twin trends of habitat and ecosystem loss and can help sustain rare species. Reintroduction artificially disperses and increases native biota where natural dispersal patterns have been disrupted or fatally compromised. For example, nest predators that prosper in today's fragmented habitat have severely curtailed reproduction of the Blanding's turtle; captive rearing and reintroduction programs are mechanisms to sustain the species. Reintroduction also serves as a tool for recreating the large blocks of native plant communities and community complexes now missing from the Chicago Wilderness region. Seeds and/or plants are reintroduced to degraded natural communities or to former agricultural lands to fill gaps. Large blocks of the native landscape are crucial for the viability of area-sensitive species, to avoid edge effects, and they reduce the chance that a chance event will wipe out an entire population.

Native-species reintroduction in the Chicago region began early in this century with the extirpated white-tailed deer. In the 1960s the region saw its first prairie restorations, most notably the 100-acre project at the Morton Arboretum. Larger-scale projects have now been undertaken, such as the 1000-acre Fermilab prairie restoration, where a phased series of projects on old farmland is creating valuable habitat. In another example of reintroduction, the formerly abundant prairie white fringed orchid is being returned to appropriate sites.

When planning to reintroduce a native species or a mix of species, the site manager must consider several issues about the species' biology and the site, to insure that the reintroduction has a chance of succeeding and will not harm other conservation or restoration efforts. The following items should be considered, especially for sites that contain established high-quality communities or rare species or when working with rare or threatened species:

- taxonomic status of individuals to be reintroduced
- historical information about the loss and fate of species populations from the region and from the reintroduction site, including losses from any previous reintroduction
- the status and ecology of the species or groups of species to be reintroduced
- the effect the reintroduced species will have on the ecosystem and on species currently occupying the required habitat
- the rate of reintroduction, the optimal number of individuals to be reintroduced, and the composition of the reintroduction

The site must be within the historic range of the species being introduced and should offer long-term protection. Previous causes of decline for the species should be eliminated or significantly reduced. Habitat restoration should be at a stage to sustain the reintroduced population.

To retain functioning native communities within Chicago Wilderness, we need seeds and plants of local origin. In some cases, the supply has run short, and some species are not available in the commercial market. Some actions to pursue to develop a larger supply of seed and plants of local ecotypes include the following.

Recommendations

- ✓ Land management agencies that have not already done so should develop in-house nurseries to produce seeds and plants. A nursery can produce large quantities of seed at low cost and can also produce propagules irrespective of natural environmental conditions.
- ✓ Expand seed and plant exchanges. Member organizations can trade for seed or plants of the local or regional ecotype that are not available within their own land. This creates a market for the seed and plants that are surplus for one organization but useful to another that year.
- ✓ Donate or exchange the use of facilities. Local conservation organizations and landowners can make use of each other's facilities or landholdings to build up the number of available propagules. The collaborative efforts create a regional economy of scale and assist individual organizations whose resources are stretched thin.
- ✓ Conduct propagation research. The task of recovering over 1500 native plant species is a daunting one. Only about 350 of these species have been propagated commercially or for restoration. The personnel and facilities of significant botanical research organizations within Chicago Wilderness provide great potential for research into propagating native plants for restoration and could act as a clearinghouse for such work. Such botanical facilities include the Chicago Botanical Garden and the Morton Arboretum. Staff from these facilities can and also do help in preparing recovery plans for rare species.

- ✓ Work with home gardeners. Volunteers have provided their backyards as nurseries for several plant species identified for inclusion in restoration seeding. Gardeners receive seed or plants to grow in their backyards. The seed from these plants is collected and used in restoration projects.

Research topics of importance to enhance the success of species reintroduction projects include how underground biota influence reintroduction of flora; autecology and synecology of little-known species; and propagation and dispersal requirements for selected species. Specific research and recovery needs for priority plant species are included in Chapter 7.

References useful for planning plant species re-introductions include Bowles (1990), Falk et al. (1996), Packard and Mutel (1997), and Swink and Wilhelm (1994).

9.2.5 Control of invasive plant species

The invasion by aggressive species is an international conservation issue of the most serious concern, because it threatens native biodiversity in regions and preserves across the globe. Invasive species are those that become established in natural or semi-natural ecosystems or habitat, are an agent of change, and threaten native biological diversity. The international Convention on Biological Diversity recognizes invasive species as one of the major threats to biodiversity and calls upon the governments of the world to take steps to prevent the introduction and manage the impact of invasive species. The Field Museum hosted an international symposium addressing this subject in 1997. Locally the goal is to reverse the trend of degradation caused by invasion and to minimize the negative alteration of natural communities.

Approximately two dozen invasive plant species are currently causing serious and sometimes devastating damage to natural areas in our region, reducing native plant diversity (and thereby associated animal diversity) by successfully competing for space, water, sunlight, and nutrients. Once established, these plants are difficult to eliminate or control. Most of our invasive species are introduced from the Old World, but others are native species that have become similarly aggressive with the disruption of normal ecological processes, such as alteration to natural hydrology or suppression of natural fire. The spread of these species is recognized as a direct threat to natural communities and to some endangered species, and it is arguably the greatest single threat to the integrity of the flora and fauna of the Great Lakes region.

A plan to control invasive species is an important element in any management plan. In dealing with invasive species, two important maxims are that prevention is at

least as important as eradication and that identifying and resolving the cause of the invasion is a critical step in control. Some invasive species are of region-wide concern, not only causing impacts where they occur, but also posing a threat to parts of the region not yet invaded. In such cases it is important for Chicago Wilderness to develop a regional component to planning, research, and control. Decisions about specific methods for controlling invasive species depend on several variables including the species involved, the nature of the invasion, surrounding environmental conditions, resources available, and the management objectives for the area. In most cases a combination of control methods works best. Three categories of control are available:

Physical control

Physical controls include prescribed fire, mowing, restoration of hydrological function, cutting, pulling, girdling, and other methods that physically remove or weaken the invasive species, promoting successful competition by natives. Mowing can be effective for the control of some annual and biennial pioneering invaders if native plants are available to provide long-term competition. The timing of mowing is important, both to achieve control and to avoid injury to nesting grassland birds. Hand pulling or removal of seeds can be effective for small areas, but is labor intensive. Girdling is an important tool when working in high-quality areas or for creating habitat for cavity-nesting birds or bats. Sections 9.2.2 and 9.2.3 discuss management with fire and hydrological restoration. Flooding by manipulating water levels can be effective in some wetland situations where some species such as cattails can be drowned.

Biological control

Biological control uses the natural enemies and competitors of a species to control its population. Predators or diseases not currently known in the area are used. These should be host-specific to avoid negative impacts on non-target species. The USDA closely regulates such introductions. Currently biological controls are being implemented for purple loosestrife and Eurasian water milfoil. Early indications look positive. The use of bacterial sprays to combat gypsy moths is of some concern, since the bacteria also destroy some native moths and butterflies. Another form of biological control is the seeding of native plant species that may in time out-compete invasive species under restored natural conditions.

Chemical control

Herbicides are by far the most commonly used pesticide in management of natural areas. They are often used in combination with physical or biological controls. In most cases, they are used on a temporary basis with the objective of establishing a balanced condition where the nat-

ural processes of fire and competition by native plants will be sufficient to exclude the invasive species. Herbicide is commonly used to control brush when it has grown beyond the size controlled by fire and when its shade has limited the availability of fuel.

Before any pesticide can be sold in the United States, it must be registered and approved by the U.S. Environmental Protection Agency. How the pesticide may be used is governed by terms specified in the product label, which has regulatory authority and limits the amounts to be used and the conditions under which application occurs. State governments test and license individuals seeking to apply pesticides commercially or on public land, usually through their departments of agriculture. Land-owning entities may have additional rules about use of pesticides and qualifications of those applying them.

Used according to label requirements, herbicides provide a cost-effective and safe means of controlling invasive vegetation, especially in short-term situations where the problem has arisen because natural processes have been disrupted by human activity. In most such cases, the best long-term solution is to restore the natural processes to the maximum extent possible. For example, buckthorn can be controlled by prescribed burns, but only after the large buckthorns and their roots have been controlled with herbicide.

It is important for each landowner to establish priorities for invasive-species control. Of highest importance are:

- preventing new infestations
- targeting the existing problems that are the fastest growing and fastest spreading
- targeting species that are the most disruptive to natural ecosystems
- monitoring for new threats and stopping them before the new species becomes established

The following species are particularly problematic invasive plants in the Chicago Wilderness region. These species are currently causing biodiversity loss and, if left unchecked, will cause irreparable damage to our native species and communities.

<i>Garlic mustard</i>	<i>Teasel</i>
<i>Canada thistle</i>	<i>Tartarian honeysuckle</i>
<i>Purple loosestrife</i>	<i>Reed canary grass</i>
<i>Black locust</i>	<i>Crown vetch</i>
<i>Moneywort</i>	<i>White and yellow sweet clover</i>
<i>Giant reed grass</i>	<i>Glossy buckthorn</i>
<i>Common buckthorn</i>	<i>Multiflora rose</i>
<i>Leafy spurge</i>	<i>Oriental bittersweet</i>
<i>Autumn olive</i>	<i>Narrow-leaved cattail</i>

Native species can become invasive under some conditions. One example is the invasion of prairies and woodlands by gray dogwood, box elder, elm, ash, etc. in the absence of regular fire. The control of these species should be addressed in management plans.

In addition to these problem plants, several invasive animal species are causing harm to or threatening biodiversity in the region.

Many of the actions to protect terrestrial and aquatic communities from the threat of invasive species are discussed in earlier chapters.

Recommendations

- ✓ Continue to develop and share cost-effective protocols for controlling targeted invasive species.
- ✓ Monitor species locally and regionally to identify and anticipate problems before they reach epidemic proportions.
- ✓ Develop region-wide collaborative efforts to control invasive species on all public land not already managed for biodiversity, including utility and transportation rights-of-way
- ✓ Develop and promote native landscaping recommendations for residential and commercial properties that strongly discourage the use of potentially invasive species in landscaping, working through nurseries and other outlets.

9.2.6 Management of problem wildlife

The fragmentation of ecosystems in the Chicago Wilderness region and the growing populations of some wildlife species (especially deer) present real challenges to the conservation of biodiversity. Each native plant and animal species is valued as a component of ecosystems. Some wildlife species, however, are having quantifiable negative impacts upon plant and animal communities and ecosystems. As discussed in sections 3.3.7 and 5.7.9, many species and natural communities are threatened by overabundant animals. Over abundance can destroy ecological balances, destabilizing relationships within the community and making it vulnerable to invasive species. Such species (native or introduced) are problems that require careful attention. Some animal species cause damage or inconvenience to people, and some are a threat to rare species and healthy natural communities.

In aquatic communities, the zebra mussel, round goby, rusty crawfish, and common carp can drive other species to local extinction. Research on the national or larger regional level is badly needed to find ways to protect high-quality ecosystems from these species. The Canada

goose, though native, has become so abundant (in the absence of natural predators and through creation of artificial habitat) that it pollutes some waterways and conflicts with human uses of its favorite local habitat, mowed lawns. It is also very destructive of efforts to restore wetlands.

In terrestrial communities, some native species have become overabundant due to the loss of large predators (wolves, mountain lions, and human hunters). Thus in many areas, breeding birds are heavily impacted from high numbers of smaller predators such as raccoons, skunks, and opossums.

A severe threat to many songbird species is nest parasitism by the brown-headed cowbird. The cowbird once had only temporary impact, as it followed wandering herds of bison. Today it thrives in mowed areas and is able to invade all parts of most of the region's fragmented forested habitats, permanently thwarting most reproduction by some species.

Thousands of stray and feral cats roam the Chicago area, the suburbs, farmlands, and natural areas. These animals have significant impacts on wildlife populations and can be health risks to other cats, wildlife, and humans. Recent research suggests, for example, that rural cats in Wisconsin are killing an estimated 39 million birds per year (American Bird Conservancy 1998).

One of the most serious threats to woodland and other communities in the region comes from white-tailed deer. The continuing development of open lands removes available deer habitat, concentrating deer in limited remaining open space. These deer consume a great number of plants and, if unchecked, their consumption leads to the loss of native plants and animals, including endangered species. The effects of excessive browsing are many. (See Crawley (1983) for a summary.)

Deer populations can grow rapidly in the absence of natural predators and regular management. A study of radio-collared deer from DuPage and Cook counties from 1994 through 1998 found that adult deer have high annual survival rates (>80%) and few natural predators. Automobiles and trains accounted for more than 60 % of urban deer mortality (Etter 1998). Populations can more than double annually in the absence of predators if left unchecked.

Deer management in the Chicago region currently occurs under approved management plans. A plan for managing deer (or other wildlife) involves:

1. Identifying the problem and measuring the extent of damage caused by the wildlife
2. Evaluating possible solutions and techniques for abating the damage and selecting techniques
3. Educating the public, agency personnel, and decision makers about the problem and the need for the recommended solution
4. Obtaining all necessary local, state, and federal permits
5. Developing a monitoring program to evaluate success and making changes as needed

Important tools in deer-management programs are models that predict the response of a population to management or lack thereof. With the high degree of scrutiny that wildlife-management programs receive, models are essential to the careful choice of a management solution. A project funded by Chicago Wilderness has developed a simple deer management model, based on data from local studies, that helps managers predict trends in a deer population (Etter 1999).

In forest preserves and other public lands in Chicago Wilderness, deer are removed by state-qualified sharpshooters. Work occurs when preserves are closed. Venison is donated to local charities, including the Greater Chicago Food Depository. This is the best available method and is used by agencies nationwide. Contraceptives may one day offer an effective form of population control, but no practical programs have been demonstrated.

Increasing the efforts to limit the damage from deer and invasive animals is of great importance to biodiversity conservation in the region. The following actions would enhance the effectiveness of such programs.

Recommendations

- **Deer**
 - ✓ Until effective alternative methods become available, deer should be harvested regularly to limit numbers to levels that support a balance that sustains a full range of native plants and provides diverse habitat for birds and other animals.
 - ✓ Disseminate any new information on alternative control methods to land managers.
 - ✓ Disseminate models that predict responses of deer populations to management to managers and encourage their widespread use. Continue to improve existing models based on additional field research and the incorporation of stochastic functions and spatial components.
 - ✓ As deer populations are managed and reduced in size, there will be an increased need for more accurate census techniques. Additional research should

be carried out to develop more effective census techniques in general.

- ✓ State and federal agencies should provide support for collecting information from deer harvests that can provide a basis for future decisions about deer management. This information would include collection locations; gender; the number, gender, and age of fetuses; and reproductive information.
- ✓ Public agencies (and private landowners where relevant) should cooperate more closely to manage deer across borders of managed lands.

• Zebra mussels and the round goby

- ✓ Support continued research on limiting the spread of zebra mussels. Promising research pursued by Chicago Wilderness members shows that control of zebra mussels in river systems would be most efficiently focused on particular upriver source sites rather than on the entire river. Illinois Natural History Survey (INHS) found that removing zebra mussels or constructing barriers to prevent down-river dispersal of larvae would have a strong negative effect on down-river populations. Plans are underway to construct a dispersal barrier to the round goby, another invasive species, in the Chicago Ship and Sanitary Canal.
- ✓ Provide more public outreach and education calling for boat owners to take responsibility for cleaning boats and boating equipment prior to transporting them from one water body to another.
- ✓ Promote research on methods to control zebra mussels and round goby.

• Feral cats

- ✓ Chicago Wilderness members should lead a public education effort explaining the problems caused by feral cats and advocating that people not feed stray cats, support cat licensing laws, support humane removal of stray cats from neighborhoods and wildlife areas, and keep domestic cats indoors.

9.2.7 Management plans

To guide and coordinate conservation of biodiversity in the Chicago Wilderness region, management plans are needed at several levels. At the broadest, regional scale, this Biodiversity Recovery Plan seeks to describe and gain consensus on existing conditions, goals for recovery, and the major steps needed to reach the goals. At the other end of the geographic scale, each managed site should also have a site plan that describes its current condition, desired conditions, and the steps needed to attain them.

Depending on the preference of the landholder, a site plan can cover a few acres or thousands. For a large site with multiple habitats and ecological communities, a set of plans for smaller areas may be appropriate. Especially for publicly owned lands, plans need to provide a logical basis for conservation and restoration that informs and enrolls support of all stakeholders. Such plans should also reflect other plans, such as those for recovery of endangered species, greenways, stream restoration, and water trails.

Between the regional recovery plan and the site plans there may be multiple levels of plans by landowners such as the counties or states, based on their needs and policies. Plans at all levels must support each other, providing a clear path to recovery.

The content of management plans varies greatly depending on the needs of the organizations involved. In addition to addressing the questions of where we are now, where we are trying to go, and what actions are needed, other important questions are: what natural processes have been disrupted, what human activities are causing problems, and how will progress be monitored?

The Science and Land Management Teams of Chicago Wilderness are continuing to define management techniques, suggested content of site plans, and recommendations for site monitoring. One recommendation can be made now.

Recommendation

- ✓ Chicago Wilderness members should support regional ecological performance standards, monitoring techniques to measure attainment of the performance standards, and evaluation techniques (such as a regional report card) to evaluate land restoration and management.

9.3

Monitoring and adaptive management

9.3.1 Introduction

While land managers use the best available knowledge about communities and species, there is always opportunity and need to improve management techniques and to learn more about ecosystems. Management and monitoring need to be organized so that they help evaluate the effectiveness of current techniques, and management needs research projects that answer questions relevant

to management. Research, monitoring, and inventory are distinct activities, yet they must be linked to make their results immediately useful to conservation practitioners. Management within an experimental framework, making use of results in future management decisions, is referred to as adaptive management. Developing and implementing a regional monitoring program and pursuing a prioritized research agenda will provide significant contributions to conservation of biodiversity.

Central to the adaptive approach proposed here is multi-scale ecological monitoring, a process for measuring progress toward goals for conservation and ecologically sensitive development. Chicago Wilderness members are designing a region-wide monitoring program that will detect change in pattern and process at three levels: (1) the landscape, (2) natural and human communities, and (3) species. At every stage of design and implementation, this monitoring program will involve a broad spectrum of stakeholders in the region's ecological health: professional scientists, citizen scientists, volunteers, schools, land managers, local businesses, community-based organizations, and urban planners, among others.

Much ecological monitoring is already underway in the region. Chapter 11 describes many of these on-going efforts under the roles of county and state agencies and volunteers. Now is the time to unify and strategically add to these efforts, so that their results can keep pace with rapid region-wide change. Critical for this effort will be a monitoring framework that allows integration across space and time, as well as across organizations, and that strengthens and streamlines the participation of diverse contributors. Here we propose a flexible thought process for designing such a framework, to be tested among the complexities of this metropolitan ecosystem.

9.3.2 Adaptive management and conservation design

Conservation design is a process for deriving conservation goals and strategies directly from assessment of biological values and the threats to those values. Although conservation design is site-based, the "site" can scale from a single natural area to an entire region. A region-wide ecological monitoring program is just one outcome of the conservation design process. Others are a program of scientific research and an agenda for ecological inventory. We consider monitoring, research, and inventory distinct but closely related:

- Ecological monitoring is an iterative process for measuring progress toward conservation goals.
- Ecological research is a systematic approach of posing and answering questions to reveal cause-and-effect relationships.

- Ecological inventory is a snapshot of conditions at one time (e.g., species richness, population distribution, pattern of vegetation on the landscape) that establishes a baseline against which to measure change over time.

Conservation design focuses our efforts in monitoring, research, and inventory so that they contribute directly to conservation action. Each of these three activities incorporates human elements into the larger context of regional biodiversity, with the ultimate goal of improving quality of life.

We approach conservation design through a series of questions that allow us to identify biological (including human) values, threats to these values, and adaptive action to protect these values from these threats. The questions include:

- What is the geographic scope of our conservation efforts?
- How does this site work (at scales ranging from individual preserves to the whole region)?
- What do we want to protect or enhance within this site?
- What do we want these targets to look like in x years?
- What could prevent us from achieving this vision for our targets?
- What should we accomplish to offset these threats to specific targets?
- What will we do to reach these goals and objectives?

The work to produce this recovery plan has provided initial answers for several of these questions. Chapters 4 and 6 identify our initial conservation targets to answer the third question. Chapters 4 and 5 offer vision statements to answer the fourth question. Immediate next steps are to complete the conservation design and to begin implementing an integrated program of inventory, monitoring, and research.

One result of this process will be the identification of conservation and development strategies. These become the experimental treatments of adaptive management. Addressing the most severe threats may require a mixture of innovative strategies drawn from science, policy, stewardship, and institution building. Once a strategy is in place, conservation and development actions define the schedule, people, and funds necessary to implement it. Ongoing work will link strategies to goals; ultimately, our aim is to address human and natural communities simultaneously. Like the rest of the plan, these strategies are evolutionary: we will learn both from our mistakes and from our successes.

9.3.3 The link between management and monitoring

Ecological monitoring is the mechanism regulating the loop between our management goals (including goals for restoration) and our strategies for conservation and development. How can we make that mechanism both concrete and adaptive? In Chicago Wilderness, we are testing an approach to monitoring design that builds on the process of conservation design. As in conservation design, our emphasis is on action.

Ecological surveillance is the measurement of long-term trends in the ecological condition of species and communities. Though not goal- or action-oriented, surveillance can complement ecological monitoring by providing additional spatial and temporal context.

Our approach to monitoring design is as follows:

Choose indicators

An *indicator* is a variable that measures change toward a goal/objective or in completing a strategy/action. *Outcome indicators* show whether we are reaching our threat-related management goals and objectives; *performance indicators* show whether we actually have implemented the strategies and actions that we devised to accomplish these goals. Although in a few cases we may find a single variable that is sufficient to answer our questions about progress for a particular goal or strategy, usually we will use multiple indicators that draw from several levels of organization and that address some combination of composition, structure, and function. The key is to find the smallest set of indicators that will give us confidence in our conclusions. Chicago Wilderness members are interviewing land managers, planners, and scientists to reveal potential monitoring indicators for the landscape, human and natural communities, and species. Later we will determine the optimal subset of these possible indicators related to our goals and strategies. We will rank these indicators by analyzing threats and will aggregate them across geographic scales. Even if we find some indicators that we can use successfully at all sites in the region, we still will use many site-specific indicators.

We emphasize that indicators are variables, not organisms. We may use the population size of threatened prairie species A, for example, as an indicator of progress toward a goal of reestablishing viability for species A. If we have good evidence that threatened species B or prairie species C shares species A's conservation needs, we may feel confident in using A's population size as a proxy in measuring progress toward our goals and strategies for B and C. Very rarely, if ever, will we find an indicator related to a single taxon that will "speak for"

the health of an entire ecosystem. More useful will be suites of indicators, perhaps including composite variables that are indices of quality or integrity.

Set thresholds

A *threshold* is a value of an indicator that, when crossed, sends up a "red flag" calling for a management response. The response might be a policy change in a human community as well as a change in the practice of ecological stewardship of a natural community.) This threshold may be tied to status (e.g., "respond if the population of species A declines to 500 individuals") or to trend (e.g., "respond if the population of species A is declining by 10 individuals per month"). Like establishing a vision for conservation or development targets, deciding on appropriate thresholds involves many uncertainties, and hence discomforts, for the decision-makers. In Chicago Wilderness, we will rely on a combination of targeted research and the extensive experience of land managers to set and refine these thresholds.

Plan options for management responses

Knowing *when* to intervene does not imply that we know *how* to intervene. Red flags may go up quickly, and we must be prepared to act. Given the uncertainties inherent in systems as complex as ecosystems, we are unlikely to be successful in specifying a fixed management response when a particular threshold is crossed. Instead, we must plan a range of options. For the most part, we will direct our responses toward sources of threats, rather than the stresses associated with them. Once again, the wealth of knowledge in Chicago Wilderness institutions and individuals will supply options for management intervention. Research and cycles of monitoring will modify these options as time goes on.

Design sampling protocols

Once we have laid out monitoring indicators, thresholds, and responses, we will focus on sampling design, including intensity of monitoring and methods of data collection. Our methods must be not only scientifically sound but also as simple and cost-effective as possible. In our interviews of land managers, planners, and scientists, we will use current and past monitoring methods as guides for the future. In addition, a workshop will provide intensive training in sampling design, as well as program design, specifically tailored to the needs of the region.

Implement the monitoring program

The monitoring program for Chicago Wilderness is already in progress. Projects range from landscape-level measures of change in vegetation cover to measures of change in the populations of individual species in particular preserves. Through the process of monitoring

design described above, we will consolidate, adapt, and unify this program so that stewards can benefit from the landscape-level results and the region can benefit from the data of individual conservation areas. Participation by the broad range of actors in Chicago Wilderness will be central to success.

9.3.4 The link between research and monitoring

To have confidence in monitoring results, we must have confidence in at least two kinds of linkages: between source of threat and the stress that it creates on a target, and between a conservation or development strategy and the goal that we hope to achieve thereby. Through concentrating research effort on the linkages between threats and the highest-priority targets, and between strategies and the highest-priority goals, we can ensure that investment maximizes conservation impact.

As with monitoring, research at many levels of organization is flourishing throughout Chicago Wilderness. The Recovery Plan outlines overall research needs: the gaps between what we now know and what we need to know to promote the quality of human and natural communities. Our next step will be to link these needs for research more specifically to the questions given in section 9.3.2.

9.3.5 The link between inventory and monitoring

Even in Chicago Wilderness, a landscape with a long history of scientific study, we still lack inventories of some taxa and natural communities, both for particular conservation areas and for the region as a whole. As we design monitoring programs, biological and socioeconomic inventory becomes critical for measuring change. How can we make these assessments cost-effective, as well as connect them tightly to our goals and strategies for conservation and development?

We are experimenting with several nontraditional approaches to ecological inventory. Using satellite imagery, aerial photography, and Geographic Information Systems (GIS), we are conducting *inventories at the landscape level*, such as vegetation maps and quantitative analyses of cover type. As we couple this remote sensing with ground truthing and representative assessment of species and communities within cover types, we increase our confidence in the use of these landscape units as surrogates for units of biodiversity at smaller scales. We also are evaluating the effectiveness of *rapid assessment methods* for taxa that give clues to the current condition of natural lands and waters. We recognize the need for a

baseline of *human ecological data*, as well; we are drawing on existing databases of real-estate trends in Chicago-area neighborhoods and are exploring the possibility of incorporating other social and economic information.

9.3.6 Information management for monitoring

Through the design process outlined here, we will work toward a regional framework for conservation science in which monitoring, research, and inventory interlock and support one another. Holding this framework together will be a system of information management that allows us to scale across geography and across levels of organization. Chicago Wilderness has begun to develop an electronic catalogue of geo-referenced data sets held by member institutions. One of our greatest challenges will be to integrate data for human and natural elements across the entire region. One of our greatest strengths is a commitment to participation by a complete cross section of stakeholders in information management. Participatory data management not only strengthens our scientific framework but also fosters the dedication of the region's human communities to conservation and ecologically sensitive development.

9.3.7 Promoting management-related research

The complexity of ecosystems and ecosystem function is greater than we are capable of imagining. This becomes more apparent when we attempt the tasks of rebuilding and restoring natural communities. Having a complete understanding of these systems is not necessary to begin preserving them, but improved knowledge is needed to support long-term preservation and restoration of all species and communities and to improve efficiency. If we begin to work while there are sufficient species and fragments of habitat left, under intelligent management and with restoration of natural processes, the fabric of these natural communities may mend itself. Nonetheless continued research is necessary to better guide restoration.

Traditional science has enumerated and described species and communities. Today, as management of our natural resources becomes more important, scientific research is critical in guiding and in determining the success and direction of these management efforts. To reach our conservation goals, a better understanding is needed of the presettlement landscape conditions and processes, of current landscape condition and processes, of the best techniques to improve ecological health, and of requirements for sustaining biodiversity over the long term. Scientists and land managers in the Chicago Wilderness

region should work together to compile a prioritized list of research needs and to support research projects that will lead to this improved knowledge.

The Chicago Wilderness consortium has already brought together scientists, restorationists, and policy makers to focus attention on important research questions and gaps in information. Now, an atmosphere needs to be fostered that will promote the investigation of these questions. A first step is to build better links between land managers and academia and to promote more research projects within the region.

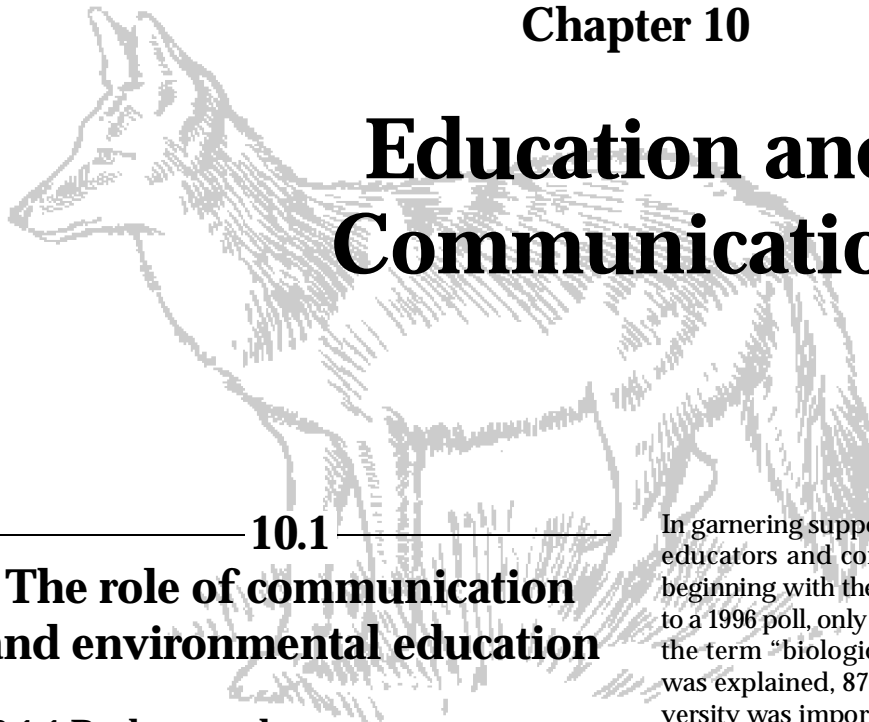
Existing scientific knowledge about regional natural areas needs to be published and integrated. Integration of this knowledge with programs to develop monitoring protocols, to conduct further inventories, and to address additional research needs will help to ensure preservation of much of the biodiversity of the region.

Recommendations

- ✓ Compile a prioritized list of research needs and support targeted research projects with internal and external grants.
- ✓ Set up a central source of information for students and professors about priority research needs.
- ✓ Promote the Chicago Wilderness region as a research station. This would help students to identify appropriate sites and experts, as well as to receive permits.
- ✓ Compile a thorough literature review of previous studies regarding management of natural communities and conservation of biodiversity relevant to efforts in the Chicago Wilderness region.

Chapter 10

Education and Communication



10.1

The role of communication and environmental education

10.1.1 Background

Public awareness and support are inherent elements in the recovery of this region's biodiversity. As we head into the next century, we are faced with a variety of threats to the unparalleled natural wealth of the Chicago region. The decisions to address those threats will be made by a variety of groups, including elected officials and public landowners, as well as by individuals. Individuals not only drive the larger decisions with their votes but also make daily decisions affecting the health of our natural ecosystems, ranging from home building to checking their boats for zebra mussels before transportation. Individuals are also the past, present, and future of the region's renowned volunteer stewardship efforts. Indeed, the future of our native landscapes depends upon the support and involvement of our citizenry.

Fortunately, most Americans consider environmental protection a priority, and there is widespread concern about air and water pollution, destruction of tropical rain forests, and toxic waste contamination (Gallup News Service 1999). While not ranked as highly, habitat lost to development also elicits broad concern (Belden and Russonello 1996). On a local level, people have a strong affinity for our parks and forest preserves, and they have demonstrated solid support for increased land acquisition. Conservationists, then, have a base upon which to build public support, a base that includes appreciation for the beauty of nature, a sense of responsibility to future generations, and the desire for a healthy environment.

In garnering support for biodiversity recovery, however, educators and communicators face many challenges, beginning with the term "biodiversity" itself. According to a 1996 poll, only two out of ten Americans had heard of the term "biological diversity." Yet, when the concept was explained, 87% indicated that "maintaining biodiversity was important to them" (Belden and Russonello 1996). In order to strengthen and broaden public awareness, conservation communicators need to not only define but also to make biodiversity real and to convey its connection to our own quality of life.

While it will take time for the word and the concepts of biodiversity to enter the public vocabulary and consciousness, concerned organizations must act with a sense of urgency. As earlier chapters indicate, the region's remaining natural communities and habitats urgently need to be protected and restored in landscapes of sufficient size and quality to protect biodiversity. In order to inform the public, organizations must, therefore, employ short-term communication strategies while building longer-term educational approaches.

By definition, environmental education is long term in scope and takes significant investment in resources and time, but it produces powerful results. Environmental education is characterized as a process addressing the knowledge, awareness, attitudes, skills, and participation of a target audience. The following specific objectives, as outlined by UNESCO in 1978, have been adopted by the Chicago Wilderness Education and Communication Team:

- Fostering clear *awareness* of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas
- Helping social groups and individuals gain a variety of *experiences* in and acquire a basic *understanding* of the environment and its associated problems

- Helping social groups and individuals acquire a set of values and feelings of *concern* for the environment and the motivation for actively participating in environmental improvement and protection
- Helping social groups and individuals acquire the *skills* for identifying and solving environmental problems
- Providing social groups and individuals with the opportunity to be actively *involved* at all levels in working toward resolution of environmental problems

These objectives help guide the development of an environmentally literate citizenry, capable of making well-informed decisions about protecting local biodiversity. While short-term communications strategies can raise awareness and get the public involved at an entry level, both formal and nonformal programs in biodiversity education are needed to sustain that interest and develop the deeper understanding that will lead to the active public support required to ensure biodiversity recovery.

10.1.2 Communication opportunities

Through the work of professionals and forums in market research, much has been learned about the communications challenges for Chicago Wilderness. The Consultative Group on Biodiversity initiated the Biodiversity Project in 1995 to assess public opinion on biodiversity, develop collaborative strategies to increase public awareness and engagement, and lay the groundwork to implement those strategies. The Biodiversity Project (1998) identifies six objectives to guide conservationists toward fostering public support:

1. Help the public recognize biodiversity in its everyday experience.
2. Help the public understand its dependence on nature.
3. Raise fundamental ecological literacy.
4. Help the public understand the specific human impacts on biodiversity.

A new environmental education initiative in northwest Indiana

The Indiana Dunes Environmental Learning Center provides a new resource for biodiversity education for the entire Chicago Wilderness region. Launched in October 1998, the Learning Center is a not-for-profit residential facility developed in partnership with the USDI National Park Service. Located in Indiana Dunes National Lakeshore, the project is receiving widespread support from area businesses and industry.

The new facility, located on the site of an old summer camp, has overnight capacity for eighty people in ten cabins, with plans to triple the capacity through expansion. One-fourth of the capacity of the Learning Center is reserved for classes that need financial assistance to attend, supported by funding from diverse sources. The primary service area is considered to be a 90-mile radius, or a 1½ hour drive, from its location near Chesterton in Porter County.

The initial program for 4th-6th grade classes aims to provide understanding of ecological principles and the importance of biodiversity through hands-on experience in the outdoors. Teachers and administrators are enthusiastic about how the curriculum helps them meet new state science curriculum requirements. There are also art, language arts and social science elements. A high school program that involves students in ecological monitoring and stewardship will be expanded in the 1999-2000 school year.

The Learning Center has been successful in attracting classes from diverse ethnic and racial communities. This result also reflects the diverse membership and the high level of cooperation with local environmental organizations such as the Grand Calumet Task Force and the Minority Health Coalition of Michigan City. The Learning Center has also organized an Environmental Education Network of agencies and private groups that is providing the means for outreach to educators and the general public. In May 1999, for example, twenty agencies participated in a resource fair for teachers, with a second such event scheduled for early in the 1999-2000 school year. Weekend and summer programs are also provided for adults and special groups including teachers and children. The Learning Center is also made available to other groups, provided at least 25% of their program schedule is devoted to environmental issues.

5. Help the public understand its capability to act to conserve biodiversity.
6. Motivate the public to act to conserve biodiversity.

The conservation agencies and organizations of the Chicago region, in concert with our highly visible botanic gardens, zoos, and museums, have the opportunity to realize these objectives and, working together, to effect positive change. They must integrate current efforts in communication, marketing, and education and direct them toward these objectives. Local organizations and agencies involved with conserving biodiversity need to prioritize their efforts and devote more resources to communicating about local restoration efforts. They can then create comprehensive campaigns and programs that connect biodiversity conservation to core values that people already hold, applying the knowledge gained through public-opinion research and thorough evaluation of the effectiveness of various efforts.

People get the information that forms their attitudes and behaviors from a wide range of sources beyond the communication and education programs of conservation organizations. Schools, the media, and community leaders contributing in important ways to the values held by the public. They also interpret conservation issues for the public. Outreach and education to these audiences is crucial to developing “third-party” endorsements and affirmation of actions such as ecological restoration.

The most successful marketing strategies are those that catapult issues into popular culture. Smokey the Bear is a prime example in the conservation arena. Another is the attention drawn to the devastation of tropical rain forests, which has resulted in a remarkably high level of awareness for an issue occurring thousands of miles from our shores. If conservation communicators can employ these strategies to the local situation, they have the advantage of using issues that have a much more direct impact on our citizens’ quality of life. By working together, utilizing market research, devoting more resources, and adopting innovative approaches, we can engage the public and realize the goals of this plan.

10.1.3 The current state of environmental education in schools in the Chicago Wilderness region

Since 1995, the Chicago Wilderness Education and Communication Team has been working to identify and resolve issues of biodiversity education specific to the region. They have assessed and addressed the state of current biodiversity education efforts in a number of areas. Information from this work is summarized below. To date, the majority of research about the collective

reach and implementation of biodiversity education has centered on in-school programs. There exists a need for the same type of documentation with out-of-school programs and life long learning efforts.

Biodiversity education does not appear to play a major role in the region’s public schools. Surveys from two states in the Chicago Wilderness region (Sebasto-Smith and Small 1997, Lane et al. 1994) show that, although teachers want to integrate environmental education into the curriculum, a number of barriers exist. According to the surveys, 90% of Illinois teachers and 94% of Wisconsin teachers “agreed” or “strongly agreed” that it is important to integrate environmental concepts into their subject or grade level. In addition, 87% of Illinois teachers and 90% of Wisconsin teachers “agreed” or “strongly agreed” with the statement “a goal of my teaching is to increase students’ level of environmental responsibility.” However, 65% of Illinois teachers reported they were not infusing environmental education into their curriculum and 76% of Wisconsin teachers spend less than 15% of their overall teaching time infusing environmental concepts.

Why do teachers overwhelmingly say that environmental education is important but dedicate less than an hour per week to the topic? The top five reasons given by teachers in the two states are listed below:

Illinois:

1. Not enough resources/funding
2. Not enough preparation time
3. Not enough knowledge or background
4. Not enough class time
5. Other concepts more important

Wisconsin:

1. Concepts not related to subject matter
2. Not enough knowledge or background
3. Not enough class time
4. Other
5. Not enough preparation time

It is ironic that there are such similarities between the findings in both states, since there are major differences in how the two states mandate the integration of environmental education. Wisconsin has mandated 1) periodic assessment of the environmental literacy of its teachers and students, 2) pre-service training in environmental education for teachers, and 3) consideration of environmental education concepts in the development, implementation, and evaluation of school-district curriculum plans. In contrast, Illinois has a relatively ambiguous and unenforced mandate for environmental education in its schools. While these surveys did not cover the status of biodiversity education in Indiana, the third state in the Chicago Wilderness region, it is noteworthy that a posi-

tion dedicated to integrating environmental education at the state level was recently left unfunded. In addition, the Indiana Department of Education currently has no mandated environmental education component for the K–12 curriculum.

10.1.4 Cultural diversity and biodiversity

Research shows that, in addition to children, other important audiences including minorities, low-income populations, and senior citizens are generally being left out of environmental education (U.S. Environmental Protection Agency 1996). An illustration of this void is the finding by Belden and Russonello (1996) that two in ten Americans said they had heard of “biodiversity.” These respondents were most likely to be men, upper-income, college-educated, and professionals. However, the same survey reveals the potential for building support among broader audiences. In describing who is most likely believe “maintaining biodiversity is very important,” Belden and Russonello state, “Demographically, they have lower incomes, live in cities, and are found in higher proportions among African Americans and Hispanics.”

A summary of 1990 census data for the portion of Chicago Wilderness in northeastern Illinois contains the following. As of that year, 12% of residents were born outside the United States. In that same year, 20% of all households spoke a language at home other than, or in addition to, English. Perhaps a better measure of the human diversity in the region are the proportions of Hispanics (12%), non-Hispanic blacks (19%), and non-Hispanic whites (69%) living in northeastern Illinois in that year. Forecasts prepared by the Northeastern Illinois Planning Commission indicate the population of this same area will be 22% Hispanic, 23% non-Hispanic black, and 55% non-Hispanic white in the year 2020. As our population grows more racially and ethnically diverse over the coming decades, the long-term success of Chicago Wilderness will be determined in part by its ability to attract the support of all segments of the population.

These numbers are particularly noteworthy because today the large majority of members of most environmental organizations are non-Hispanic whites. A combination of factors may account for this disparity, a circumstance that local environmental organizations need to fully understand if their messages are to reach all segments of the population. A recent report to Congress by the U.S. Environmental Protection Agency Advisory Council (1996) offers several reasons for the failure to reach diverse audiences, including:

- lack of materials, commitment and, organizational support

- uncertainties in knowing how to engage Hispanic and non-white audiences
- difficulties in adapting traditional strategies to non-formal environments within these communities

Further information on the importance of culture in shaping attitudes toward the natural environment can be gleaned from a 1998 survey of leaders and a cross-section of citizens in two sample areas in the region, the Uptown neighborhood of Chicago and the Butterfield Creek watershed in southern Cook County. The survey showed that one’s age, economic status, and place of residence are associated with attitudes about the environment. For example, suburban environmental concerns included over-development and flooding, while inner-city concerns included air pollution, poor water quality, litter, asthma and lead poisoning (Babcock 1998).

The survey also showed that open space evoked powerful images of home and cultural history for immigrants as well as native residents. City parks are often used as gathering places for ethnic communities, not to celebrate nature per se, but to enable these groups to share in their common language and culture. Other findings indicated that fishing and gardening were viewed differently by different groups. Motivations for these activities ranged from a desire to follow cultural traditions to simple economic necessity. A key finding for conservationists to consider was the respondents’ low level of familiarity with the natural resources found in the Chicago region, especially among immigrant communities.

In a study of nonformal outreach programs, Sayre et al. (1997) interviewed Chicago residents to determine what types of programming they might find interesting and desirable, and why they may not be participating in existing programs. This study found that many of the institutions that are charged with educating the public about the environment are not viewed as an educational resource by certain population segments. Further, though a myriad of good programs is available, people interviewed were not aware of them. Most important, however, was the finding that under-served communities are receptive to environmental outreach efforts, if awareness of diverse communities is enhanced and input collected from them.

10.1.5 Tools for communicating and teaching about biodiversity

While evaluating the current state of biodiversity education in the Chicago region, Chicago Wilderness has also begun to create the tools needed to improve both the scope and methods of communication and education efforts. Some of these tools, which are described in

“12 natural wonders of the Chicago Wilderness”

A collaborative campaign to foster a connection to Chicago region natural areas

From April 1998-May 1999, Chicago Wilderness conducted a communications campaign called “12 Natural Wonders of the Chicago Wilderness.” Its aim was to increase awareness of natural areas throughout the region, through an integrated effort centered around the designation of 12 spectacular yet accessible preserves. The elements of the campaign included both broad-based and targeted communications. At the core was the nature walks program, a year-long series of 29 guided walks. Led by skilled interpreters from the collaborating partners, the walks involved more than 500 people over the course of the campaign.

Materials produced for the campaign included the Natural Wonders preserve guide, (6,000 distributed), poster (4,000) and 1999 calendar (5,000). Designed to introduce biodiversity issues beyond the traditional conservation audiences, the materials featured spectacular vistas, colorful plants and animals, and clear messages about biodiversity and habitat restoration. Media coverage provided not only continued awareness, but also encouraged a sense of community pride for those designated locations (more than forty print and electronic features were garnered). Another element of the campaign was the Media Workshop in December 1998, where journalists were introduced to a multitude of biodiversity issues. Direct outreach to 15 community groups surrounding the preserves included slide presentations and participation in events that reached more than 450 people. In addition, the Chicagoland Environmental Network launched a database of people responding to the campaign for notice of future events and volunteer opportunities. Combined with additional sources, this provides Chicago Wilderness with nearly 4,000 individuals as a base for building greater awareness and involvement.

The formal evaluation of the campaign (Forester, 1999) included mail and phone surveys with the various groups reached through the campaign. This data revealed:

From nature walk participants:

- Nearly 40% of survey respondents have returned to the Natural Wonder preserve they visited since their walk.
- As a result of reading the Natural Wonders brochure, 32% of respondents have visited other Natural Wonders described there. Another 66% plan to visit another site, while only 2% were unsure they would.
- The majority of nature walk respondents heard about the walks through media coverage.
- The most noted positive aspect of their walk was the walk leader’s knowledge (each walk had a theme relating to restoration and management).

From outreach audiences:

- While a majority of the participants were non-Hispanic white (88%) the percentage of other racial and ethnic groups was higher here than that of the nature walks respondents.
- Most participants heard about the presentations and other outreach activities through friends or other people.
- The overwhelming majority felt that the programs increased their knowledge about “biodiversity in the Chicago region” (98%) and “habitat restoration in the Chicago region” (96%).
- 20% of respondents reported they would be interested in volunteering to conserve natural areas.

From media workshop participants and non-attending media who requested workshop packets:

- 90% of survey respondents have since used information learned in the workshop.
- 100% of respondents are interested in attending future media workshops.
- 80% felt that media coverage of conservation issues was inadequate, although half thought such coverage has been increasing.

greater detail in Appendix 7, are:

For Educators:

- Biodiversity Kit
- *Chicago Tribune* Educational Services supplement, “Chicagoland Ecosystem”
- Chicago Wilderness Atlas Education Package

For Individuals, Agencies, Organizations:

- *Chicago Wilderness: An Atlas of Biodiversity*
- *Chicago WILDERNESS Magazine*
- Chicago Wilderness “Portable Resources” (video, slide show, display)
- Chicagoland Environmental Network (CEN)
- Chicago Wilderness Web Site at www.chiwild.org

A preliminary assessment of the effectiveness of these tools reveals varied awareness of the materials and a wide-range of implementation strategies. Specific needs and solutions are addressed in sections 10.1.6 and 10.2.

10.1.6 Biodiversity education needs in the Chicago Wilderness region

Since its inception, the Chicago Wilderness Education and Communication Team has used a matrix to determine specific needs for education about biodiversity in the Chicago Wilderness region. The matrix plots audiences versus the five essential components of education (knowledge, skills, awareness, attitude and participation). Existing environmental education programs appear in the matrix cells according to the objectives they meet. Several conclusions about programming, which parallel research findings in environmental education, have been drawn from the matrix:

- Although there are many programs aimed at school-age children, the approach is by no means comprehensive and many students are not being reached.
- Most programs or resources available for biodiversity education for school-age children lack at least one of the components of attitude, skill and participation essential to quality education.
- Biodiversity topics pertaining to the Chicago region do not appear to be emphasized at local colleges and universities.
- Although tools exist for biodiversity education, they are not being used effectively for community-based education and are not reaching diverse audiences.

10.2

Goals and actions for biodiversity education and communication

10.2.1 Introduction

The overall goals for biodiversity education for Chicago Wilderness are to improve the knowledge, awareness, attitudes, skills, and participation of diverse stakeholders in the recovery process. This effort requires actions that carry audiences through each level, culminating in active participation. The target audiences are diverse, so actions tailored to each are required.

Some recommendations for biodiversity recovery, however, cannot wait until educational goals are met. Significant current challenges require immediate strategies to increase public awareness and understanding. The perception of ecological restoration, in particular, requires urgent attention. While most local citizens agree with the idea of restoration, there is a lack of understanding of the techniques required (Barro and Bright 1998). Communication strategies need to address these perceptions—and misperceptions—about restoration techniques.

Agencies and organizations must, therefore, complement their long-term approaches to environmental education with actions aimed at achieving more focused, short-term biodiversity communication goals. The following sections outline both long-term education goals and short-term communication goals.

10.2.2 Long-term education goals

- **Goal 1: Ensure that every student graduating from a school system in the Chicago Wilderness region is “biodiversity-literate.”**

The most efficient way to educate the next generation about biodiversity issues is to fully integrate the subject into the existing public and private school systems.

Recommendations

- ✓ Develop a commonly held definition of “biodiversity literacy”—what knowledge, skills, attitudes, and experience are essential to help people make informed decisions and participate in biodiversity protection.
- ✓ Increase the visibility of biodiversity concepts and issues in state education standards to encourage teachers to integrate biodiversity content into other programs.

- ✓ Give school staff the incentive to devote precious instructional time to biodiversity topics by demonstrating to teachers how using biodiversity as a unifying theme could improve test scores.
- ✓ Support state plans that integrate environmental education into schools. In particular, work to support the passage of the Environmental Education Literacy of Illinois Master Plan.
- ✓ Develop “best practices” for teacher training, such as the package being produced for the Mighty Acorns youth stewardship education program.

- **Goal 2: Expand the scope of existing and future programs in biodiversity education to include components for attitudes, skills, and participation in curricular design.**

One of the greatest challenges in biodiversity education is getting students involved in the process of conservation. To achieve this, programs need to include components for attitude, skills, and participation.

Recommendations

- ✓ Determine the effectiveness of existing biodiversity education programs for achieving “biodiversity literacy,” and use successful programs as models.
- ✓ Foster professional development for organizations inaugurating biodiversity education, and increase the number of pre-service and in-service opportunities for teachers to strengthen their qualifications to teach biodiversity.

- **Goal 3: Make biodiversity in Chicago Wilderness a component of the degree programs of local colleges and universities.**

Although students at many local institutions of higher education are peripherally exposed to the biodiversity of the region through courses that visit natural sites, there are few efforts to make the region’s unique resources a focus of study. Because of this, we are losing an excellent opportunity to inform our most educated citizens.

Recommendations

- ✓ Survey existing course selections at local universities. Identify courses that effectively and thoroughly communicate key information about local biodiversity and work to increase their visibility.
- ✓ Develop a degree program in restoration ecology at a local university with an accompanying field station.

- ✓ Promote practicum opportunities by linking universities with professional land managers in the region.

- **Goal 4: Expand and improve the use of existing tools for biodiversity education, and create new tools as needed.**

A number of recent formal studies and informal surveys have highlighted the need for better ways of developing and disseminating tools for biodiversity education. Steps to address this challenge are listed below.

Recommendations

- ✓ Work toward the better distribution of existing tools by forming a distribution center and investing in publicity about the center.
- ✓ Assess the effectiveness of tools for reaching their target audiences.
- ✓ Create new tools for groups starting community-based, non-school projects in biodiversity education. For example, create a biodiversity program primer with a list of potential partners.
- ✓ Produce tools and materials in multiple languages.

- **Goal 5: Increase the number of communities being reached with non-school-based programs in biodiversity education.**

As described in Section 10.1.4, it is imperative that we provide services for biodiversity education to cultures and communities throughout the Chicago Wilderness region. Reaching this wide range of people requires the variety of actions listed below.

Recommendations

- ✓ Foster neighborhood- and community-based programs aimed at improving the environment and biodiversity locally to unify different cultural groups for concerted community action.
- ✓ Identify specific leaders in cultural and ethnic communities who can inform educators and communicators and serve as partners for collaborative programs.
- ✓ Create a diverse base of spokespeople, including professionals and volunteers, who can serve as “ambassadors” for biodiversity to a wider variety of communities.
- ✓ Develop collaborations between Chicago Wilderness member organizations and cultural, ethnic, and arts and humanities organizations to foster the exploration of nature through cultural avenues.

- ✓ Improve the infrastructure within conservation agencies and organizations to better support community-based biodiversity projects.
- ✓ Develop links between school-based biodiversity programs and community projects.
- ✓ Find new ways of providing urban populations with opportunities to become aware of and explore the region's natural communities (for example, a "biodiversity bus" to bring urban residents to outlying natural areas).
- ✓ Devote more effort to recruiting citizen scientists from more diverse communities. Build effective tools to track the success of recruiting techniques, and use the effective techniques to expand the reach of volunteer-recruitment programs.
- ✓ Encourage the providers of non-formal education programs to recruit and employ professional educators who reflect the diversity of the communities they serve.

- **Goal 6: Measure local citizens' understanding of biodiversity by developing appropriate gauges for long-term effectiveness of education programs.**

The only way to assess success in reaching Goals 1–5 is to measure the target audiences' understanding of biodiversity issues. To accomplish this, resources should be dedicated to creating appropriate measures and systematically collecting data.

Recommendations

- ✓ Create appropriate gauges and gather baseline data on targeted communities.
- ✓ Gather data at set intervals to measure long-term change.
- ✓ Disseminate findings to agencies and organizations involved in biodiversity education.

10.2.3 Short-term communications goals

- **Goal 1: Gain a better understanding of the views of a broader segment of the Chicago-area population on biodiversity issues such as ecological restoration.**

The current concerns and viewpoints of different population segments must be understood before communication can be effective. While national market research is valuable to decision-makers and conservation communicators, unique circumstances (such as county forest preserve systems) exist in the Chicago region, and they may affect our citizens' values and views. More local research on issues related to biodi-

versity protection is needed, including ecological restoration and knowledge of or access to avenues of public involvement.

Recommendations

- ✓ Compile existing local market research, including that gathered through land-acquisition bond campaigns, to determine gaps in the understanding of public values and perceptions.
- ✓ Commission professional market research locally to better inform communications strategies and messages.
- ✓ Disseminate research findings to decision-makers and conservation agencies and organizations.

- **Goal 2: Increase the public's understanding of the role of management in natural areas.**

Many people believe nature should be left alone. In the Chicago Wilderness region, however, only aggressive land management can restore the natural processes that allow an ecosystem to "take care of itself." Communication strategies must emphasize the human role in nature as healer and must show that management is necessary to alleviate the pressures placed on ecosystems in a large metropolitan area. Understanding these messages can lead to endorsement of ecological restoration, even though its methods (such as prescribed fire) may appear damaging in their early stages.

Recommendations

- ✓ Craft a common lexicon that describes restoration efforts, and create methods to evaluate and adapt the messages to grow in effectiveness.
- ✓ Foster the delivery of essential message points not only through conservation agencies and organizations, but also through a broader range of institutions and channels.
- ✓ Engage and educate those who interpret conservation issues for the public, including community leaders, media, and elected officials.

- **Goal 3: Improve communication with those immediately affected by management decisions.**

Neighbors and users of forest preserves and other natural areas should be aware of management decisions and understand their necessity. In the early stages, habitat restoration is typically not aesthetically pleasing. Whether conducting demonstration burns or distributing brochures house-to-house, staff of land-management agencies and stewards need to let people know what's going to happen and why. They should

also work with user groups (such as birders, hikers, and canoeists) on issues of common concern.

Recommendations

- ✓ Ensure that restoration efforts, particularly in new areas, include plans for communications to local residents, and that resources are available for efficient and appropriate communication efforts.
 - ✓ Create a communication guide that restoration agencies can use to help develop these plans, including resources that already exist and successful examples from other agencies.
 - ✓ Conduct direct outreach to organizations in the local communities, such as block clubs and religious groups, that are interested in environmental work.
 - ✓ Engage advocacy organizations that work on environmental issues (such as air and water quality or sprawl) and educate them about biodiversity loss.
 - ✓ Seek opportunities to inform journalists and increase media coverage of restoration and land management.
 - ✓ Review current mechanisms for public involvement in land-management decisions and make improvements, using models that are successful in other arenas.
 - ✓ Create a structure for collaborating partners not only to react quickly but also to anticipate issues that arise in public forums.
- **Goal 4: Communicate documented benefits of local restoration efforts, especially those of most value to humans.**

To accept restoration techniques as necessary, people need to know that these efforts are producing the desired results, that habitats are being restored. Restoration efforts also need to be connected with tangible benefits—showing that biodiversity is a necessity, not a luxury.

Restoration efforts also need to be connected with tangible benefits—showing that biodiversity is a necessity, not a luxury.

Recommendations

- ✓ Gather data on the results of restoration efforts, translating the data into easily understood benefits.
- ✓ Create communications tools that connect restoration results to core values: the beauty and wonder of nature, our responsibility to future generations, and the desire for a healthy environment.
- ✓ Include illustrations of restoration results in programs, nature walks, signs, and other communication vehicles.

- ✓ Develop innovative campaigns and programs that position habitat restoration in mainstream culture (such as museum exhibits, ad campaigns, and retail promotions).

- **Goal 5: Improve the credibility and public perception of the people involved in restoration efforts.**

The perception exists in some communities that restoration is the folly of misguided volunteers or outsiders. Better explanations are needed of the role of the professionals and volunteers in restoration projects, as well as of the volunteers' experience and training of and their value to land management agencies.

Recommendations

- ✓ Seek trusted local spokespeople who represent the sound, scientific thinking behind restoration and/or exemplify the role of the local volunteer.
 - ✓ Provide support for volunteers who interact with the public, and offer training in public speaking, ecological concepts, interpretation, etc.
 - ✓ Emphasize the public service provided by volunteers and the leverage of public funds through donated time.
 - ✓ Ensure that decision-makers are aware of the value of conservation volunteers.
- **Goal 6: Improve communication about biodiversity with key decision-makers such as elected officials and their staff, land managers, and planners.**
- These key decision-makers need information about local biodiversity before issues arise in order to make informed decisions. They also need quick access to new information as issues are being considered. Communication programs and tools need to address their needs.

Recommendations

- ✓ Assess current tools and programs to inform key decision-makers for content, availability, and effectiveness in increasing understanding of the importance of local biodiversity.
- ✓ Survey, as necessary, to assess key decision-makers' knowledge, attitudes, and information needs.
- ✓ Develop vehicles to keep decision-makers regularly informed, such as tours, literature, up-to-date scientific information, and contacts for further information.

10.3

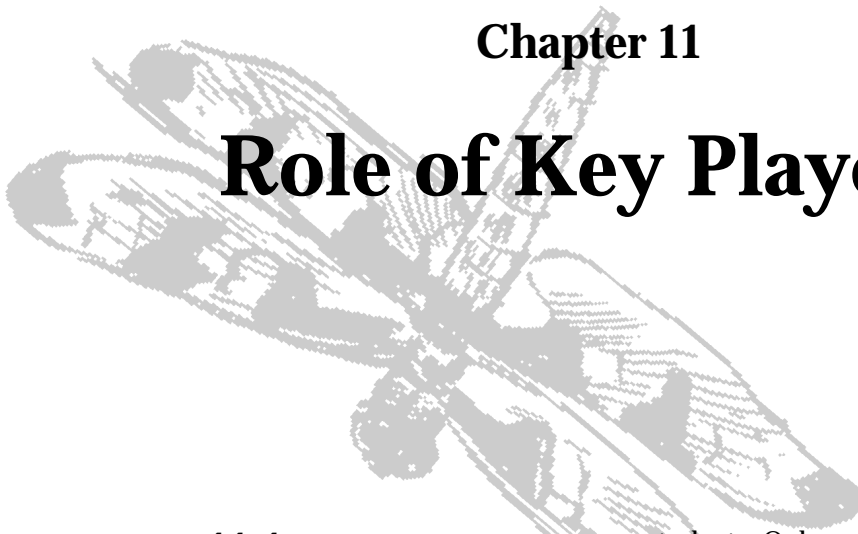
Conclusion

While the challenges to conservation educators and communicators are many, they *can* engage the public on biodiversity by working together, understanding their audiences, devoting more resources, and adopting innovative approaches. While the American public is relatively unaware of the loss of biodiversity, we in the Chicago region have the tangible demonstration to motivate positive change right before our eyes—no citizen in

the metropolitan area is more than twenty minutes from a natural area. Communicators can build on the public's affinity for our parks and forest preserves and the unique opportunities they provide. While Chicago and urban centers worldwide struggle with issues such as quality of life, over-development, pollution, and traffic congestion, Chicago Wilderness also has the potential to create a new model of a metropolitan citizenry that is aware, appreciates its natural ecosystems, and takes action on their behalf.

Chapter 11

Role of Key Players



11.1

Introduction

Achieving the objectives of this plan requires the teamwork of many agencies, institutions, corporations, and individuals. This chapter identifies key players and describes their current roles in preserving biodiversity. Except where stated to the contrary, this plan calls upon all of these key players to continue performing their current roles and, in a few instances, to take additional actions. In addition to the roles and actions outlined here, Chapter 8 includes many recommendations for actions that government agencies can pursue to contribute to land and water protection. Also, each of the recommendations in the preceding chapters needs to be addressed by one or more of the key players identified here. The order of presentation that follows is not intended to suggest relative importance. Those who own and manage sites containing natural communities are obviously central actors, but so too are those who provide the funding, the expertise, and the volunteer hours required to make this plan succeed.

Both governmental and non-governmental organizations are now moving to protect and restore the rich biodiversity of the region. One aspect of this is their cooperation in the development of this plan.

11.2

Role of government agencies

11.2.1 Overview

As the greater Chicago region developed, governments were created and modified to provide desired services: police, fire, transportation, zoning, recreation, pollution

control, etc. Only very recently have we realized that some conservation needs are not adequately addressed by existing governmental agencies. No one governmental body has responsibility for conserving biodiversity. In addition, the science of conservation biology has emerged fairly recently, and conservation issues exist on scales that do not neatly coincide with governmental boundaries.

11.2.2 Local governments

Forest preserve and conservation districts

These special districts are among the most important of the many actors involved in biodiversity recovery in the Chicago region, simply because they hold extensive lands containing natural communities. (See Table 11.1.) If this plan is to succeed, these county agencies must continue their selective acquisition efforts and must increase appropriate land management to assure that natural communities are being preserved.

While subject to property-tax caps, most Chicago-area counties have gained or plan to seek voter approval for funding substantially more land acquisition in the coming years. Public support for increased spending on the active management of natural lands is also critically important and may require more extensive public education. An alternative may be legislative relief from caps for this type of expenditure.

The Forest Preserve District of Cook County has not yet announced any referendum. A land-acquisition plan was developed in 1994 and was pending approval by the County Board as of September 1999.

The Forest Preserve District of DuPage County, in the fall of 1997, gained voter approval by referendum to spend \$75 million for open-space preservation.

Table 11.1
Major public land owning agencies information

	FPD of Cook County	FPD of DuPage County	FPD of Kane County	FPD of Will County	Lake County, IL FPD	McHenry County CD	Illinois DNR	Wisconsin DNR	Indiana DNR	US Forest Service	National Park Service
Total acres owned	67,700	23,000	8,000	12,000	20,794	10,800	21,364	6,484	17,285	15,080	10,092
Total acres serving conservation objectives	54,170	19,550	7,200	6,296	17,832	10,200	—	—	—	—	9,120
Acres actively managed	8,041	9,000	<6,000	2,500	8,000	7,191	—	2,836	—	2,940	4,780
Formally protected natural areas	4,359	65	850	2,903	1,579	1,451	4,206	445	2,492	0	9,120
Referendum/bond issue (within past 4 years)	.no	yes (1997)	yes (1999)	yes (1999)	yes (1999)	no	n/a	n/a	n/a	n/a	n/a
Monetary amount	n/a	\$75M	\$70M	\$70M	\$35M	n/a	n/a	n/a	n/a	n/a	n/a
Desired additional acres through referendum	n/a	2,400	5,000	6,500	4,000	n/a	n/a	n/a	n/a	n/a	n/a
Formally established goal or cap on total land holdings (in acres)	75,000	25,000	13,000	18,500	45,000	—	—	—	—	19,000	n/a

Total acres owned = All of the land holding acres of the agency within Chicago Wilderness region.

Total acres actively managed = This is the land that is being actively managed for conservation purposes. This may include removing of invasive species, burning, and other restoration practices.

Total acres of land serving conservation purposes = This is land that is not developed with buildings, parking lots, golf courses, ball fields, etc. It is also not agricultural land, unless it is slated for restoration. However, this land is not necessarily being actively managed. Therefore it is serving conservation purposes and could be actively managed if desired.

Formally protected natural area = For Illinois county lands, this is based on land designated as Nature Preserves or Land and Water Reserves through the INPC.

The Forest Preserve District of Kane County has spent \$23 million over the last five years and plans to preserve another 5,000 acres over the next 20 years. On April 13, 1999, a referendum for \$70 million for land acquisition passed by 66%.

The Lake County Forest Preserves' referendum on April 13, 1999, passed by 66%, providing \$35 million to buy land and \$20 million for habitat restoration, trails, and other improvements. A voter-approved 1993 referendum had previously provided \$20 million for land acquisition and \$10 million for restoration, trails, and improvements.

The McHenry County Conservation District hopes to double its current inventory of 10,500 acres over the next 10 years.

The Forest Preserve District of Will County, on April 13, 1999, won 57% voter approval for \$70 million to buy 6,500 acres.

Additional roles of forest preserve and conservation districts are public education and outdoor recreation. These roles derive from the statutory responsibilities outlined in their enabling legislation. The districts also serve as primary coordinator of volunteer stewardship and monitoring work on the land they own and manage. Providing such opportunities for public enjoyment, learning, and involvement helps build understanding of the mission of the districts and support for public funding to preserve and restore the districts' lands.

Recommendations

- ✓ In keeping with their central role as land managers, the forest preserve and conservation districts should continue to play lead roles in identifying, evaluating, and acquiring unprotected natural communities within their jurisdictions.
- ✓ Federal and state agencies should support these efforts with funding and technical resources. The most recent example of such a partnership was the Chicago Wilderness collaboration that produced the natural-areas inventory for McHenry County.
- ✓ Forest preserves should use all tools available to add land to their holdings. It is also recommended that existing natural areas be protected from purchase requests by commercial and other interests or conversion to intensive recreational uses.

Park districts

The mission of park districts more heavily emphasizes recreation than does the mission of conservation and forest preserve districts. However, this does not preclude them from making a valuable contribution to the conser-

vation of biodiversity. Many of the 148 park districts in the Illinois portion of Chicago Wilderness have the opportunity to acquire or manage natural communities falling within their jurisdiction. Such sites are sometimes too small to meet the acquisition criteria of the local forest preserve or conservation district. The St. Charles Park District, for example, has adopted policies for preserving and maintaining natural areas and is a leader in restoring natural areas in their ownership. Pilcher Park, an Illinois Natural Areas Inventory site, sets a good example of working with volunteer stewards and with the state Nature Preserves Commission to manage its fine resource. Many park districts, including the Chicago Park District, have become involved in restoring wetlands and in reestablishing native prairies and woodlands. Lake County Parks and Recreation in Crown Point, Indiana, has been actively acquiring and restoring natural areas. Park districts can and should play the important role of educating the public on the importance of maintaining biodiversity.

Like forest preserve districts, park districts are subject to property-tax caps and may have to hold public referenda in order to finance acquisitions or major projects. Public education by all parties regarding the importance of biodiversity can be vitally important to the success of such referenda.

Sanitary districts

The role of sanitary districts in recovering biodiversity is limited principally to the collection, treatment, and discharge of wastewater that meets federal and state standards. Some are also responsible for treating storm water that reaches their plants through combined sewer systems. Hence they have an interest in storm water management. Treated effluent can have major impacts on aquatic biodiversity depending on both its quality and the location of the point of discharge. Unfortunately, the regulatory practices determining discharge locations usually consider only engineering standards such as the availability of stream flow for dilution rather than the impact on the ecology of the receiving stream. The state governments have regulatory authority for discharge locations and limits.

Sanitary districts may also own land that supports significant biodiversity. Such land affords opportunities for partnering with organizations more directly charged with conservation of biodiversity. The largest landowner of this type is the Metropolitan Water Reclamation District, which encompasses most of Cook County. The District has effectively used intergovernmental agreements and other cooperative agreements to enhance the use and maintenance of District lands to support biodiversity. This good practice should be continued and expanded.

Sanitary districts also have indirect impact on biodiversity when extension of their service areas facilitates more intense development. While the primary function of sanitary districts is to provide service, they can work actively with other governmental units that have a more direct role in directing development and protecting natural areas. Such cooperative effort can be important to protecting biodiversity.

Recommendations

- ✓ Since the concern for maintaining biodiversity is not one of the purposes for which sanitary districts were created, enabling legislation should be amended to specify the authority and obligation of districts to protect biodiversity.
- ✓ In the case of private utility companies that provide wastewater collection and treatment services, and whose franchises are regulated by the Illinois Commerce Commission, a similar broadening of authorizing legislation would be appropriate.

Illinois counties and municipalities

County governments regulate land in unincorporated areas and, in some instances, play important roles in stormwater and/or wastewater management. Municipal governments regulate the use of land and also have the authority to annex new land, typically for the purpose of facilitating new development. A number of municipalities also own and operate their own wastewater treatment systems and therefore can extend sewer service as part of an annexation agreement.

Illinois, with its heavy emphasis on the property and sales taxes to fund municipal governments, has created a strong incentive for municipalities to expand into new areas. Several recent tax-reform initiatives have looked at the problem of over-reliance on the local property tax and have made recommendations that would lessen the incentives for territorial expansion.

Some municipalities operate their own park systems and therefore may be the most appropriate bodies to preserve natural areas within their boundaries. Also, both county and municipal governments have the authority to prepare and adopt comprehensive plans. These plans should identify open spaces meriting preservation and specify who should be responsible for their preservation.

Municipalities can also take direct action in managing lands that they own to support biodiversity and they can acquire and manage additional land. Even in municipalities that have separate park districts, they can play an important role in funding the acquisition and management of open space, wetlands and other natural areas. In situations where park districts do not have sufficient

financial capacity, municipalities can provide assistance through cooperative agreements. This is especially the case with Illinois home rule communities that are not limited by tax caps. Chapter 8, section 8.3 discusses other possible actions by municipalities related to plans, ordinances, etc.

Recommendations

- ✓ Counties and municipalities should amend their comprehensive plans, zoning ordinances, and other regulations to incorporate relevant recommendations contained in this plan.
- ✓ When a state infrastructure investment such as a toll road or major airport is likely to trigger substantial residential, commercial, or industrial development, affected governments (including state, county, municipal and other local jurisdictions) should enter into intergovernmental agreements designed to prevent adverse environmental impacts, including the loss of biodiversity. Such agreements were developed as part of the process for considering a proposed expressway in central Lake County, Illinois.
- ✓ Municipalities should play an active role in protection and management of biodiversity by managing their lands to support native ecological communities and consider acquisition of additional land for these purposes.

Northwest Indiana municipalities

The municipalities in Indiana, such as the City of Gary and the City of Hammond, have unique roles in preserving and protecting biodiversity. This stems from the large impact of business and industry in northwestern Indiana. These businesses and industries are key elements of local economies and, in many instances, owners of environmentally sensitive land.

To effectively protect biodiversity in northwestern Indiana, partnerships need to be nurtured among the various agencies of the federal, state, and county governments, city departments, and private organizations that own and oversee land requiring preservation and long-term management. For example, this is important for the City of Gary since it contains portions of the Indiana Dunes National Lakeshore as well as several pieces of dune-and-swale ecosystems that are protected and managed by the Indiana Department of Natural Resources and private conservation groups.

These cooperative partnerships may evolve into comprehensive and cooperative planning and management initiatives among the various agencies, departments, and organizations. At present there is no comprehensive, coordinated, or cooperative relationship between the var-

ious habitat managers and landowners in the City of Gary, such as the City Park Department and the Redevelopment Commission.

The cities of northwest Indiana may develop guidelines for the staffs of economic-development departments and planning departments urging them to include, where possible, habitat preservation in development projects that impact sensitive areas and habitat restoration in previously disturbed areas. While these cities are developing the capacity to manage natural resources, state, federal, or private agencies and organizations may assist in providing technical assistance for city-owned natural resources.

Recommendations

- ✓ In northwest Indiana, city departments should enter into partnerships aimed at protecting biodiversity with federal, state, and county agencies and with private organizations that own and oversee land requiring preservation and long-term maintenance.
- ✓ Indiana cities and their regional planning and development agencies should develop a process for taking inventory of natural areas and prioritizing areas for preservation and restoration in conjunction with economic-development initiatives.
- ✓ Indiana cities and their partner agencies should develop plans and allocate funds to preserve land and to manage preserved land consistently.

Special units of government

The Chicago Wilderness region is home to a number of specialized units of government that can play an especially important role in providing for expanded habitat. The argument is often raised that enabling legislation does not specifically identify habitat protection and restoration as an activity of such districts. Yet various governmental bodies nonetheless can play a major role simply by administratively choosing to do so. Thus, the Illinois Department of Transportation plants prairies along its rights of way because it saves maintenance dollars over the long run and the program is well received by the public. Grade schools and high schools plant prairie gardens; community colleges restore large natural areas on their grounds. The Metropolitan Water Reclamation District of Greater Chicago grants long-term, low-cost leases on its important natural areas for habitat management. None of these public agencies are legislatively enabled to accomplish these activities, nor are they legislatively precluded from doing so. They choose to do so for the community good and, often, because it means lower maintenance and operation costs.

Mosquito abatement districts: Alternative approaches to mosquito control that do not harm other fauna need to be identified through round-table discussions among the mosquito abatement districts and Chicago Wilderness representatives.

Drainage districts: Drainage techniques that serve agriculture while also improving habitat, controlling erosion, and controlling storm water should be identified and used along channelized streams managed by drainage districts.

The Fox River Waterway Management Agency: Waterway-management agencies should implement strategies to protect and enhance habitat throughout their jurisdictions, especially for fish migration and spawning, water bird migration and nesting, restoration, control of exotic species, shoreline erosion control, and protection and enhancement of mussel beds.

Illinois Prairie Trail Authority: This authority, representing the five Illinois collar counties, could play an important role in coordinating region-wide public access, education, and activities related to natural areas adjoining the collar-county trail network.

Local highway departments: These departments can play a leading role in habitat restoration and protection by detaining storm water on site, managing salt use, pursuing environmentally benign alternatives to salt, and using native landscaping within rights of way more extensively.

Illinois International Port District: The Port District includes Lake Calumet, one of the largest and most important habitats for birds and fish in southeast Chicago. There is a need for a long-range management plan, developed with community involvement, to provide a balance between habitat preservation and economic development. Such a plan should deal with restoring water quality and providing access to Lake Calumet for appropriate recreational activities.

11.2.3 State agencies

Illinois Department of Natural Resources

The Illinois Department of Natural Resources (IDNR) has played a lead role in conserving biodiversity in northeastern Illinois by establishing and maintaining the Illinois Natural Areas Inventory (INAI), by acquiring and managing land, and by providing technical assistance to public and private agencies and groups interested in resource conservation. IDNR also administers several grant programs to fund biodiversity-related initiatives. This section describes various IDNR programs.

The **Illinois Natural History Survey** (INHS), founded in 1858, is recognized as the nation's premier natural history survey. INHS scientists study plants and animals and how they interact among the variety of ecosystems. Scientists from the **Illinois Water Survey and Geological Survey** also study critical factors involved in ecosystem function such as hydrological patterns and soil structure.

As for land protection, IDNR is the third largest non-federal public landowner in the six-county region (see Table 11.1) with over 21,300 acres of state parks, natural areas, conservation areas, and registered Land and Water Reserves. The Office of Resource Conservation (ORC) and the Office of Land Management and Education (OLME) are responsible for identifying and managing these ecosystems. The Surveys, ORC, and OLME are involved with watershed management, restoration ecology, long-term monitoring of natural communities, controlling invasive species, and fish and wildlife ecology. They foster improved management of the state's biological resources and public appreciation of Illinois's natural heritage.

The **Office of Water Resources** has regulatory responsibilities in stream channels, floodways, and floodplains.

The **Illinois Nature Preserves Commission** works with landowners who wish to voluntarily protect high-quality natural areas as either Illinois Nature Preserves or Registered Illinois Land and Water Reserves. These high-quality natural areas have frequently already been identified on the Illinois Natural Areas Inventory, either as relatively undisturbed natural plant communities or as habitat for state-listed endangered or threatened species.

Dedication of these natural areas is a legal process whereby the owner voluntarily restricts future uses of the land in perpetuity for the purpose of preserving the land in its natural state. The owner retains custody but relinquishes the right to develop the land or make any changes that negatively affect the natural qualities of the property. Sites dedicated as Illinois Nature Preserves or registered as Illinois Land and Water Reserves are protected under the auspices of the Illinois Natural Areas Preservation Act. That act states that "areas dedicated as nature preserves are hereby declared to be put to their highest, best, and most important use for the public benefit."

After the land is dedicated, it becomes part of a statewide system of nature preserves or land-and-water reserves that is overseen by the Illinois Nature Preserves Commission, a nine-person citizen body appointed by the Governor. To date, 285 sites totaling 37,778 acres have been dedicated as Illinois Nature Preserves, and 33 sites totaling 14,675 acres have been registered as Illinois Land and Water Reserves. Of that total, 106 nature preserves and five land-and-water reserves are located in the six-

county region of northeastern Illinois. Nearly half of these protected areas are owned by the county forest preserve and conservation districts. The Illinois Department of Natural Resources, park districts, municipalities, and private parties own the remainder.

Many high-quality natural areas in northeastern Illinois, however, remain unprotected. A number of the high-quality Chicago lake-plain prairies and wetlands, for example, have not been formally protected.

The Nature Preserves Commission staff also provides recommendations and assistance regarding restoration and management of protected sites. The staff also works cooperatively with landowners, municipalities, and regulatory agencies to prevent or minimize impacts associated with changing land uses on Illinois Natural Areas Inventory sites and protected sites.

The Nature Preserves Commission is an important partner in the Volunteer Stewardship Network, providing the legal basis for volunteers to apply herbicides by indemnifying those who become licensed through the state.

The **Illinois Endangered Species Protection Board** is an independent board of nine members appointed by the governor. The board was created by the Illinois Endangered Species Protection Act of 1972 and is dedicated to protecting Illinois's endangered and threatened species. Following from this mandate is the evaluation and listing of animal and plant species as state-endangered or -threatened. The list is updated and published every five years following a two-year review process.

Duties of the board include the following:

- Listing, delisting, or changing the listing status of species of plants and animals
- Advising the Department of Natural Resources on the assistance, protection, conservation, and management of native endangered and threatened plants and animals and their habitats
- Encouraging and promoting research and investigations that determine status of native plants and animals that may be eligible for listing, and promoting research and management that may enhance the possibility of success of a listed species and ultimately lead to recovery and delisting
- Informing the public about matters pertaining to threatened and endangered species
- Working with other agencies and organizations to conserve threatened and endangered plants and animals and their habitats

IDNR has a long record of providing financial support for land acquisition in northeastern Illinois. The department administers the state's **Open Space Lands Acquisition and Development Program (OSLAD)**, the **Natural Areas Acquisition and Development Program (NAAF)**, **C-2000 Ecosystem Program**, and the **Open Land Trust (OLT)**.

OSLAD has helped local park and forest preserve districts acquire and develop substantial open spaces. Funded by the Illinois real-estate transfer tax, OSLAD is budgeted statewide at \$17,715,000 for FY 99. In FY 98, applications from local governments in Cook County were approved at a level of \$3,925,000, while applicants in the collar counties were awarded \$5,466,000. Since its beginning in FY 86 through FY 98, OSLAD has provided \$27,735,000 to Cook County applicants and \$31,656,000 to the collar counties. OSLAD requires a 100% local match.

NAAF was established in 1989 with a portion of the real-estate transfer tax. The fund is dedicated for acquisition and stewardship of natural areas, including habitat for endangered and threatened species, high-quality natural communities, wetlands, and other areas with unique or unusual qualities of natural heritage. Lands acquired remain in state ownership. Approximately \$2 million each year is used for acquisition and stewardship.

C-2000 Ecosystem Program funds watershed- and ecosystem-based local partnerships that seek to maintain and enhance natural areas and coordinate conservation efforts with other local interest such as business. Among the projects eligible for grants are those for land acquisition or the purchase of conservation easements for the purpose of habitat protection or restoration. Total grants for the statewide program are expected to average \$3 million per year. Partnerships within northeastern Illinois include Chicago Wilderness, the Fox River Ecosystem Partnership, Lake Calumet Ecosystem Partnership, Prairie Parklands Partnership, Thorn Creek Ecosystem Partnership, Wisconsin-Upper Des Plaines Partnership, and the Upper DuPage River Coalition.

The C-2000 Ecosystems Program has established pilot projects in four downstate watersheds designed to "fix" local streams by a variety of methods including better land management. These will serve as important case studies for application within the Chicago Wilderness region.

OLT is Governor Ryan's landmark initiative to dedicate \$160 million over four years to acquire natural areas and open space and to provide recreational opportunities for the citizens of Illinois. The program will allow the IDNR to acquire land; create a grant program for units of local government to acquire land; and enter into management

agreements with not-for-profit organizations on land acquisition.

Recommendation

- ✓ The State of Illinois should continue its grants programs for open space with more funds for acquisition directed to northeastern Illinois. Open Lands Trust Act funds should primarily protect lands with current or potential biodiversity values.
- ✓ The state should continue to acquire high-quality natural areas through the NAAF.

Indiana Department of Natural Resources

The mission of the Indiana Department of Natural Resources (DNR) is to protect, enhance, preserve, and wisely use natural, cultural, and recreational resources for the benefit of Indiana's citizens. It does so through public information programs to promote awareness and conservation of Indiana's natural resources, by acquiring public lands with programs such as the Indiana Heritage Trust, and by using a watershed-based multi-disciplinary management approach in its programs.

The **Division of Nature Preserves** is responsible for inventory, protection, dedication, and management of Indiana's remaining natural areas. In addition, the Indiana Natural Heritage Data Center, within the Division of Nature Preserves, collects, manages, and provides data on Indiana biodiversity, including endangered species, natural communities, and conservation lands in the state.

In the Chicago Wilderness area of northwest Indiana, the Division conducts field inventories for endangered species and natural communities, manages several nature preserves, and works with various conservation partners protecting some of the most diverse natural areas in the state. Two funding sources allow the Division to acquire (or assist in acquiring) natural lands: the Indiana Natural Heritage Protection Campaign and the Indiana Heritage Trust program. The former is a public/private program to fund conservation that has successfully protected the best remaining natural areas across the state. The latter program, which is funded by sale of the environmental license plates, has proven to be one of the most successful conservation-funding programs ever in Indiana.

Wisconsin Department of Natural Resources

The Wisconsin Department of Natural Resources (DNR) has broad responsibility and involvement in managing biodiversity in Wisconsin. It manages the state owned wildlife areas (such as the New Munster Wildlife Area), recreational areas (like the Bong State Recreational Area), and state parks (such as Big Foot Beach State Park). In

addition, the Department often works in partnership with other public and private agencies and groups to acquire, preserve, and manage unique sites and natural areas (such as the Chiwaukee Prairie). The Department regulates modifications to waterways and wetlands, establishes and enforces effluent standards for industrial and municipal wastewater facilities, and approves modifications to sewer service areas. Wisconsin DNR oversees local implementation of zoning regulations for floodplains and shores. Wisconsin DNR maintains the Natural Heritage Inventory in Wisconsin and implements the state law on endangered and threatened species.

In May 1995, the Wisconsin DNR issued a report entitled *Wisconsin's Biodiversity as a Management Issue*. This report presented the department's strategy for the conservation of biological diversity. It provided DNR employees with an overview of the issues associated with biodiversity and provided a common point of reference for incorporating the conservation of biodiversity into DNR's management framework. In June 1995, the Wisconsin DNR published a land-use report entitled *Common Ground*. *Common Ground* focuses specifically on improving DNR programs and policies that relate to making decisions about land use. This report reflects the DNR's desire to have strong public policies that not only protect Wisconsin's environment but also enhance the state's economy and maintain a high quality of life. In 1996, the Wisconsin DNR reorganized so that program implementation and land management are carried out in Geographic Management Units (GMUs). GMUs reflect the natural boundaries provided by watersheds and river basins. The Wisconsin DNR has formed "partnership teams" with the public and private sectors to guide planning and implementation within the GMUs. Wisconsin DNR is currently working on a map of terrestrial ecological regions based on the National Hierarchical Framework of Ecological Units.

Illinois Environmental Protection Agency

The Illinois Environmental Protection Agency (IEPA) regulates waste discharges to water, air, and land. A major role for maintaining biodiversity is oversight of water-quality management planning as mandated by the federal Clean Water Act. In that capacity, IEPA approves the sizing, location, and limits on effluents for sewage-treatment plants. IEPA also determines the boundaries of areas to be served by treatment plants, and it thereby can influence patterns of growth and development.

The Agency also administers the national permit program for stormwater discharges. This program has the potential to significantly reduce the adverse effects of stormwater runoff on the biodiversity of streams. Phase

One of the program covers municipal storm-sewer systems that do not receive sanitary sewage and that serve populations of 100,000 or more, construction activities that disturb five acres or more, and numerous industrial activities. In the fall of 1999, Phase Two will extend the program to small municipalities and construction activities disturbing one or more acres of land.

In addition to regulating discharges to streams and lakes, IEPA administers state water-quality standards that are set by the Illinois Pollution Control Board to establish conditions that must be maintained in streams and lakes. The standards include limits for various chemicals, to protect both human health and aquatic life.

IEPA regulation of air pollution and contaminated land also benefits both aquatic and terrestrial biodiversity. A specific aspect of air-pollution control that is important for protection and restoration of biodiversity is the issuance of permits to landowners for conducting prescribed burns.

IEPA's Office of Pollution Prevention encourages businesses to prevent pollution before it becomes a problem. The agency also promotes holistic approaches that eliminate the sources of waste in products, processes, and raw materials.

Illinois Department of Transportation

As a major landowner, the Illinois Department of Transportation (IDOT) sets an example when it employs best management practices in its highway design and maintenance. To its credit, IDOT has demonstrated a willingness to establish and maintain native landscaping along many state roads including some in northeastern Illinois.

IDOT also participates in the regional transportation planning process in northeastern Illinois, including identification and mitigation of environmental impacts of transportation facility decisions.

Recommendation

- ✓ IDOT should incorporate biodiversity principles into all transportation infrastructure planning and all implementation decisions.

Illinois State Toll Highway Authority

Planning the widening or extension of major toll roads in the Illinois portion of the Chicago Wilderness region is a part of the official regional transportation-planning process. The authorization to build is made solely by the Illinois General Assembly, with actual construction directed by the Illinois State Toll Highway Authority.

One of the most recent major additions to the Chicago-area system of expressways and toll roads is the north-south toll road in DuPage County. The environmental impact statement (EIS) prepared for that project identified a number of potential adverse impacts and proposed remedies. It specifically discussed erosion controls to protect adjacent streams during construction.

Recommendation

- ✓ Future toll-road construction projects must assure full compliance with EIS recommendations.

Illinois Department of Agriculture

This agency supports farmers who participate in conservation programs under federal farm bills and in general habitat restoration. The Illinois Department of Agriculture has sought to curb excessive conversion of farmland to other uses by commenting on proposed actions involving federal or state monies that could cause the loss of farmland. This advisory review is conducted under the authority of the Illinois Farmland Protection Act, PA 82-945. There is some possibility that this act could be used to block land acquisition by forest preserve districts or other conservation agencies.

Other Illinois legislation pertaining to farmland preservation include: 1) the Agricultural Areas Conservation and Protection Act, PA 81-1173; 2) Protection of Farming Operations from Nuisance Suits, PA 82-509; and 3) Illinois Soil and Water Conservation District Act.

11.2.4 Intergovernmental organizations

In the Chicago Wilderness region, three intergovernmental planning agencies cover multiple counties: 1) the Northeastern Illinois Planning Commission, 2) the Northwestern Indiana Regional Planning Commission, and 3) the Southeastern Wisconsin Regional Planning Commission. Given the cross-section of local governments serving on their boards, they are well positioned to facilitate coordinated, intergovernmental planning and to provide technical assistance on local environmental matters. A fourth agency, the Chicago Area Transportation Study (CATS), is the designated MPO specifically for transportation planning for northeastern Illinois.

Northeastern Illinois Planning Commission

The Northeastern Illinois Planning Commission (NIPC) has a threefold role in preserving biodiversity. First, it develops and adopts regional plans, such as the Regional Greenways Plan, which has been widely accepted and used by local as well as state government. Like the Greenways Plan, the Biodiversity Recovery Plan can set a direction for the region and, once adopted by NIPC, can serve as a guide for municipalities, counties, and other

government units. Second, NIPC studies growth and development patterns, and it prepares forecasts for population, households, and employment. Also, NIPC monitors water quality in streams, lakes, and wetlands, and it promotes good planning and the use of best management practices for these resources. Third, NIPC works with local governments to promote intergovernmental activities through means such as intergovernmental agreements and planning processes for joint areas.

Northwestern Indiana Regional Planning Commission

The Northwestern Indiana Regional Planning Commission (NIRPC) promotes biodiversity through various activities of planning, implementation, and policymaking. As the federally recognized planning organization for Northwest Indiana, NIRPC recently adopted the Vision 2020 Transportation Plan for Northwest Indiana, which incorporates environmental sensitivity, promotes wise use of land, and encourages the use of alternative fuels. NIRPC's Environmental Management Policy Committee serves as a regional advisor and facilitator for discussion and public education on air quality. It also acts as a point of contact for discussion, coordination, and action on a wide range of programs and projects for air, land, and water quality. NIRPC is assisting in the preparation of an inventory and functional assessment of wetlands in the three-county region. It also prepared a management plan for the Trail Creek watershed. NIRPC serves as staff to the Quality of Life Council, a regional roundtable of public and private leaders that promotes sustainable development in Northwest Indiana. NIRPC is currently reactivating its role in community and economic development to promote Smart Growth for the region. NIRPC also provides staff support to two river-basin commissions whose missions include wetland and habitat restoration.

Southeastern Wisconsin Regional Planning Commission

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) is the official area-wide, comprehensive planning agency for southeastern Wisconsin, which comprises Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha Counties. SEWRPC provides the basic information and planning services necessary to solve problems that transcend the boundaries and fiscal capabilities of the region's local units of government.

Since its inception, SEWRPC has placed a high priority on the identification, protection, and wise use of the natural resources of the region. In 1997, the commission completed a *Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin*. This plan is the product of almost ten years of

intensive work conducted under the guidance of a Technical Advisory Committee consisting of individuals particularly knowledgeable about the natural areas and the habitats of critical species of the region. Through an extensive inventory, this plan identified all of the high-quality natural areas and habitats of critical species remaining in the seven-county region. It formulated recommendations for the protection, wise use, and proper management of those areas and habitats. This report also provides information to promote sound rural and urban development, avoiding conflicts between development proposals and resource protection.

Chicago Area Transportation Study

The Chicago Area Transportation Study (CATS) is federally recognized Metropolitan Planning Organization (MPO) for transportation planning for the six-county Chicago region. CATS leads the region in producing the long range transportation plan, the 2020 Regional Transportation Plan (1997) which identified levels of investment for existing transportation facilities and for transportation system expansion. The Transportation Plan calls for priority investments in our existing system and at the same time includes new expressways, toll roads and transit lines. Each of these projects, if built, could affect a number of wetlands and other natural communities.

- ✓ The regional transportation planning process should incorporate biodiversity principles into the transportation planning and programming process.

Municipal associations

Like regional planning commissions, municipal associations facilitate joint action by their member governments. They are usually organized within a single county but can collaborate across county borders when necessary. To date, their chief activities related to the environment have been in the areas of water supply and solid-waste management. Their support of biodiversity recovery as a municipal concern would be very helpful to the objectives of Chicago Wilderness.

11.2.5 Federal administrative agencies

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) carries out a wide array of federal statutes having to do with the physical, chemical, and biological environment. It has major authority to regulate discharges of pollutants to water, air, and land. It regulates these discharges either directly or by delegating authority to those states that demonstrate capacity and willingness. It also has responsibility for research and technology transfer in related

areas. Many EPA functions affect biodiversity. Examples include review of environmental impact statements prepared by other federal agencies, incentive programs to address land runoff to surface waters, identification of high-quality wetlands, wetland permit reviews, and wetland enforcement. The agency also has a small pilot program encouraging the use of native plants in private land holdings such as corporate campuses.

U.S. Army Corps of Engineers

The Corps of Engineers, under Section 10 of the Rivers and Harbors Act, regulates construction in navigable waters, including major waterways and Lake Michigan. The Corps also has authority under Section 404 of the Clean Water Act to issue permits for the deposition of dredged and fill materials and for excavation in waters of the United States, which include most wetlands and streams. Wetlands are still vulnerable to deterioration since such activities as vegetation removal, erosion, destruction of buffers, conversion to impoundments, and the discharge of storm water into wetlands are not regulated.

The Corps has various authorities allowing them to evaluate, design, and implement solutions to aquatic resource problems. Projects require a local partner or sponsor. The authorities include those specifically authorized by Congress, plus the Continuing Authorities Program, particularly Section 206 (Aquatic Ecosystem Restoration), Section 204 (using dredged material to restore wetlands or other aquatic systems) as well as others. Studies may be accomplished through the "Planning Assistance to States" program, which supplies technical expertise to evaluate, design, and implement solutions to the ongoing loss of biological integrity in and around streams.

The Corps has the authority to grant permits for projects that affect wetlands, provided the impacts are no more than minimal. Mitigation of project impacts is considered as part of the overall evaluation of a project. The Chicago District has developed some innovative practices that have greatly aided the region's ability to improve and restore degraded habitat. Mitigation banks, in-lieu fee programs, and the use of enforcement and noncompliance resolutions to improve impacted habitat are noteworthy. While resources have been somewhat constrained in the last few years, the Corps continues to look for ways to maximize its effectiveness and to develop partnerships with many of the diverse groups involved in wetlands.

U.S. Department of Agriculture:

USDA Forest Service

"Caring for the land and serving the people" is the mission of the USDA Forest Service. The Forest Service,

through partnerships with state and local natural-resource agencies, works in Northeastern Illinois to manage forests, prairies, and related natural resources for long-term sustainability and for improved quality of life for all citizens. The Chicago area is home to three USDA Forest Service offices: the Midewin National Tallgrass Prairie in Wilmington, the North Central Research Station in Evanston, and the Northeastern Area State and Private Forestry office in Evanston.

The Midewin National Tallgrass Prairie is part of the National Forest System. Administered by the Forest Service in close cooperation with the Illinois Department of Natural Resources, Midewin is the largest piece of protected open space in northeastern Illinois. Although public access to Midewin is currently restricted because of the Army's ongoing cleanup of the former Joliet Arsenal, Midewin's mission is to conserve and enhance native populations of plants and animals, provide opportunities for research and environmental education, support continuing agricultural uses in some areas, and provide a variety of recreation opportunities. Prairie restoration and new research have already begun at Midewin, and opportunities for the public to visit and work on the site will grow over the coming years.

North Central Research Station in Evanston conducts social-science research aimed at managing forest environments for urban populations. Northeastern Area State and Private Forestry provides financial and technical assistance for managing forest ecosystems in populated areas. This assistance includes conservation education, woodland restoration, and management of trees in parklands and streets, as well as management of exotic pests such as the Asian longhorned beetle and gypsy moth.

Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) is the federal agency that works with private landowners and communities to achieve their conservation goals through a voluntary approach to land stewardship. NRCS emphasizes voluntary, science-based assistance, partnerships, and cooperative problem solving at the community level. NRCS employees are skilled in many scientific and technical specialties, including soil science, soil conservation, watershed planning, hydrology, and wetland science. Assistance is provided through a network of local field offices.

NRCS can support aspects of the Biodiversity Recovery Plan through its efforts in community assistance and watershed planning. Using the watershed-planning process, community members can determine local priorities for resources and can develop a plan of action that addresses the needs of both the community residents and their environment. In addition to general technical assis-

tance, NRCS provides technical leadership for the many provisions of the 1996 Farm Bill, including the Wetland Reserve Program, Wildlife Habitat Incentives Program, and Conservation Reserve Program. These programs can be used in the protection and restoration of biodiversity in the Chicago Wilderness area.

U.S. Department of Interior: U.S. Fish and Wildlife Service, National Park Service

The U.S. Fish and Wildlife Service operates an Ecological Services field office in northeastern Illinois that implements the Endangered Species Act, including listing, recovery, and consultation. The Service offers consultation to other federal agencies on their permits, licenses, and funded projects. It provides technical and monetary support to private and public landowners for habitat restoration. It also investigates effects of environmental contaminants on fish and wildlife, participates in regional conservation planning, and provides education and outreach to schools and the general public on biodiversity conservation.

The Service also operates the 93 million-acre National Wildlife Refuge system, which provides habitat for migratory birds, endangered species, and other fish and wildlife. The Service could play a major role in the Chicago Wilderness region as a federal landowner, assisting in the acquisition of large parcels necessary to create habitat complexes identified in this plan and restoring habitat for area-sensitive species.

Also within the Department of Interior, the National Park Service maintains the Indiana Dunes National Lakeshore and conducts scientific studies.

U.S. Department of Transportation

The U.S. Department of Transportation provides over \$1 billion annually to the Chicago Wilderness region for a variety of programs relating to transportation. The current federal transportation-funding act is called TEA-21, the Transportation Equity Act for the 21st Century. While the bulk of TEA-21 funding locally goes toward maintaining our existing systems of highways and mass transit, funding is also used for acquisition of bicycle- and foot-trail rights of way, historic preservation, beautification programs, landscaping (e.g. natural landscaping) of transportation rights of way, and environmental mitigation. Each of these can help meet some of the biodiversity objectives of Chicago Wilderness.

TEA-21 requires a planning process and a funding process for improving and expanding transportation systems. These processes can provide a mechanism to promote biodiversity recovery, both through the design of new and improved transportation systems and through

their consideration of actions to avoid or mitigate environmental damage.

Recommendation

- ✓ Transportation designers and planners should carefully follow the TEA-21 process, taking advantage of its programs related to biodiversity in the Chicago Wilderness region.

U.S. Department of Energy

Two Department of Energy (DOE) National Laboratories have extensive land holdings in northeastern Illinois: Argonne National Laboratory and Fermi National Accelerator Laboratory (Fermilab). DOE has devoted resources to establishing and maintaining native species on both properties.

Argonne is a 1500-acre research facility in DuPage County that is surrounded by the Waterfall Glen Forest Preserve. The approximately 700 acres of undeveloped land at Argonne include woodland, wetland, and prairie habitats. Argonne has ecological research capabilities in the areas of mycorrhizal fungi and soil ecology, carbon sequestration, phytoremediation (using plants to concentrate and break down pollutants), and ecological assessment.

Fermilab has one of DOE's seven National Environmental Research Parks (NERPs), representing the tallgrass prairie region for the country. The NERP is an outdoor laboratory, containing over 1000 acres of reconstructed prairie, natural and constructed wetlands, agricultural land, and open water. Since its dedication in 1989, researchers from universities and from other DOE sites (including Argonne) have used the park to conduct more than 40 projects, including investigations of succession, soil structure, and microbial communities, evolution of plant defenses, and predator-prey dynamics, as well as surveys of vertebrates and invertebrates.

they fill in the cracks, clear bottlenecks, and otherwise creatively and adeptly make a difference. The large number of organizations contributing to biodiversity conservation in the region precludes including full discussion of their roles in this plan. This in no way implies that these organizations are any less vital to the achievement of this plan than the other actors described in this chapter. Appendix 8 provides an overview of the variety of non-governmental organizations in the region, their missions and significant accomplishments.

The region's museums, zoos, arboreta, and botanic gardens contribute profoundly to the evolving "conservation culture" of the region. Hundreds of thousands of people annually attend their exhibits and educational events. Their large research staffs, on the cutting edge of conservation around the globe, bring a focus of solid science to the many challenging questions facing conservationists here.

Many conservation organizations are run largely or entirely by volunteers active in their communities on a broad range of issues of conservation, environmental education, and open space. Some of these organizations own and manage local lands for habitat. Many are active in land-use planning and community development.

Some larger organizations with staff play major roles in acquisition of natural lands, conservation science, policy and planning, and volunteer recruitment. They often collaborate with public agencies in highly cost-effective partnerships.

Public participation is often key to the effective functioning of government agencies in a democratic society. Preserve users, neighbors, and other taxpayers have a healthy and growing interest in wise management of conservation lands. Not-for-profit conservation groups have a long and valuable history of advocacy and other forms of public participation that can improve the responsiveness and focus of all types of institutions. Just as volunteer programs have contributed mightily in health, education, and youth sports, volunteer programs in conservation and environmental education have a growing importance. These programs owe their effectiveness to partnerships between governmental and non-governmental organizations.

Non-governmental organizations have also been important in building coalitions and have played important roles in development of Chicago Wilderness itself, Midewin National Tallgrass Prairie, the Volunteer Stewardship Network, and a wide variety of other conservation successes in the region.

11.3

Role of private sector

11.3.1 Non-governmental organizations

The non-governmental organizations of the Chicago region that focus on conservation have demonstrated the flexibility and creativity to contribute to conservation at a high level. With a wide range of missions, they engage in various programs to preserve biodiversity, including direct work on protected natural areas, community-based organizing and education, and advocacy. In addition,

11.3.2 Business and industry

Commercial Club of Chicago: Historically, the private, for-profit sector has played an important role in open-space preservation in the Chicago region. The most widely known examples include Aaron Montgomery Ward's defense in the 1890s of Grant Park as "forever open clear and free" and architect Daniel Burnham's *Plan of Chicago*, produced in 1909. It is noteworthy that the sponsorship of this "Burnham Plan" came from the Commercial Club of Chicago, an organization representing the leaders of most major corporations and professions in the Chicago region. The introduction to the 1970 reprint (Commercial Club of Chicago 1970) includes the following passage by architectural historian Wilbert Hasbrouck, AIA:

Two vitally important results of the plan are the development of the lakefront and the extension of the Forest Preserve System of Cook County. Burnham often is given credit for initiating the forest preserves which ring metropolitan Chicago with a green belt...but this basic system had been established before the plan came into being. The concept of the Forest Preserve System was formulated by architect Dwight Heald Perkins, who served his apprenticeship in Burnham's office during the Columbian Exposition. What Burnham did do was to encourage the extension and continuation of the forest districts. There is no question that without the plan, the forest preserves as we know them today would not exist.

In 1999, the same Commercial Club of Chicago published a sequel to the Burnham Plan, which includes a strong endorsement of Chicago Wilderness (Johnson 1999).

Northwest Indiana Forum: This group, the leading organization of businesses in northwestern Indiana, has played an important role in promoting open-space preservation. It did so by helping to negotiate the settlement of pollution claims by the US EPA against certain local industries. This settlement directed corporate contributions toward the preservation of environmentally important sites rather than the payment of fines.

Homebuilders: Chicago-area homebuilders are in a unique position to promote the conservation of biodiversity by means of good site design and the preservation of open spaces such as wetlands contained on a building site. Some have done so, but many have found it difficult to find qualified organizations willing to receive and properly manage small open spaces. This issue requires further analysis by Chicago Wilderness members before recommending solutions.

Natural landscaping: Many businesses are also landowners. In the U.S., approximately 20 million acres of lawn are cultivated, covering more land than any single crop. Natural landscaping—using native plants and

plant communities in landscaping—is an opportunity to reestablish diverse native plants, thereby inviting the birds and butterflies back home. Using native plants promotes biodiversity and stewardship of our natural heritage. One approach to promoting biodiversity on private lands is "naturalizing" the land using restoration techniques such as planting and prescribed fire. Another approach is using native plants in more formal landscapes in place of turf grasses.

Several corporations in the Chicago region have chosen to use natural landscaping on their own properties. Examples include Sears corporate headquarters in Hoffman Estates, the AT&T corporate campus in Lisle, the Lucent Technologies campus in Naperville, and several right-of-way sites belonging to Commonwealth Edison.

Among the major reasons for natural landscaping is cost saving. Appendix 9 compares costs of the two basic options for landscape design and management. The first option is to plant and maintain hybrid turf grasses and other non-native ornamental plants and trees. These plants are now established throughout the non-agricultural portions of the region, especially in most parks and residential areas and in most commercial and institutional sites. NIPC (1997c) estimates that over a ten-year period, installation and maintenance of Kentucky blue grass cost \$59,400 per acre. The second option is to use native plants, and in some cases to restore hydrology, which in turn will support more animals, birds and other native species. The NIPC study estimates that over a ten year period, installation and maintenance of either buffalo grass or prairie grasses and forbs cost under \$10,000 per acre.

It is important to note that natural landscaping complements the ecological restoration taking place across the Chicago Wilderness. In natural landscaping, the property owner is concerned primarily with selecting from the palate of native plants and is generally not interested in restoring the hydrology or soils on the site. Nonetheless, replacing the monoculture of lawns with native plants enhances habitat for birds and insects and also provides important public education for broader restoration projects.

11.3.3 Farmland owners

All of the highest quality streams in the Chicago Wilderness region are in primarily agricultural areas, which suggests that most farming in the Chicago region is more compatible with preservation of stream quality than is most suburban development. Croplands intermixed with pasture and woodlands can result in a habitat suitable for certain native bird species, such as meadowlarks, as well as a variety of mammals.

Agricultural areas offer the most feasible opportunity for large-scale expansion of natural areas, although prime farmland should be kept in production where at all possible. In evaluating land for its preservation potential, soil maps can be especially helpful, especially to find hydric soils whose drainage has been altered by drain tiles.

Various techniques to preserve farmland have been developed and applied nationally. In the Chicago area, tax assessments can reflect agricultural land values if the owner agrees not to develop the land for ten years. Kane, McHenry, and Will Counties in northeastern Illinois have defined prime agricultural areas and sought, with mixed success, to keep them from being developed. One tool available to counties is agricultural zoning, but their authority to zone is preempted once a nearby municipality annexes the land. Few municipalities have identified farmlands to be preserved in their comprehensive plans.

One farming practice that can affect biodiversity is the setting aside of certain lands for conservation purposes, using subsidies available under the U.S. Department of Agriculture Conservation Reserve Program (CRP). Currently, 7,348 acres of farmland have been set aside under ten-year contracts in the collar counties of Illinois. CRP has already been shown to help stabilize or even increase previously declining bird populations, including those of Henslow's sparrow, Grasshopper sparrow, and meadowlark. The more recently established Conservation Reserve Enhancement Program (CREP) includes state matching funds for contracts ranging from 15-year to permanent easements. However, in the Illinois portion of Chicago Wilderness, CREP is only available for floodplains and wetlands in the Lower Fox River Valley.

Farmers can also help preserve natural communities by maintaining vegetative filter strips of at least 25 feet adjacent to streams and by keeping livestock waste out of streams. Also, farmers owning wetlands and wood lots containing important native communities can help preserve them by establishing adjacent buffer areas. The federal and state Departments of Agriculture should use educational programs to encourage the application of best management practices to such areas.

11.3.4 Private owners of large, low-density, non-agricultural properties

Many privately owned, non-farm properties scattered throughout the region contain extensive open spaces that support or could support natural communities or at least a variety of native species. Prime examples are the Morton Arboretum, the Marshall Field estate in Lake County, Illinois, and the Max McGraw Wildlife Center in East Dundee. Some newer private housing subdivi-

sions are incorporating open space and natural areas into their design, such as the Prairie Crossing development in Grayslake and the Coffee Creek development in Chesterton. Other examples include golf courses, corporate headquarters such as the Sears property in Hoffman Estates, Tel Labs in Bolingbrook, and private residences on lots of five or more acres. Some, like those mentioned above, are already using native landscaping or managing natural communities within their properties. Their accomplishments should be made more widely known so that other property managers can learn to develop similar strategies. Section 11.3.2 discusses natural landscaping; Appendix 9 details the cost savings it offers.

Any private landowner whose property contains or buffers remnant natural communities can grant protective easements or take other measures to help assure the preservation of biodiversity. Chapter 8 discusses the actions available to private owners.

11.3.5 Residential property owners

Residential properties can play a role in Chicago Wilderness by providing habitat. Small yards in urban settings have limitations but they can play an effective role in enhancing bird habitat especially during the migratory season, diversifying the native species composition of urban trees and shrubs, and providing local environmental education opportunities. For those with larger lots, homeowners can provide a broader base of restoration activities with natural landscaping which creates micro-habitats for birds and insects. Natural landscaping slows runoff and increases water absorption, a hydrological impact with benefits to stream and river biodiversity and groundwater-fed wetlands.

Lots which adjoin forest preserves or nature preserves may contain native soil organisms, seed and plant stock and may be migration corridors for amphibians, reptiles, insects and other fauna. Simple restoration techniques in these situations may allow a yard to blossom into usable habitat in a very short period of time.

Lots which adjoin, share or include detention ponds can play a role in enhancing the water quality and biodiversity of our region's streams and rivers by creating wetland edges, planting deep-rooted plants on the berms and higher ground, and if designed as "dry ponds," supporting their retrofitting into wet pond/wetland habitats.

Larger lots can play an important role in regional habitat enhancement. Aside from the suggestions described above, larger residential acreages can create more diverse restorations. An increasing number of private restorations have sustained 100-200 native plant species. Larger lots can restore natural hydrological functions (e.g., total

absorption of rainwater in most storm events). They can also participate in cooperative long term natural resource management efforts with nearby forest preserves and natural area management agencies. For a list of techniques for committing private property to local environmental management initiatives, see Section 8.2.

Benefits to biodiversity are both direct and indirect. Direct benefits include providing habitat for organisms that rely on native plants for food and shelter such as butterflies and migrating birds. Indirect benefits include educating people about native ecosystems and gaining their interest and support for protecting and restoring their natural heritage. Further benefit can be provided by owners of land close to natural areas by providing native habitat that has the effect of expanding the size of the protected area.

11.4

Role of volunteers

11.4.1 Importance of volunteers

Volunteerism has a rich history in American tradition. Volunteer firefighters and paramedics continue to play essential roles in many areas even today. Legions of volunteers provide vital assistance in hospitals, museums, botanical gardens, and other institutions across the country.

In the Chicago region, volunteers have played vital roles in preserving biodiversity. Many of the member organizations of Chicago Wilderness involve volunteers in a wide variety of activities, ranging from hands-on restoration through teaching to advocacy. Volunteers often do important work that otherwise would not get done. Crucial management can sometimes be omitted or delayed because there are simply not enough staff resources available. Volunteers are motivated by knowing that species populations will die out without their help. Over the years, restoration volunteers have developed techniques and a culture that makes this work both effective and fun for thousands of people. Many volunteers have developed considerable expertise. These skilled volunteers are an important part of the conservation team of many agencies. There is room for participation by many thousands more volunteers through the various programs of Chicago Wilderness member organizations.

Volunteers provide a major resource as docents, guides, monitors, and workers. Volunteers physically clean up streams, monitor lakes and streams, maintain bird counts, support scientific studies by gathering data, and restore

native ecosystems on public land. Restoring ecosystems includes controlling exotic species, removing brush, conducting prescribed burns, and gathering, processing, and planting seeds. Considering the magnitude of the need to manage publicly owned land for biodiversity, a substantial increase in volunteer activity appears to be the only practical option. In fact, one measure of the success of this plan will be the extent to which volunteers are involved in implementing its recommendations.

Chicago-area forest preserve and conservation districts have long recognized how volunteers can help them to carry out their mission. The Illinois Association of Conservation and Forest Preserve Districts has encouraged member districts to emphasize public participation in natural-resource management by providing opportunities for volunteering. The recommendations emphasize that the districts should provide volunteer and service groups with staff support. Volunteers can be an important means of achieving the fundamental goals and purposes of conservation organizations. They are a valuable extension of paid staff and can have a powerful presence because of their numbers, distribution, and willingness to be active after business hours and on weekends.

Volunteer programs are strongest and most effective when they encourage volunteers to be deeply involved and to have a sense of real connection to the places they work. The full potential of volunteers is not simply as laborers, but as self-motivated, creative owners involved in planning, organizing, implementing, and evaluating projects. Empowering volunteers to apply their energy and creativity under the guidance of land-owning organizations offers immense potential. They are stewards of public land, acting on behalf of the public in the public interest.

11.4.2 Strengthening volunteer programs for protection and restoration of biodiversity

Volunteers should be invited to be partners in planning and implementing land management. This strengthens the ties between volunteers and the host organization and ensures consistency and continuity. Time donated by volunteers should result in accomplishing important additional tasks, not performing work otherwise expected of staff. Thus, the host organization should use volunteer help in defining and building the volunteer program itself.

Recommendations

- ✓ Land-managing agencies should invite volunteers to be partners both in planning and in implementing land management.

- **Specific actions for host organizations**

- ✓ Develop a strategy for involving volunteers. Identify functions and tasks to be accomplished by volunteers.
- ✓ Provide opportunity for personal satisfaction in accomplishing tasks that are needed for restoration. People serve as volunteers because they find satisfaction in the work. Successful volunteer programs build on this fact to accomplish the purposes of the organization.
- ✓ Remove barriers. Make it easy and inviting for volunteers to contribute time and energy. If requirements and/or qualifications are necessary, provide ways for volunteers to earn them through training or certification based on tests of ability or knowledge.
- ✓ Provide an organized context for volunteer activities. At a minimum, provide a stable set of ground rules to accommodate volunteer efforts and involve volunteer leaders in developing them.
- ✓ Encourage volunteers to adopt or take “ownership” for specific functions or places.
- ✓ Identify a specific person within the host organization as the central contact for volunteers.
- ✓ Provide recognition for volunteers regularly.
- ✓ Provide support for a volunteer newsletter and related communications that offer education and information on volunteer opportunities.
- ✓ Provide tools or other necessary resources where possible.
- ✓ Provide opportunities for face-to-face contact between volunteer leaders and organization staff.
- ✓ Provide support with heavy equipment operated by staff if needed and possible.
- ✓ Develop long-term site plans for restoration and protection and annual work plans for activities to complete them. Include volunteers in the planning process and identify their role clearly.
- ✓ Have experienced volunteer leaders, trained and certified by the landowning agency, provide on-site supervision of most volunteer activities.

- **Training and certification**

- ✓ Develop criteria for various functions and tasks and facilitate training to ensure expertise in them.
- ✓ Certification is appropriate for some activities, including applying herbicide on public land and

participating in prescribed burns. In such cases it is important to establish clear requirements and the means of meeting them such as training or testing at convenient times and places.

- **Volunteer leaders**

- ✓ Leadership among volunteers develops as people gain experience and knowledge. Those willing to accept and provide leadership should be encouraged to do so and should be given added responsibility and recognition.
- ✓ The Volunteer Stewardship Network (see below) should be supported and recognized as a valuable asset in developing leadership, expertise, and overall membership in conservation programs.

11.4.3 Citizen scientists and the Volunteer Stewardship Network

An important type of volunteer is the citizen scientist, who enjoys learning scientific aspects of the local ecology. Such individuals may become involved in education, monitoring, research, or various stewardship activities. They represent a major resource and are often core members of volunteer programs.

The Volunteer Stewardship Network is an unincorporated organization of self-motivated site stewards and citizen scientist/ecologists who have worked with many land managers to lead ecosystem protection and restoration. These volunteers, who serve as leaders for thousands of other volunteers in our region, work to maintain communication among their groups and to build collective expertise. As volunteers become more invested in the success of natural-areas management and assume leadership roles within the network, they both strengthen the network and increase the number and quality of volunteers.

The Illinois EcoWatch Network is a volunteer ecosystem monitoring program coordinated through the Illinois Department of Natural Resources, Division of Energy and Environmental Assessment. EcoWatch volunteers are trained as Citizen Scientists to monitor streams, forests/woodlands, prairies, wetlands, and urban green spaces using biological indicators. EcoWatch arose from research indicating a need for monitoring data collected at a large number of sites using systematic and consistent methods. EcoWatch monitoring programs were designed by state scientists who are responsible for analyzing the data collected, with input from the broader scientific community.

11.4.4 Examples of successful volunteer programs

One example of a successful volunteer-driven program is the Mighty Acorns. This educational program involves many adult volunteers, working through twelve partner agencies, who work with schools to introduce grade-school children to natural areas and to adopt a field site that they visit three times each year during different seasons. Working in groups of five to seven per adult volunteer, the children participate in restoration work such as removing weeds and brush or gathering and planting seeds. This hands-on approach with ample instruction brings children into contact with nature in a way that most have not experienced.

Other very successful local volunteer programs include the Butterfly Monitoring Network, the Orchid Recovery Project, the Bird Conservation Network, EcoWatch, the Interreligious Sustainability Project, and many groups engaged in on-the-ground ecological restoration in every county in northeastern Illinois as well as several counties in Indiana.

11.5

Conflict resolution and intergovernmental cooperation: recommending a comprehensive process for managing growth

One of the thorniest issues in the management of public lands is how to satisfy competing user groups. Those who enjoy active outdoor recreation such as horseback riding, biking, and field sports often find themselves competing with those who wish to see fragile natural areas left undisturbed. Transportation planning often pits the need for transportation facilities against land-use plans and the need to protect natural resources. Since governmental agencies have an obligation to serve all reasonable interests, the resolution of disputes over use can become an arduous process. Various conflict-resolu-

tion processes have been developed, but, at all geographic scales from region-wide transportation planning to site design, the best outcomes usually involve creative planning and compromise among all interested parties. A purpose of this plan is to heighten local officials' understanding of biodiversity and its dependence on place. Officials must know how to value local habitats and ecological functions so that they can be fully considered in dealing with controversies and competing pressures.

Governments, too, frequently compete for land. Annexation disputes and disagreements over proposed uses of land are common. One frequent course of action has been to develop intergovernmental boundary agreements well in advance of actual land development. The municipalities in the corridors for the proposed extensions of the north-south toll road in Lake and Will Counties have recently negotiated non-binding intergovernmental agreements on the future uses of land, including the designation of permanent open spaces. The municipalities in the vicinity of the proposed third airport in Will County have done the same. The effectiveness of these agreements has yet to be tested, as none of these projects has yet received final approval for construction.

To further the goals of this plan and to establish a smart and equitable approach to resolving conflicts, we recommend a coordinated, intergovernmental, region-wide, comprehensive process for managing growth. Appendix 10 contains a recommended set of procedures for establishing and carrying out such a process. To make this recommendation tangible, the Appendix uses an example of planning a transportation corridor (the example presented is for a major arterial corridor, such as Strategic Regional Arterial, where complex, intergovernmental issues call for such a process). This example illustrates the actions, procedures, and considerations that should be included to ensure careful weighing of a full set of values and outcomes before making decisions. The recommendations in the example apply to residential-area planning, planning for economic development, and open-space planning.