



# Hidden in Plain Sight

The Role of Plants in  
State Wildlife Action Plans



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## The Role of Plants in State Wildlife Action Plans

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State wildlife action plans, completed in 2005 by all U.S. states and territories, are designed to guide wildlife conservation efforts and have been described as a nationwide strategy to prevent wildlife from becoming endangered. Developed by the individual states based on the best available scientific information and on broad public engagement, these plans are increasingly important in a wide variety of conservation and planning efforts. Yet the federal guidelines governing development of these plans specifically exclude plants from the definition of “wildlife.”

How well, then, do wildlife action plans consider plant species and—whether by design or serendipity—address their conservation needs? With support from the Doris Duke Charitable Foundation, NatureServe reviewed all 56 wildlife action plans in order to answer this question.

Our study found that only a modest number of wildlife action plans explicitly incorporated plant species of conservation concern into various aspects of their planning process. Just eight of 56 plans (14%) took the most direct approach of including plants on their list of species of greatest conservation need. Another way of addressing plants was through the process for identifying priority habitats. We did not find strong support for the assumption that the habitat component of these plans would effectively address plant-related conservation needs. Just six plans (11%) considered plant species of concern in their methods for setting habitat priorities.

Fewer than half the states identified specific geographic areas of particular conservation interest. Twelve plans (21%) included plant species of concern in their methods for defining these focal areas, generally relying on plant data maintained by state natural heritage programs. The final way that some plans addressed plants was through recommended conservation actions. We found that 17 plans, or about one-third (30%), included at least one action item that, if carried out, would benefit plant species of concern. In most plans, however, the number of plant-related actions was quite limited, and the proposed activities very general in nature.

The development of state wildlife action plans represents a tremendous opportunity for systematically and strategically advancing conservation in America, and the plans for Georgia, Missouri, Nebraska, and Oregon are notable for effectively addressing the needs of plant species of concern. Yet because consideration of plants was neither required nor funded through the federal State Wildlife Grants Program, the first generation of wildlife action plans collectively do not constitute a national strategy for stemming the decline of the nation’s plant life and preventing additional species of native flora from becoming endangered.

## Recommendations

- Promote implementation of actions and strategies for wildlife that would also benefit plant species of concern.
- Avoid implementation actions that could be detrimental to sensitive plant species.
- Add plant-specific components to existing wildlife action plans.
- Develop state-level plant conservation strategies to complement wildlife action plans where necessary.
- Ensure that plants are fully represented in major new conservation funding opportunities, including those related to climate change adaptation.

Plants have too long been hidden in plain sight. The prospect of continued threats to the nation’s plant life, coupled with the large proportion of the flora already at risk, argues that now is the time to bring plants out from the background, and to put the conservation needs of our nation’s flora squarely into view.

## Introduction

Conservation in America entered a new era in 2005 with the completion of wildlife action plans in all U.S. states and territories. Although differing from one state to another, the plans all are designed to provide a strategic blueprint for guiding wildlife conservation efforts. In particular, the plans are designed to protect each state's wildlife species before they become threatened or endangered. With support and guidance from the U.S. Fish and Wildlife Service and the Association of Fish and Wildlife Agencies, these plans were developed by the individual states based on the best available scientific information and on broad public engagement. These state-based plans collectively have been described as forming a "nationwide strategy to prevent wildlife from becoming endangered."<sup>1</sup>

With plans now in place across the country, focus is shifting to implementation—carrying out priority actions and activities. The plans are proving to be an effective means for bringing the needs of wildlife to the attention of diverse audiences. Because of their nationwide availability and federally sanctioned status, the plans increasingly are being used to reflect the needs of biodiversity and at-risk species generally, and are becoming a primary means by which conservation perspectives are built into a broad array of land use, development, and resource management policies.

The use of wildlife action plans to inform and influence such efforts is a very positive development, and one that has the potential to significantly advance conservation efforts nationwide. As these plans become embedded in a broad range of decision processes it is important to understand what the plans address, and what they do not. Of particular interest to many conservationists is the way in which plant life, an enormously important component of the nation's wild legacy, are addressed in the wildlife action plans. Indeed, plants represent more than half (56%) of species federally listed as threatened or endangered.

"Wildlife," under federal guidelines governing development of these action plans, is defined exclusively as free-ranging fauna. These guidelines explicitly note that "species of greatest conservation need"—the set of species that largely determine a plan's priority habitats, areas, and actions—"must be fauna and not flora."<sup>2</sup> Although plants as species are excluded from consideration under these guidelines, the plans are required to identify priority habitats, providing another avenue for plant life to be considered as part of the plans. Priority habitats, however, are defined specifically in terms of their value to animal species ("essential to the conservation of ... species of greatest conservation need").<sup>3</sup>

The states were allowed considerable flexibility in developing their action plans, so that they could be adapted to local needs and conditions. While State Wildlife Grant guidelines precluded expenditure of federal funds to consider plant species in the plans, the states were not *prohibited* from addressing plant species of concern in their plans. In an effort to be truly comprehensive in their conservation planning, some states did just that.

Understanding what will be required in order to conserve the nation's full array of wild species requires that we understand the degree to which the current generation of wildlife action plans take plants into consideration. This report examines how plant species of concern were treated in this first round of wildlife action plans, to determine whether — by design or serendipity — plants are likely to be well-served by implementation of these plans. Such an understanding can then allow conservationists to identify what additional or complementary efforts will be required to ensure the conservation of our nation's full array of wild species.

## Hidden in Plain Sight: America's Extraordinary Flora

Plants are all around us. Our trees, shrubs, and grasses largely define how we see and experience the natural world. With their remarkable ability to capture solar energy and convert it into the carbon-based fuel on which life depends, plants are also the foundation upon which rests virtually our entire food chain, sustaining—directly or indirectly—humans as well as wildlife. Yet despite the centrality of plants to our very existence, their presence is often taken for granted, and to many the vast array of plant species blur into an undifferentiated green mass. As if the subject of a continental-scale magic trick, America's extraordinary flora all too often is hidden in plain sight.

With its enormous geographic span, varied climates, and diverse terrains, the United States is fertile territory for wild plant life. From diminutive arctic willows in the north to swaying palm trees in the south, and from carnivorous bog plants in the southeast to ephemeral wildflowers in the desert west, America harbors an exceptional range and variety of plants. Vascular plants—which may be thought of as the “vertebrates” of the plant world and consist of flowering plants, conifers, and ferns—have more than 16,000 distinct species across the 50 states. Among these are some of the tallest living organisms on earth (coast redwood, *Sequoia sempervirens*), some of the oldest (bristlecone pine, *Pinus longaeva*), and some of the most massive (aspen clones in the Rocky Mountains, *Populus tremuloides*). Yet for each well-known and “charismatic” member of our national flora, there are hundreds more plant species—from trees to herbs—forming the very fabric of our ecosystems and enriching the genetic diversity of our landscapes.

Wild flora share many of the same management issues as wild fauna. The botanical equivalent of game species exist, including plants such as American ginseng (*Panax quinquefolius*) and black cohosh (*Actaea racemosa*), which are prized for their medicinal values, or savory plants like the onion-like ramps that are sought out for the plate. As with animal-based wildlife management, plants too are subject to poaching. Cactus rustling, for instance, continues to be a problem in the southwest, while the passion for illicit wild orchid collecting was aptly profiled in the popular movie *The Orchid Thief*.

The major risks to our floristic heritage, however, relate not so much to over-harvesting or poaching of select species, but rather to many of the same factors causing broad declines in the nation's wild animals. Destruction or alteration of habitats, spread of invasive alien species, emergence of lethal diseases, and increasingly, shifts in climate, all are taking a toll on the nation's plant life. Because they are rooted in place, plants can't move out of the way of an oncoming bulldozer, or take shelter until danger passes. And because many rare plants are highly localized, growing only in very specific soils or micro-climates, they are particularly susceptible to being wiped out, often without anyone's knowledge. They are, in effect, hidden in plain sight.

The diversity of plants across America follows patterns similar to those of many animal groups, with the greatest number of species found along our southern borders and Pacific Coast states (Figure 1). California leads the nation with more than 5,400 native species, followed by Texas with more than 4,500 (see Appendix A for full state rankings of diversity and risk). Sheer numbers are not the only measure of biological importance, however. Hawaii, for instance, ranks second to last among states for total number of native plant species with fewer than 1,200. Because they evolved on the islands in isolation, however, most of these are found nowhere else on Earth, and the state ranks first in the nation for risk, with an astonishing 83% of its native plants of conservation concern (Figure 2, Appendix A). Other states with significant levels of risk include such southwestern states as California, Utah, Nevada, and Arizona, as well as southeastern



Only a few hundred individuals of the striking Sandhills lily (*Lilium pyrophilum*) are known to exist. Susceptible to collecting pressures, this rare plant is also threatened by fire suppression and loss of its limited habitat. / Photo © Johnny Randall, North Carolina Botanical Garden.

states like Florida and Georgia. Yet each state has a rich floristic heritage, and each has important responsibilities for conserving its plant diversity.

Why should we care about the loss of these species, many of which can only be distinguished by specialists? How many plant species are actually needed in order to provide wildlife with habitat and to perform other essential ecosystem functions? Although there is no way to accurately predict the consequences of losing any particular species, numerous past experiences suggest that loss of even relatively rare species can reduce ecosystem resilience, in some cases leading to dramatic ecosystem-level changes. For example, Fraser fir (*Abies fraseri*) is a rare tree species restricted to just seven mountain areas in the southern Appalachians. Loss of mature fir trees due to a variety of natural and human-induced causes has had cascading effects, leading to overall declines in high-elevation spruce-fir forest. North Carolina's wildlife action plan has identified such declines as cause for concern in sustaining key wildlife species dependent on those habitats, such as the northern flying squirrel.<sup>4</sup>

Plants are essential to both wildlife and humans through provision of such key services as food, shelter, fiber, and medicine. But the imperative to conserve America's extraordinary diversity of plants transcends these prosaic values: by offering aesthetic and even spiritual sustenance, protecting our wild flora goes to the heart of the human condition. Yet without focused conservation attention to the growing plight of the nation's plant species, we are at risk of losing significant portions of our wild heritage, and the ecological resilience that comes with that diversity.

FIGURE 1  
Number of Native Plant Species  
by State

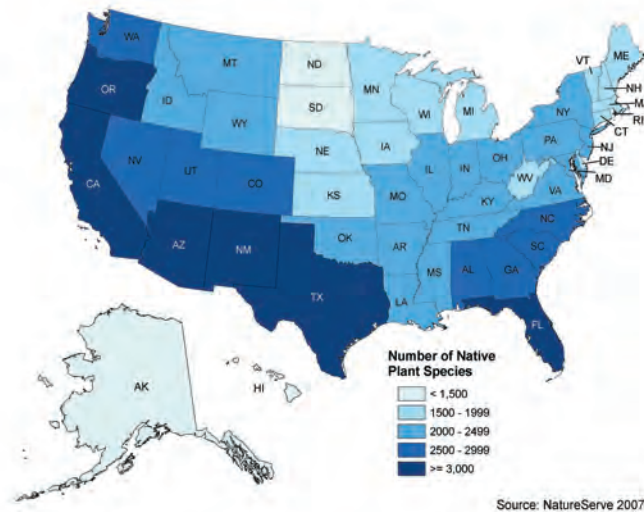
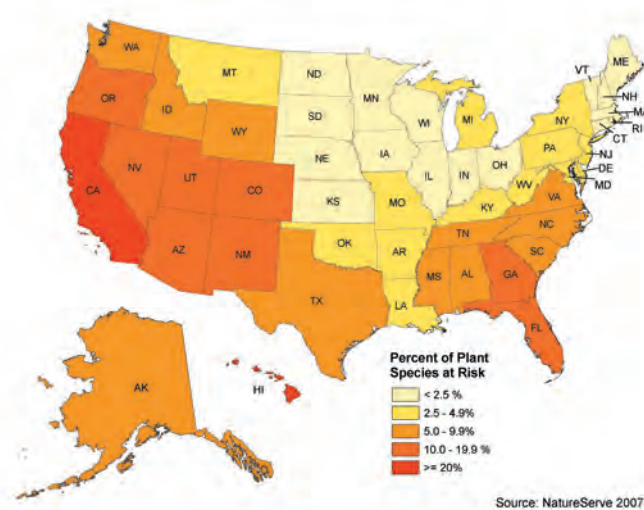


FIGURE 2  
Percent of Plant Species At Risk  
by State





State funding for wildlife conservation historically has come from user fees borne by the hunting and fishing communities, including such revenue sources as excise taxes on hunting equipment under the 1937 Pittman-Robertson Act, and fishing gear under the 1950 Dingell-Johnson Act. Because of their origin, these funding sources focus on conservation and restoration of game species harvested by hunters and anglers.

Concern for non-game species took on a new life in the early 1970s with passage of the federal Endangered Species Act, which created new funding opportunities directed towards protecting and recovering wildlife species in imminent danger of extinction. Most wildlife species, however, are neither the target of fishing and hunting, nor have yet declined to the point where they are eligible for endangered species protections. As a result, few traditional financial resources have been available for conservation of the vast majority of wildlife species. Nonetheless, it has become clear that investing in the conservation of species while they are still abundant is far more cost effective than carrying out heroic and expensive measures to resurrect them once they have become threatened or endangered. As in human medicine, an ounce of prevention is worth a pound of cure.

The State Wildlife Grants Program was developed in an effort to bring just such a preventive approach to management and conservation of the nation's wildlife. By addressing the needs of the many non-game species that historically have not been well-served, the program was designed to help species from becoming endangered through a simple premise: keep common species common.

Since 2000 when the State Wildlife Grants Program and the related Wildlife Conservation and Restoration Program were enacted by Congress, more than \$400 million in new federal funds have been made available to the states for wildlife conservation, including development and implementation of state wildlife action plans. (Several names have been used for these documents over the course of these programs; in this report we refer to them as "wildlife action plans"). Under the terms of the programs, states were required to submit these action plans to the U.S. Fish and Wildlife Service for review and approval by October 2005. All states and territories now have approved wildlife action plans in place.

A plan's approval by the U.S. Fish and Wildlife Service was contingent on the inclusion of eight required elements (see box on page 6). Although guidelines for developing the plans and for addressing these core elements were developed under the auspices of the U.S. Fish and Wildlife Service and the Association of Fish and Wildlife Agencies, the states were provided with considerable flexibility in how the actual plans were developed. As a result, plans reflect many different approaches, and vary considerably from state to state.

Given the growing importance of wildlife action plans in a wide variety of conservation and planning efforts, there is considerable interest in understanding the degree to which these plans considered plant species—particularly those of conservation concern—and addressed plant-oriented conservation needs. With support from the Doris Duke Charitable Foundation, NatureServe reviewed all 56 wildlife action plans to document the various ways in which plants were incorporated into these efforts.

## Methods

For our review of the plans, we developed a framework against which each plan was evaluated, considering four major mechanisms by which plant species may have been addressed in the plans. This framework considers whether or not plant species of conservation concern are explicitly:

# A Botanical Review of State Wildlife Action Plans

## Eight Required Elements of Wildlife Action Plans

Congress asked states to address eight core elements in their plans in order to conserve all wildlife, with a focus on wildlife of greatest conservation need.

1. Information on the distribution and abundance of **species of wildlife**, including low and declining populations, that describes the diversity and health of the state's wildlife.
2. Descriptions of locations and relative conditions of **habitats and community types** essential to species in need of conservation.
3. Descriptions of **problems** that may adversely affect species or their habitats, and priority research and survey efforts.
4. Descriptions of **conservation actions** proposed to conserve the identified species and habitats.
5. Plans for **monitoring** species and habitats, and plans for monitoring the effectiveness of the conservation actions, and for adapting these conservation actions to respond to new information.
6. Descriptions of procedures to **review** the plan at intervals not to exceed ten years.
7. **Coordination** with federal, state, and local agencies and Indian tribes in developing and implementing the wildlife action plan.
8. Broad **public participation** in developing and implementing the wildlife action plan.

Source: Adapted from *State Wildlife Action Plans: Working Together to Prevent Wildlife from Becoming Endangered*.<sup>5</sup>

- included as “species of greatest conservation need”;
- included in the process used to identify priority habitats;
- included in the process used to identify focal areas; or
- the subject of one or more proposed conservation actions.

We evaluated each plan against this framework, with particular attention to the most relevant sections of the plans (e.g., species of greatest conservation need lists, actions lists, and habitat and focal area definition and priority-setting methods). We also noted where plant species of concern (or plant conservation) were discussed elsewhere in a plan. Because implementation of the plans will largely take place on the ground, often in plan-defined focal areas, we also carried out a spatial analysis to document the degree to which the distribution of plant species of concern overlapped, whether by design or coincidence, with these focal areas.

To ensure accuracy in our interpretation, we sent the results of our plan assessments to the wildlife diversity and wildlife action plan implementation contacts in each state for their review and comment. In our communications with these reviewers, we indicated how we had scored their plan with regard to each framework question, and referenced the specific plan language on which this interpretation was based. We also highlighted instances of ambiguity, and requested clarification of those cases. Finally, we provided the opportunity for respondents to provide perspectives and additional information on the relationship of their action plan to the conservation of plant species in their state, including follow-on activities. A tabular summary of our plan reviews can be found in Appendix B. We are deeply grateful to the many state agency staff that took time to review our assessments and inform us of plant conservation-related developments in their states.

## Plants as Species of Greatest Conservation Need

While the state wildlife action plans are intended to address the full array of wildlife and wildlife-related issues, Congress directed that they focus on “species of greatest conservation need” (SGCN). Embodied as the first required element of the plans, the determination of the SGCN list largely drives other aspects of the plan. For example, the identification of priority habitats or focal areas is largely based on what is needed to sustain species of greatest conservation need. Similarly, other elements of the plans — such as description of problems, proposed actions, and plans for monitoring—are largely derived from the needs of those species. The state agencies responsible for developing the wildlife action plans were given great latitude in how to identify wildlife species that—from that state’s perspective—would be considered to be “of greatest conservation need.” These lists were to include species with low or declining populations and/or those that, in the view of the state agency, are indicative of the diversity and health of the state’s overall wildlife.<sup>6</sup>

Federal guidance noted that the lists could include species already protected under federal or state laws as threatened or endangered, and could draw from other lists of species of concern. The states were encouraged to make full and effective use of existing information resources, and at least 44 plans used species status assessments from state natural heritage programs as a key source of such information.<sup>7</sup> Although the states were given considerable flexibility in designating species of greatest conservation need, the guidelines were unequivocal in one regard: “these species must be fauna, and not flora.” Nonetheless, several states felt strongly about the need to include plants on their lists of

species of greatest conservation need, and used alternative funding sources to do so.

Eight plans (14%) included plants on their list of species of greatest conservation need (SGCN). These consist of six states—Georgia, Hawaii, Missouri, Nebraska, Oregon, and Vermont—and two territories—Guam and U.S. Virgin Islands (Figure 3, Table 1).

Among those plans that included plants on their SGCN lists, the approaches for determining botanical SGCN varied considerably. Perhaps nowhere in the nation are plants as much a part of the conservation mainstream as in **Hawaii**, and how the Hawaiian SGCN list came to include plants is revealing. The initial list focused exclusively on animals, consistent with federal guidelines. As described in Hawaii’s plan, “...a consistent theme during public review was the recommendation to include native flora on the list of SGCN.” The planning team responded to public input by developing a process for incorporating plants on the list. Plants placed on the list included those with status under the federal Endangered Species Act, those previously identified as “genetic safety net” species (i.e., with fewer than 50 individuals), and those regarded as important elements of native habitats, which included providing essential food or habitat for native animals. This process resulted in a list of over 600 species, including each of the more than 100 species of algae endemic to the state.

In **Missouri** the SGCN list overall draws directly from the state’s checklist of Species and Communities of Conservation Concern, which at the time of plan submission included 632 plants. This checklist is developed by the Missouri Department of Conservation in collaboration with specialists across the state, and reflects those species being actively tracked by the state’s natural heritage program. Similarly, the **Vermont** plan’s 575 plant SGCN are based the state natural heritage program’s status assessments, focusing on those species ranked at the state level as critically imperiled (S1) or imperiled (S2). The Vermont plan accords high priority, however, only to those plants also considered rare regionally by the New England Plant Conservation Program.

**Nebraska**’s list of more than 300 plant SGCN also started with natural heritage program assessments, and includes all species with a state conservation rank of critically imperiled (S1), imperiled (S2), or vulnerable (S3). The Nebraska plan, however, distinguishes between Tier I and Tier II species as a means of focusing attention on those plants

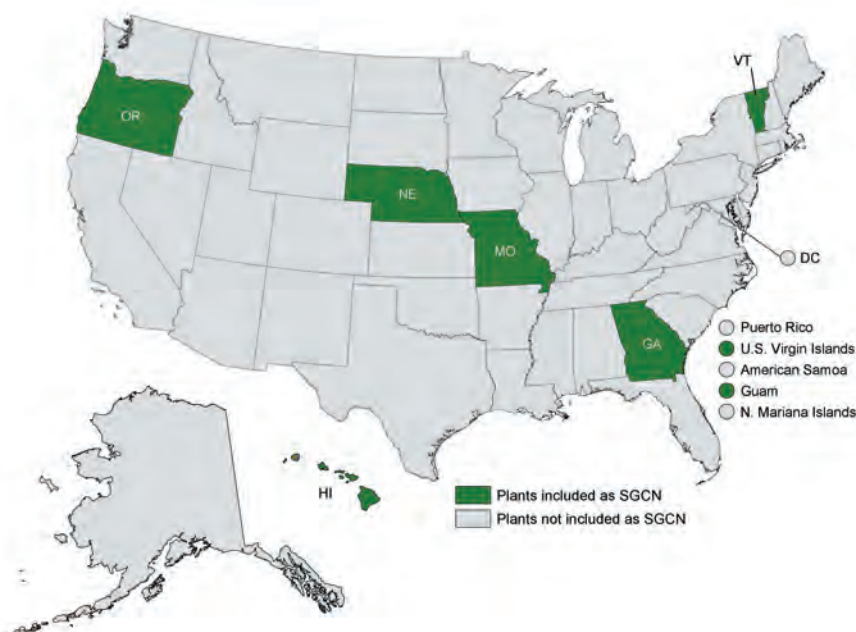


FIGURE 3  
Plants as Species of Greatest Conservation Need (SGCN) in State Wildlife Action Plans

TABLE 1  
Summary of Plants on Lists of Species  
of Greatest Conservation Need

State or Territory	Native Vascular Plants	Plants on SGCN List	Composition of Plant SGCN
Georgia	2,981	323	Vascular plants: 264 species, 41 subspecies/varieties. Mosses: 7 species, 1 variety. Liverworts: 8 species. Lichens: 2 species.
Hawaii	1,174	628	Vascular plants: 442 species, 77 subspecies/varieties. Algae: 102 species, 7 varieties. 177 species identified as highest priority.
Missouri	2,061	632	Vascular plants: 390 species, 109 subspecies/varieties. Mosses: 106 species, 8 varieties. Liverworts: 18 species, 1 subspecies.
Nebraska	1,554	388	Vascular plants: 345 species, 43 subspecies/varieties. 20 species identified as Tier 1 species.
Oregon	3,159	60	Vascular plants: 49 species, 11 subspecies/varieties.
Vermont	1,610	575	Vascular plants: 323 species, 20 subspecies/varieties. Mosses: 161 species, 7 varieties. Liverworts: 56 species, 8 subspecies/varieties.
Guam	327 <sup>8</sup>	11	Vascular plants: 11 species.
U.S. Virgin Islands	~950 <sup>9</sup>	61	Vascular plants: 60 species, 1 hybrid.

*Note: Number of native vascular plants from NatureServe Central Databases 2007, except for Guam and U.S. Virgin Islands.*

(and animals) in greatest need. Tier I species reflect those that are globally or nationally at-risk, while Tier II species may be at-risk within Nebraska but are apparently doing well in other parts of their range. Just 20 plant species passed the Tier I filter, which included species that are state endemics, listed under state or federal endangered species laws, or regarded by NatureServe as globally at risk (G1, G2, or G3).

**Oregon's** SGCN list of 60 plants included only species listed as threatened or endangered under the state's Endangered Species Act. These reflect the specific priorities of the state Department of Agriculture's Native Plant Conservation Program, which has jurisdiction over native plant conservation in Oregon.

**Georgia** was the only state to assemble a full "species technical team" to review, revise, and update the status assessments of its plant species of conservation concern. While such broad-scale reviews and updates were routine for assessing animals in many states—and reflect a signature achievement of the wildlife action planning process—Georgia was the only state to extend this level of treatment to its flora. The technical teams began with species of concern lists generated by the state's natural heritage program, and evaluated these against such factors as global and state rarity, range in Georgia, endemism, threats and trends, and importance of Georgia's efforts to the overall conservation of the species.

## Plants in Setting Habitat Priorities

**W**hile the wildlife action plans were charged with identifying species of greatest conservation need, there was a clear expectation that much of the emphasis would be on the habitats that support and sustain the full array of a state's wildlife species. Indeed, with loss or deterioration of habitat as the primary cause of species declines, a focus on habitats and their conservation is essential.

The specific requirement was for the states to describe the location and condition of key habitats and community types essential to the conservation of the species of greatest conservation need. Many states used habitat as a central organizing theme in the development of their plans, recognizing the reliance of multiple species on similar habitat types. There was, however, wide variation in the approaches used for identifying and characterizing habitat types. While some states developed detailed maps of priority habitat types, and in some cases mapped out all habitats, other plans did not include any spatial information on the location of key habitats, instead choosing to address this in text format.

One argument put forth for not including plant species in the State Wildlife Grants Program legislation was that plants are primary components of habitats, and therefore would be well covered under the habitat provisions of the planning process and grants program. Although it is true that for most terrestrial habitats, plants are at the base of the food chain and provide much of the structure for shelter, it is not necessarily true that the habitats essential to animal species of concern will coincide with those of plant species of concern. To explore how well the habitat components of wildlife action plans addressed the habitat needs of plant species of concern, we reviewed each of the plans for the role plants played in the process for defining and identifying priority habitats.

Habitat was addressed in all plans, and 32 set clear priorities, emphasizing some habitats over others. Of the 32 plans that set habitat priorities, six, or 11% (Georgia, Missouri, Oregon, Texas, Guam, and American Samoa) explicitly included plant species of concern in their methods for setting the priorities (Figure 4).

The methods for setting habitat priorities varied considerably across the states. **Georgia**, for instance, detailed habitat requirements for each SGCN (including plants) and synthesized those descriptions to identify habitats of most overall significance to the state's species of greatest conservation need. **Oregon** took a fine-filter/coarse-filter approach to identifying priority habitats, with plant species of concern most comprehensively considered in the identification of the "specialized and local" habitats that embodied the fine-filter. Identification of these specialized habitats included consideration of plant species of concern among several other factors, and "rare plants" generally were mentioned in the descriptions of over one-third of them.

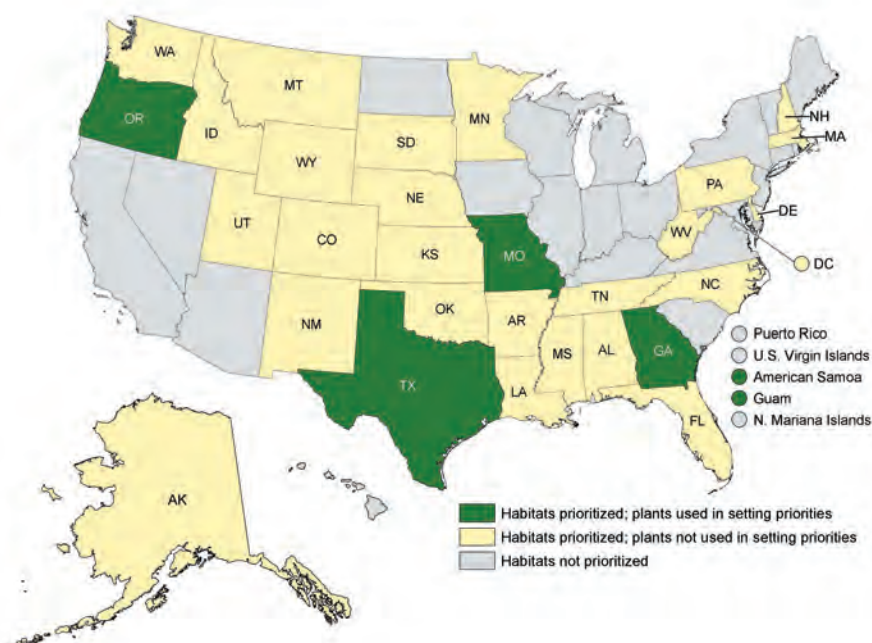


FIGURE 4  
Use of Plants in Setting Habitat Priorities



Habitats crucial for rare plants, such as pitcher plant bogs, were not always well-represented among habitats identified as priorities for wildlife. / Green pitcherplant (*Sarracenia oreophila*) photo © James E. Henderson.

Texas used a very different approach, focusing on priority ecoregions as well as on two priority habitats that cross multiple ecoregional boundaries—native prairies and grasslands, and riparian habitats. The prioritization of these habitats and ecoregions appears to take into account their relative importance for rare plants and plant biodiversity. Missouri followed a conservation planning approach in which explicit conservation targets were identified, which included landscapes, natural communities, and habitats. The state was divided into distinct ecological units with targets identified for each. Plant species of concern were an important component of the terrestrial assessment process used in Missouri for identifying these targets, or priorities. In Guam, best professional judgment apparently was employed to identify the three of the island’s eight habitat types that were considered “most important” to the island’s SGCN, which included plants. In American Samoa, “critically threatened” habitats were a priority, defined as habitats with very limited distributions, high uniqueness, rare plants, or high rates of loss.

Because a plan did not explicitly incorporate plant species of concern in their habitat priority-setting process does not necessarily mean that the resulting priorities are not meaningful for plants in need. Most priority setting processes considered such important factors as fragmentation and other threats, amount of habitat already lost, and amount already in protected status. Yet, the resulting lists of priority habitats sometimes were not reflective of priorities one might highlight if plant species of conservation concern were specifically taken into account. As one example, bog habitats in Mississippi support at least six globally imperiled plant species. The process used for setting habitat priorities in that plan was consistent with federal guidelines, yet pitcher-plant flat/bogs ranked 21st of 29 terrestrial habitats evaluated, behind such habitats as pine plantations (15th) and agriculture fields (20th). As another example, in Utah bare rock, talus, and scree habitats support a remarkable 58 globally imperiled plant species. Such “rock” habitats were ranked 22nd of 25 habitats examined, again behind agriculture, which ranked 13th.

## Focal Areas as Opportunities for Plant Conservation

Beyond identifying priority habitats, a number of states also identified specific geographic areas of particular conservation interest, as a means to focus plan implementation efforts. While identification of such focal areas was not a formal requirement, at least 23 plans included some variation on the theme of focal areas in their action plan submissions. Considerable differences exist in the methods used to delineate such areas, as well as the intended use of the resulting maps. Some states designated only very general regions, designed to serve as a guide to regional conservation efforts, while other states identified very specific and precisely mapped sites. Beyond differences in geographic specificity, some plans identified separate focal areas for terrestrial and aquatic features, while others considered terrestrial and aquatic targets together in defining their focal areas.

Of the 23 plans that identified focal areas, 12 (21% of all plans) explicitly included plant species of concern in their methods for defining these areas. This included nine states—Alabama, Georgia, Illinois, Maine, Missouri, Nebraska, New Hampshire, Oregon, and Washington—and three territories—Puerto Rico, Guam, and American Samoa (Figure 5).

Plans that explicitly included plant species of concern in their focal area delineations generally did so by using natural heritage plant element occurrences, or a derivative of these data.

Among states that used plant element occurrences directly, Missouri and Nebraska drew inspiration from The Nature Conservancy’s (TNC) experience in ecoregional as-



At the heart of this issue is the degree to which geographic priorities based on the needs of one set of organisms may correspond with the needs of other organisms. The use of one group of organisms as surrogates for other, often less well-known groups, is common in conservation practice. Reviews of the concordance of species richness and endemism patterns among different sets of organisms have found considerable divergence in such distributions, however, and little support for the effectiveness of flagship, umbrella, or indicator species as surrogates.<sup>11</sup> Nonetheless, at the geographic scale of focal areas in many states, even plans that did not explicitly use plant species data might be expected to include some at-risk plant species that might benefit from conservation opportunities in these areas. To explore this issue, we identified several states with clearly demarcated focal areas and carried out a geographic information system (GIS) analysis of plant species of concern based on locational data from state natural heritage programs.

In screening action plans for possible use in this analysis, we used the following criteria:

- focal areas were defined for the entire state;
- focal areas were defined as part of the wildlife action plan process (vs. reference to priority areas from other planning efforts);
- maps could be used as depicted in the action plan (i.e., it was not necessary to combine data or map layers to derive an overall set of focal areas); and
- maps contained clear boundaries distinguishing focal vs. non-focal areas.

In selecting the seven states that were the subject of these analyses, we also sought a geographic balance, as well as a mix of plans to include some that explicitly used plant species in focal area definitions, and some that did not.

For this analysis we focused on plant species that are at-risk rangewide. This translates into species, subspecies, or varieties in a given state with global conservation status ranks of historical, critically imperiled, imperiled, or vulnerable (GH to G3, or TH to T3), and for which the state natural heritage program maintains at least one mapped element occurrence in its database. Mapped occurrences of these plants were then compared in a geographic information system with the boundaries of action plan focal areas. Because most focal area boundaries are general in nature, rather than specific (e.g., based on cadastral units), we used a very inclusive threshold for defining “capture” of a species in a focal area, considering any level of overlap to constitute inclusion. Such an approach will also tend to maximize the number of species reported to be included.

TABLE 2  
Coverage of Plants in Focal Areas

State	Percentage of Species Included	Number of Plant Species Analyzed	Percentage of State in Focal Areas	Efficiency Ratio	Plants in Focal Area Methods
Nebraska	100.0%	17	31.2%	3.20	Yes
Missouri	98.1%	53	35.9%	2.73	Yes
Georgia	94.6%	223	13.8%	6.87	Yes
Tennessee	92.1%	126	21.9%	4.20	No
Oregon	83.5%	267	26.1%	3.20	Somewhat
North Dakota	77.8%	9	27.0%	2.88	No
Montana	61.5%	78	56.8%	1.08	No

*Notes: “Percent species included” is defined as percentage of plant species of concern with at least one element occurrence included in the action plan-defined focal areas. “Number of plant species analyzed” is the total for the state used in this analysis (these figures were generated based on the above-described criteria, and are not necessarily the same as the number of plants identified in a plan as Species of Greatest Conservation Need). Efficiency Ratio = % Species Included / % State in Focal Areas.*



In analyzing these data (Table 2), we assessed not only the proportion of plant species of concern that were included in one or more focal areas in a state, but also how “efficient” the set of focal areas was as a whole for capturing the full suite of plant species of concern. As an example, a set of focal areas covering 25% of the state that captured all plant species of concern would be regarded as twice as efficient as a set of focal areas capturing the same number of species but covering 50% of the state. In this context, an efficiency ratio (ER) was calculated by dividing the percent of plant species of concern included in a plan’s focal areas, by the percent of the state covered by focal areas.

Among the states analyzed, the capture of plant species in focal areas ranged from 100% in Nebraska to 61.5% in Montana (Table 2). Not surprisingly, the top three states for inclusion of plant species of concern in their focal areas (Nebraska, Missouri, and Georgia) all explicitly used plants in their methods for identifying and defining focal areas. Nebraska scored a perfect 100% inclusion, although this represents a limited number of plant species of concern (17) and the plan defined relatively large focal areas. The divergence from 100% in capture rates for Missouri and Georgia may have to do with slight differences in how plant targets were defined for this analysis and in those planning efforts. Tennessee scored remarkably well in capturing plant species of concern (92.1%), considering that plants were not used explicitly in that state’s focal area definition process.

With respect to efficiency, Georgia ( $ER = 6.87$ ) clearly stands-out, capturing nearly all plant species of concern in just under 14% of the state’s surface area. Tennessee ( $ER = 4.2$ ) also performed extremely well with respect to efficiency. Montana’s Tier One focal areas, covering more than half (56.8%) the state, exhibited a relatively low efficiency ratio of 1.08.

Several caveats apply to this spatial analysis. First, simply falling within the defined boundaries of a focal area does not guarantee that conservation actions will benefit a given plant species. This is particularly true in focal areas that are large and regional in nature. Second, we considered a species “included” if just a single occurrence fell within any focal area. Long-term persistence of a species usually depends on multiple viable populations, and so even if a single occurrence benefits from conservation efforts in the focal area, that may not be sufficient to assure the survival of the species as whole. Nonetheless, the degree to which plant species of concern overlap with these boundaries provides an indication of the opportunities available for plant conservation in these focal areas. Finally, efficiency as calculated here, is tied closely to the overall size of a plan’s focal areas. While a relatively constrained focal area footprint, with tightly circumscribed sites, may be highly efficient, other conservation values, such as landscape connectivity, may be optimized by larger focal area footprints.

Overall, focal area delineation methods that explicitly incorporated plant species tended to achieve very good to near-perfect species capture, and achieved reasonable efficiencies in doing so. For plans that did not explicitly include plant species of concern in focal area delineations, we found considerable variation. For instance, Tennessee’s emphasis on intact vegetation patches harboring populations of rare animals also did an excellent job of including plant species of concern. Montana’s focus on richness of priority habitats missed a number of regions, especially in the western portion of the state, important for plants. Although based on a small sample of plans, these findings suggest that focal area conservation actions could provide substantial benefit to plant species in at least some of the states where focal areas were defined.



Eastern prairie white-fringed orchid (*Platanthera leucophaea*). This rare plant of eastern grasslands, federally listed as threatened, has declined due to the loss of its wet prairie habitat. / Photo © Kenneth Lawless.

## Conservation Actions Targeting Plant Species

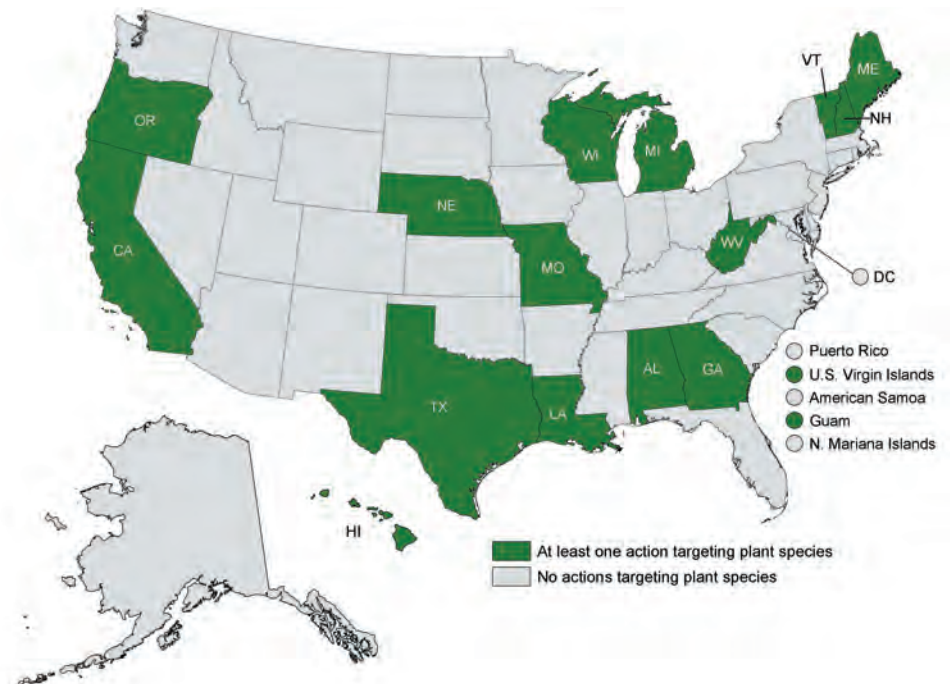
If species of greatest conservation need can be considered the drivers of many plan components, action items might be thought of as their ultimate outcome. Indeed, it is no coincidence that these plans are referred to as *action* plans. By listing numerous avenues through which conservation partners might work to conserve the state's wildlife, plans provided a springboard for a wide array of organizations and individuals concerned about wildlife to become directly engaged in conservation activities. Proposed actions varied among the plans along a number of dimensions. Actions ranged from conceptual and strategic suggestions to specific activities. They addressed planning targets as diverse as single species, entire species groups, habitat types, or particular threats. And they addressed geographic scales from the entire state to ecoregions to specific sites. Most plans proposed actions along multiple dimensions, with the intention of identifying opportunities attractive to a variety of stakeholders and partners.

In assessing the plans for plant species-oriented conservation actions, we used a generous interpretation for inclusion. We found that 17 plans, or about one-third (30%), included action items where plant species of concern were the intended beneficiaries. In addition to the eight plans that included plants in their SGCN lists, states including one or more actions focused on plant species of concern included: Alabama, California, Louisiana, Maine, Michigan, New Hampshire, Texas, West Virginia, and Wisconsin (Figure 6).

In general, even among the plans that included plants on their SGCN lists, actions targeting animal species far outnumbered those focused on plant species. Of the plans that included plants as species of greatest conservation need, only **Oregon** and **Guam** included specific conservation actions targeted to each plant on the list. **Georgia** indicated one or more categories of “conservation emphasis” for each of its plant SGCN. These three plans also included several actions targeting plant species of concern in their statewide or “big picture” action lists.

**Nebraska** and **Missouri** listed most of their specific actions at the focal-area level, and this is where actions for plant species of concern largely were addressed; both plans

FIGURE 6  
Conservation Actions Targeting  
Plants



featured specific plant SGCN in focal area actions or initiatives. In its submitted plan, **Hawaii** included only a limited list of statewide actions for all plant SGCN, additionally discussing “rare plant” needs in the context of protected area management. Since the plan was submitted, however, the state has developed species-specific conservation actions for 177 high-priority plants. Uniquely, plant-focused actions in the **U.S. Virgin Islands** were directed toward the nonvascular flora, for which several territory-wide actions were listed. **Vermont’s** actions on behalf of its plant SGCN were limited: stewardship for “rare plants” generally was advocated in several habitat summaries.

Representation of plant species on action lists dropped off even further for plans that did not explicitly include plants as SGCN. **Wisconsin** mentioned “rare plants” generally in a number of actions within ecological landscape and natural community summaries, with a few mentions of specific plant species of concern; these items were taken largely from prior comprehensive biodiversity planning efforts. **Texas** included a few actions specific to plant species in both its statewide and ecoregional action lists, drawing somewhat on a previous report on the natural communities of Texas and a prior comprehensive planning effort, the “Land and Water Resources Conservation and Recreation Plan.” Other states focused on the conservation of plant species of concern only within very specific habitats or areas. For example, **West Virginia** noted the need for rare plant surveys in shale barrens habitat. **New Hampshire** hoped to “eliminate the co-occurrence of adverse trail impacts with... rare plant populations” and “protect rare plant... populations in delineated areas” within talus slope and rocky ridge habitats. **California** noted the need for ongoing monitoring in the Algodones Dunes area, including monitoring the status of “endemic and sensitive species” (including many plants) “with the input of regional biologists (including representatives of the California Native Plant Society).”

While a fair number of plans included at least one action targeted towards plant species of concern, in most plans the number of such actions was very limited, and the proposed activities very general in nature. As a result, stakeholders seeking guidance for plant-oriented activities and projects will generally not find a robust suite of options from which to choose.

## Building Plants into Action Plans and Beyond

Several wildlife action plans consistently emerged as examples of how plant species could effectively be integrated into the action plan framework. Based on our review of 56 plans, we found the plans for **Georgia**, **Missouri**, **Nebraska**, and **Oregon** to be notable in the degree to which they addressed the needs of plant species of concern.

### *Georgia*

With nearly 3,000 native vascular plant species, synthesizing and updating species information to determine plant conservation priorities was a considerable challenge which Georgia addressed head-on in its wildlife action planning process. Nearly 1,000 plant taxa were considered for inclusion on the state’s species of greatest conservation need list, of which 323 ultimately were selected. Species assessments were coordinated by natural heritage program botanists, with a total of 60 experts participating in tasks such as defining species ranking factors and updating the status of difficult taxonomic groups. The effort was funded through an ESA Section 6 grant, with matching funds from the state’s Nongame Wildlife Conservation Fund.

Georgia’s determination of the “conservation emphasis” for each SGCN revealed the importance of maintaining specific critical habitat areas uniquely important to plant species of concern, in addition to the broad-scale habitat management often undertaken

for animals. Identification of priority habitats through synthesis of SGCN habitat descriptions had a similar result: in addition to important large-patch communities, such as mixed pine-hardwood forests and longleaf pine savannas, these priority habitats included many small-patch and localized habitats rich in rare plants, such as granite outcrops, cedar glades, and xeric aeolian dunes. Georgia's processes for identifying terrestrial focal areas also fully incorporated rare plant information, and many conservation actions recommended by botanical experts were ranked as high priority at the statewide level.

### *Missouri*

Located at the intersection of prairie parklands, eastern broadleaf forests, and lower Mississippi riverine forests, Missouri contains a rich diversity of habitats. Missouri's planning process embraced this diversity by planning at the scale of the Land Type Association, a planning unit delineated by "consistent and unique ecological characteristics." Within each Land Type Association, target plant species were selected that were of conservation concern in Missouri and that had a high affinity for the association's unique communities and habitats. This process identified over 200 plant taxa as conservation targets, representing a broad range of globally- and state-imperiled species. State-funded time of Department of Conservation biologists was used to complete the plant portions of the plan.

Planning teams involved in identifying Conservation Opportunity Areas sought to have these areas cover at least three occurrences of target plant species. Threats, actions, research needs, and monitoring strategies were identified for high-priority areas and are now being implemented by diverse groups of stakeholders. Many actions thus far identified for these areas address their diverse plant species of concern. For example, a glade and woodland restoration initiative in the Ozark highlands seeks to restore open dolomite glade habitat through the use of prescribed burning and cedar tree removal, actions that will benefit 12 plant species of concern.

### *Nebraska*

Nebraska's planning team worked within a challenging context common to many states: 97% of the state is privately-owned. To craft a plan poised for success, a guiding principle was to devise voluntary, incentive-based conservation actions that would be both attractive to landowners and beneficial to the state's species and habitats. Nebraska's plan focused on plants and animals for which the state's efforts would make a significant

Gattinger's prairie-clover (*Dalea gattingeri*) which grows on limestone cedar glades, is critically imperiled in Missouri. It will benefit from restoration strategies advanced in the Missouri action plan. / Photo © Steve Baskauf.



contribution to their overall status. The plan targeted multiple occurrences of these species, as well as all of Nebraska's natural communities, with an emphasis on those that are endemic or of limited distribution. Nesting these and other targets within relatively intact landscape areas allowed Nebraska to delineate broad-scale Biologically Unique Landscapes.

These Biological Unique Landscapes are subject to a variety of public and private uses, and the plan sought to define actions for each Landscape compatible with these uses. For example, in the Kimball County Grasslands Landscape, one strategy was to "work with private landowners whose meadows contain the Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*) to develop and implement forms of Canada thistle control that do not damage plant populations," while in the Upper Niobrara River Landscape, the plan proposed to "implement haying and grazing regimes that benefit the Ute lady's-tresses orchid (*Spiranthes diluvialis*) in meadows where the orchid occurs." As in Missouri, the plant aspects of the plan were completed using state-funded time of non-game staff.

### *Oregon*

The Oregon Department of Fish and Wildlife faced a significant challenge in its desire to undertake "an inclusive, comprehensive approach to conservation": the Department lacked funding, authority, and botanical expertise for addressing plant conservation concerns in this botanically rich state. The Department reached out to partner agencies and organizations with specific expertise in plant conservation, including the Department of Agriculture's Native Plant Conservation Program, Oregon State University's Institute of Natural Resources, and the Native Plant Society of Oregon.

Using their existing staff and funding resources, these partners answered the call, with the Department of Agriculture providing detailed habitat, threats, and actions information for the 60 plant species included on the state's endangered species list. Plant conservation partners contributed to the consideration of plants in other aspects of the plan as well. The primary priority habitats for the plan were 11 broad types, determined based on historic importance at the ecoregional level, amount of remaining habitat managed for conservation values, known limiting factors, and importance to "strategy species," including plants. Plant species of concern also played a role in identifying an additional 34 "specialized and local habitats." Although many of the data inputs for identifying Conservation Opportunity Areas were specific to animal species, plant information from partners, including The Nature Conservancy's ecoregional assessments, helped highlight key areas important to plants, such as upland prairies in the Willamette Valley.

### *Parallel Planning Efforts*

Inspired by the success of the wildlife action plans, several states have now proposed or initiated similar conservation planning processes specifically focused on plants. Some of these processes are intended to add a plant component to their existing wildlife action plans, while others represent a truly parallel planning process.

**Texas** made an important contribution to the suite of submitted wildlife action plans by including an outline of a proposed Native Plant Conservation Plan, described as a "first step in laying the framework to identify, assess, conserve and preserve the incredible native plant diversity within Texas." Although substantial funding has not yet been obtained for completing this plan, the Texas botanical community is nevertheless forging ahead, holding meetings to refine the planning approach and assign tasks.

**Idaho** is pursuing the development of a plant-focused strategy that is parallel and fully comparable to their animal-oriented wildlife strategy. Although strong relationships with federal partners may assist Idaho in funding part of this parallel strategy, fully funding the effort remains a challenge.

Fender's blue (*Plebejus icarioides fenderi*), an endangered butterfly found only in Oregon, feeds exclusively on lupine, including the rare Kincaid's lupine, a plant that is targeted in the Oregon action plan. (Butterfly shown on camas). / Photo © Bruce Newhouse.



Following the official submission of its action plan, **Illinois** developed two plant-focused supplements to the appendices for animal species in their submitted plan. One supplement includes a list of six criteria for determining plant species in greatest need of conservation, and evaluates each of the state's rare plant species against these criteria. The other supplement includes a list of 18 stresses to rare plant species in Illinois and an evaluation of the known impact of each of these on plant species in need. The supplements were designed for integration with the plan's animal data.

**Utah** also has plans to add a plant-focused appendix to its plan, including components such as a list of sensitive plants in the state, planning documents that exist for these species, a discussion of agency limitations on managing sensitive plants, and potential funding sources for plant conservation work.

### *Success Factors and Challenges*

The ready availability of botanical data and staffing seems to have played a key role in many of those states that incorporated plants into their plans. The presence of a state natural heritage program within the agency responsible for the action plan appears to have increased the likelihood that plant-related issues were considered. Although the ready availability of botanical data was a success factor in some instances, a general lack of current information about many plants hinders the ability of many agencies to build these species into their planning. This is particularly true regarding current information about population trends. We should note, however, that many states were able to upgrade their overall inventory, monitoring, and data management capacity with funding from the State Wildlife Grants Program, and many of these upgrades have benefited plant-related inventory and monitoring efforts as well.

The availability of previous conservation planning efforts was another factor that tended to promote incorporation of plants into action plans. Lead by both public and private groups, a number of biodiversity conservation planning efforts have been carried out across the country, many of which fully incorporated plants in their planning framework. The Nature Conservancy's ecoregional assessments, for example, provided many state action plans with valuable information and helped inform the identification

of priority areas. Maine’s “Beginning with Habitat” program is an example of a state-initiated planning effort that began prior to the action plan, and which considers the needs of rare plants along with other wildlife.

An active and botanically concerned public was another factor promoting the incorporation of plants in these plans. Public participation was a cornerstone of the wildlife action process, and interested individuals and organizations played a major role in helping to shape the outcome of the plans. In Hawaii, for instance, plants were only added to the plan’s list of species of greatest conservation need following strong input from the public about the importance of native plant conservation.

The most significant challenge to integration of plants into more wildlife action plans was the exclusion of flora in the federal guidelines governing these plans, and the lack of federal funding to address plant species of concern. A number of plans made clear their interest in including plants, but were unable to do so due to the lack of dedicated funding. Beyond this obvious funding impediment, however, are other challenges that inhibited the consideration of plants in the planning efforts.

In a number of states, legal authority for rare and endangered plants is either nonexistent or rests with a government entity other than the wildlife agency with responsibility for the wildlife action plan. Such a divergence in authority and responsibility was not an insurmountable obstacle, as evidenced by Oregon’s partnership approach. Nonetheless, a lack of in-house resources and expertise to support plant-related work, and weak links to plant-oriented agencies and organizations, appear to have been a barrier in some states.



## Separate but Unequal: Protection for U.S. Plants

One result of our study is clear. Despite the inclusion of plant species of concern in several wildlife action plans, *collectively these plans do not amount to a national strategy for keeping this important component of the American biota from declining and becoming endangered.* Unfortunately, this is but the latest example of how plant species are afforded separate but unequal protections. In this context, it is worth considering the mechanisms available for protecting plant species in order to determine the nature and magnitude of additional efforts that would be needed to ensure the survival and health of our botanical heritage.

The U.S. Endangered Species Act is perhaps the most important mechanism for protecting and restoring imperiled species in the United States. By prohibiting actions that jeopardize a species' survival, and requiring recovery plans and critical habitat designations, the Act provides vital protections to many U.S. species at risk of extinction. In many facets of the Act's design and implementation, however, plants receive less protection than animals. A major difference concerns the prohibition on "taking" (killing, injuring, or harming) federally listed species. While takings of listed animal species are prohibited on both public and private lands, takings of listed plant species are prohibited only on lands under federal control, or when they might result from actions authorized, funded, or carried out by federal agencies. Populations of federally listed plant species on private lands receive virtually no protection under the Act. This distinction traces back to a legal tradition in England that considered wild animals to be public property (the Crown's), with plants the property of landowners.

Although most federally listed plants have recovery plans, the effectiveness of these plans depends on their quality and most importantly, the funding available for their implementation. A review of recovery plans revealed taxonomic bias, almost always favoring vertebrate animals, in a number of recovery planning aspects.<sup>12</sup> The picture is perhaps even more lopsided when funding is considered: in 1997 recovery spending on plants was just 4% of total expenditures, even though plants make up more than half of all federally listed species.<sup>13</sup> This disparity is particularly worrisome given that funding has been shown to be positively correlated with a species' overall status and recovery prospects.<sup>14</sup> Importantly, this holds true even when controlling for the possibility that plants may have lower recovery costs than many vertebrate species (i.e., spending measured as a proportion of funds requested in recovery plans). An analysis of spending on endangered species found that plants had the lowest such proportion (0.11) of any taxonomic group, behind invertebrates (0.19), reptiles (0.26), mammals (0.30), fish (0.35), amphibians (0.45), and birds (0.49).<sup>15</sup>

Finally, there are disparities in the number of plant species that receive even these reduced ESA protections relative to vertebrate animals. For instance, while 40% of vertebrate species regarded by NatureServe as critically imperiled (G1) or imperiled (G2) are listed under the ESA, just 20% of similarly ranked plants are federally listed. Listing of plants under the Endangered Species Act has slowed significantly in recent years, and from 2001 to 2007 just thirteen plants were added to the list (Figure 7).

Many states have enacted endangered species acts of their own. While this presents another opportunity for protection of at-risk plant species, here too, plants often receive less protection than do animals. While state endangered species acts have been enacted in at least 45 states, plants are included in the definition of "species" in just fifteen.<sup>16</sup> Another 17 states have enacted separate laws covering rare or endangered plants. Thus, plants are afforded state-level protection or recognition in 32 states, but in about one-half of those states these safeguards are distinct from, and often weaker than, those afforded to animals (Figure 8).



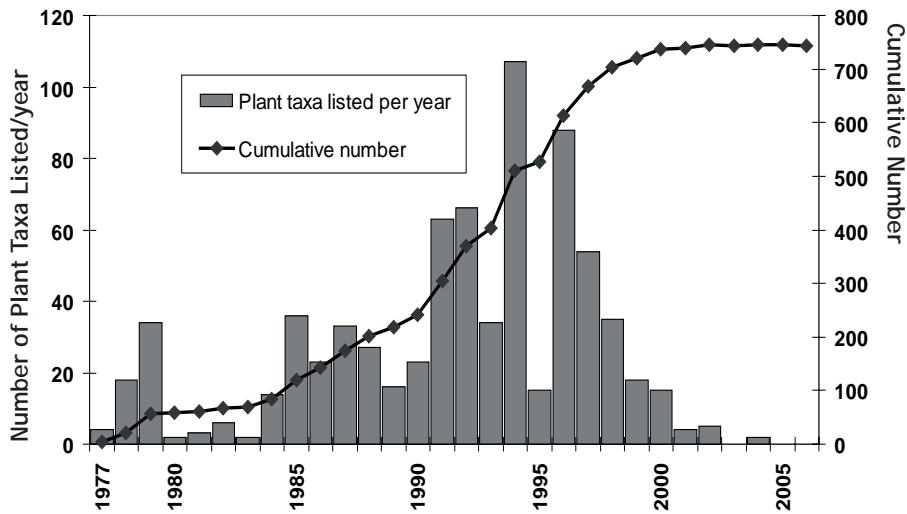


FIGURE 7  
Listing of Plants Under the U.S. Endangered Species Act

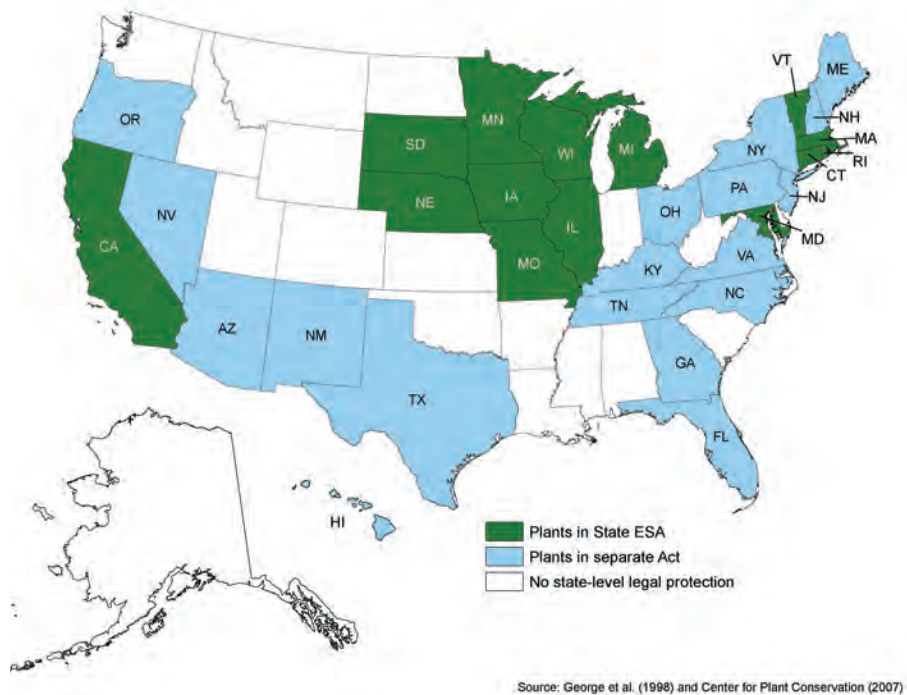


FIGURE 8  
Plants in State Endangered Species Laws

A few state endangered species laws extend protections to plants that exceed those provided by the federal ESA. For example, California’s Endangered Species Act prohibits the take of listed plant species on privately owned property as well as public lands. Many of the plant-specific endangered species laws, however, extend only very weak or no legal protection to their listed plant species. Kentucky’s Rare Plant Recognition Act, for instance, stipulates that listing “shall not serve to impede the development or use of private or public lands,” and Maine’s state-endangered plant list extends no legal protection at all, being “for informational purposes only.” Thus, even at the state level, there is a pattern of separate but unequal protection for imperiled plant species.

## Bringing Plants into Focus



Hawaii's remarkable Haleakala silversword, or ahinahina (*Argyroxiphium sandwicense*), is just one of America's more than 16,000 native plants, many of which urgently need focused conservation action. / Photo © Warren L. Wagner, Smithsonian Institution.

The development of state wildlife action plans represents a tremendous opportunity for moving conservation in America forward in a systematic and strategic way. Our interest in reviewing these plans is premised on the belief that these plans will play an increasingly important role in directing wildlife protection efforts, and be looked to as authoritative expressions of conservation priorities. We recognize that consideration of plants was neither required nor funded through the State Wildlife Grants Program, and it is not our intention to be critical of those plans that did not include plants. Instead, we have endeavored to highlight those plans that took a proactive role with respect to plants, and attempted in one way or another to address the important conservation issues confronting the nation's flora.

While many of the nation's plant species are declining and in critical condition, focus on and funding for plant conservation seems to have ebbed in recent years, even as interest in and funding for land protection and wildlife conservation have increased. Indeed, if part of the goal of the State Wildlife Grants Program is to "keep common species common," the program is missing the opportunity to address a very significant component of the nation's web of life. Already, more than half of threatened and endangered species on the federal list are plants, and without concerted attention and action, the number of plants in need of legal protection will only grow.

We are pleased to document that a number of wildlife action plans did explicitly incorporate plant species of concern into various aspects of their planning process. A few of these were particularly notable for how they integrated plants throughout their plans, and by considering the fuller range of wild flora and fauna, strove to develop a truly comprehensive conservation strategy. We were also pleased to find that, based on successful experiences in developing their wildlife action plans, several states have or are planning to add additional components to their plans specifically addressing plants, or have initiated parallel plant-oriented planning processes.

Nonetheless, the first generation of wildlife action plans collectively do not constitute anything close to a national strategy for stemming the decline of the nation's plant life, and preventing additional species of native flora from becoming endangered. This is especially significant, given the growing tendency to rely on these plans as an overall representation of biodiversity conservation needs in many states. In particular, we did not find strong support for the assumption that the habitat component of the plans would effectively address plant-related conservation needs.

Plants are all too often taken for granted, considered primarily for their value as sources of forage and shelter. They are, as we have pointed out, hidden in plain sight. Yet as we look to the future, and consider the prospect of significant shifts in climate, it will likely be plants—rooted, often long-lived, and generally slow to migrate—that will show some of the earliest and most severe dislocations. The prospect of such impacts on the nation's plant life, coupled with the large proportion of the flora already at risk, argues that now is the time to bring plants out from the background, and to put the conservation needs of our nation's flora squarely into view.

## Recommendations

Given the magnitude of the conservation challenges confronting the nation's native flora, several recommendations emerge from the findings of this report. These recommendations focus on opportunities for better integrating plants into the existing state wildlife action plans, as well as for addressing the critical conservation needs of plants through new and complementary approaches.

### **Promote implementation of actions and strategies that would also benefit plant species of concern.**

Implementation is now the focus of funding through the State Wildlife Grants Program, and the states have considerable discretion in how those implementation funds are allocated. Funding decisions usually take multiple benefits into consideration, and opportunities exist to promote projects and activities that would also benefit plant species of concern and their habitats.

### **Avoid implementation actions that could be detrimental to sensitive plant species.**

Management actions carried out under these plans will take many forms, and trade-offs among species and habitats undoubtedly will be made. Well-intentioned actions designed to enhance habitat for certain species may have the unintended consequence of degrading habitat values for other species, including sensitive and localized plant species. For example, prescribed fires can be extremely useful for maintaining certain wildlife habitats, but if carried out at the wrong time of year can be detrimental to sensitive plant species.

### **Add plant-specific components to existing wildlife action plans.**

Although full revisions of action plans are required every ten years, the plans are intended to evolve and reflect current needs and concerns. States have considerable flexibility in adding to and modifying their plans between major revisions. Building on the experience gained by other states and documented in this report, we encourage more states and territories to integrate plants into their existing plans.

### **Develop state-level plant conservation strategies to complement wildlife action plans where necessary.**

The wildlife action plans offer a successful model for bringing together diverse stakeholders to map out an overall vision for conservation at the state level. Several states already have initiated efforts to create parallel and complementary planning processes focusing on native plant conservation. We encourage other states to take this approach, if incorporation of plants directly into the wildlife action plan is not possible.

### **Ensure that plants are fully represented in major new conservation funding opportunities, including those related to climate change adaptation.**

Sustaining America's natural legacy will require that the needs of flora, as well as fauna, be addressed in future fish and wildlife conservation efforts. Given the projected impact of climate change on the nation's flora, the conservation needs of plant species should be explicitly incorporated in any current and future legislative proposals for generating funds to address climate change adaptation issues.



## Appendix A: State Rankings for Plant Diversity and Risk

Diversity Rank	State	Number of Species
1	California	5,421
2	Texas	4,511
3	Arizona	3,510
4	New Mexico	3,314
5	Oregon	3,159
6	Florida	3,060
7	Georgia	2,981
8	Utah	2,965
9	Alabama	2,930
10	Nevada	2,893
11	North Carolina	2,783
12	South Carolina	2,573
13	Colorado	2,551
14	Washington	2,510
15	Virginia	2,477
16	Idaho	2,461
17	Tennessee	2,395
18	Mississippi	2,356
19	Oklahoma	2,341
20	Louisiana	2,320
21	Wyoming	2,277
22	New York	2,197
23	Pennsylvania	2,168
24	Arkansas	2,159
25	Maryland	2,159
26	Illinois	2,155
27	Montana	2,110
28	Indiana	2,069
29	Missouri	2,061
30	Ohio	2,052
31	Kentucky	2,024
32	New Jersey	2,017
33	Massachusetts	1,968
34	Michigan	1,936
35	West Virginia	1,911
36	Wisconsin	1,874
37	Connecticut	1,792
38	Kansas	1,786
39	Minnesota	1,744
40	New Hampshire	1,619
41	Vermont	1,610
42	Maine	1,597
43	Nebraska	1,554
44	Iowa	1,552
45	Delaware	1,549
46	South Dakota	1,485
47	Rhode Island	1,364
48	Alaska	1,360
49	District of Columbia	1,324
50	Hawaii	1,174
51	North Dakota	1,167

Risk Rank	State	Percentage At Risk
1	Hawaii	83.2%
2	California	30.9%
3	Utah	17.0%
4	Nevada	16.5%
5	Arizona	16.1%
6	Florida	13.6%
7	New Mexico	12.1%
8	Colorado	11.6%
9	Oregon	11.3%
10	Georgia	10.1%
11	Alabama	9.8%
12	Texas	9.8%
13	North Carolina	8.7%
14	Washington	8.1%
15	South Carolina	8.0%
16	Alaska	7.6%
17	Idaho	7.4%
18	Wyoming	7.2%
19	Tennessee	6.3%
20	Virginia	5.3%
21	Mississippi	5.0%
22	Montana	4.8%
23	West Virginia	3.9%
24	Louisiana	3.7%
25	Arkansas	3.5%
26	Maryland	3.4%
27	Kentucky	3.4%
28	Delaware	3.2%
29	New York	3.1%
30	Oklahoma	3.1%
31	Missouri	3.0%
32	New Jersey	2.8%
33	Pennsylvania	2.8%
34	Michigan	2.5%
35	Maine	2.4%
36	Connecticut	2.3%
37	Ohio	2.3%
38	Wisconsin	2.2%
39	Massachusetts	2.1%
40	Indiana	2.1%
41	Illinois	2.1%
42	Vermont	1.9%
43	Kansas	1.8%
44	Minnesota	1.8%
45	District of Columbia	1.7%
46	Rhode Island	1.7%
47	New Hampshire	1.7%
48	Iowa	1.4%
49	Nebraska	1.4%
50	South Dakota	0.9%
51	North Dakota	0.9%

Source: NatureServe Central Databases, 2007. Notes: Figures refer to vascular plants only. Risk is defined as % of species with NatureServe global conservation status ranks from Presumed Extinct to Vulnerable (GX to G3)

## Appendix B: Summary of Action Plan Reviews

State/Territory	Plants on SGCN list?	Plant-oriented actions?	Priority Habitats		Focal Areas	
			Priorities identified?	Plants of concern in methods?	Areas identified?	Plants of concern in methods?
Alabama *		✓	✓		✓	✓
Alaska *			✓			
Arizona *						
Arkansas			✓			
California		✓				
Colorado *			✓			
Connecticut						
Delaware *			✓			
Florida *			✓			
Georgia*	✓	✓	✓	✓	✓	✓
Hawaii *	✓	✓				
Idaho *			✓			
Illinois					✓	✓
Indiana *						
Iowa *						
Kansas *			✓			
Kentucky					✓	
Louisiana *		✓	✓			
Maine		✓			✓	✓
Maryland *						
Massachusetts *			✓			
Michigan *		✓				
Minnesota *			✓			
Mississippi			✓			
Missouri *	✓	✓	✓	✓	✓	✓
Montana *			✓		✓	
Nebraska *	✓	✓	✓		✓	✓
Nevada *					✓	
New Hampshire		✓	✓		✓	✓
New Jersey *					✓	
New Mexico *			✓		✓	
New York						
North Carolina *			✓			
North Dakota *					✓	
Ohio *					✓	
Oklahoma *			✓			
Oregon *	✓	✓	✓	✓	✓	✓
Pennsylvania			✓			
Rhode Island					✓	
South Carolina *						
South Dakota *			✓			
Tennessee *			✓		✓	
Texas *		✓	✓	✓		
Utah *			✓			
Vermont *	✓	✓				
Virginia *					✓	
Washington *			✓		✓	✓
West Virginia		✓	✓			
Wisconsin *		✓				
Wyoming *			✓		✓	
D.C.*			✓			
Puerto Rico					✓	✓
U.S. Virgin Islands *	✓	✓				
American Samoa			✓	✓	✓	✓
Guam	✓	✓	✓	✓	✓	✓
Northern Mariana Islands						

Note: Asterisk denotes states and territories that responded to our request for review of plan assessments.

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