

State of Illinois
Rod R. Blagojevich, Governor

Department of Natural Resources
Joel Brunsvold, Director



THE ILLINOIS COMPREHENSIVE WILDLIFE CONSERVATION PLAN & STRATEGY

VERSION 1.0

AS PRESCRIBED BY
THE WILDLIFE CONSERVATION & RESTORATION PROGRAM
AND STATE WILDLIFE GRANTS PROGRAM



The Illinois Comprehensive Wildlife Conservation Plan & Strategy was made possible with the help of these partners in conservation:

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Audubon Chicago Region	Forest Preserve District of Will County
Bird Conservation Network	Friends of Johnson Park
Boone County Conservation District	Grand Prairie Friends
Brookfield Zoo	Henson Robinson Zoo
Calhoun County Farm Bureau	Illinois Association of Conservation Districts
Central Hardwoods Joint Venture	Illinois Association of REALTORS
Central Illinois Musky Hunters	Illinois Association of Regional Councils
Champaign County Forest Preserve District	Illinois Association of Resource Conservation and Development Areas
Chicago Botanic Garden	Illinois Audubon Society
Chicago Wilderness	Illinois Conservation Foundation
Cook County Forest Preserve District	Illinois Department of Agriculture Division of Natural Resources
Cosley Zoo	Illinois Department of Transportation Design & Environment Planning & Programming
D.J. Case & Associates	Illinois Department of Natural Resources C2000 Ecosystems Program Endangered Species Task Group
Defenders of Wildlife	Illinois Natural History Survey
Ducks Unlimited	Office of Land Management & Education
DuPage River Fly Tyers	Office of Law Enforcement
Eastern Illinois University Department of Biological Sciences	
Educational Resources for Environmental Sciences	
Embarras Volunteer Stewards	
Environmental Education Association of Illinois	

Illinois Department of Natural Resources	National Wild Turkey Federation
Office of Realty & Environmental Planning	Illinois Chapter
Office of Resource Conservation	Northern Illinois Anglers Association
Private Lands Task Group	Northern Illinois Conservation Club
Illinois Endangered Species Protection Board	Organization of Wildlife Planners
Illinois Environmental Protection Agency	Partners in Flight
Illinois Farm Bureau	Peggy Notebaert Nature Museum
Illinois Federation for Outdoor Resources	Pheasants Forever
Illinois Forestry Development Council	Prairie Rivers Network
Illinois-Indiana Sea Grant Program	Quail Unlimited
Illinois Nature Preserves Commission	Rocky Mountain Elk Foundation
Illinois State Museum	Sand Bluff Bird Observatory
Illinois State University	Shawnee Audubon Society
Department of Biological Sciences	Sierra Club
International Association of Fish & Wildlife Agencies	Illinois Chapter
Izaak Walton League	Northwest Cook County Group
Illinois Division	Shawnee Group
Champaign County Chapter	Southern Illinois University
Jo Daviess Conservation Foundation	Cooperative Wildlife Research Laboratory
Kankakee County Soil & Water Conservation District	Southwestern Illinois RC & D
Lake County Forest Preserve District	The Natural Lands Institute
Lincoln Park Zoo	The Nature Conservancy
Little John Conservation Club	The Ornithological Council
Macon County Conservation District	The Wildlife Society
McHenry County Conservation District	Illinois Chapter
	Tri-County Regional Planning Commission
	Trout Unlimited
	Illinois Council
	Union County Farm Bureau
	United Bowhunters of Illinois

University of Illinois at Urbana-Champaign	US Fish & Wildlife Service
Department of Natural Resources & Environmental Sciences	Region 3 Development Assistance Team
Urbana Park District	Chicago Field Office
Upper Des Plaines River Ecosystem Partnership	Illinois River National Fish & Wildlife Refuges Complex
Upper Mississippi River and Great Lakes Joint Venture	Mark Twain National Fish & Wildlife Refuges Complex
US Army Corps of Engineers	National Acceptance Advisory Team
Rock Island District	Rock Island Field Office
St. Louis District	Upper Mississippi River National Fish & Wildlife Refuges Complex
US Department of Agriculture	Western Illinois University
Farm Service Agency	Department of Biological Sciences
Midwin National Tallgrass Prairie Natural Resources Conservation Service	Whiteside County Soil and Water Conservation District
Shawnee National Forest	Will County Forest Preserve District Winnebago County Forest Preserve District Wisconsin Department of Natural Resources

Special Thanks to the C2000 Ecosystem

Partnerships

AMERICAN BOTTOM
BIG RIVERS
CACHE RIVER
CARLYLE LAKE
DRIFTLESS AREA
DUPAGE RIVER COALITION

EMBARRAS RIVER
FOX RIVER
HEADWATERS
HEART OF THE SANGAMON
RIVER
ILLINOIS RIVER BLUFFS
KANKAKEE RIVER

C2000 Ecosystem Partnerships

KASKASKIA RIVER/SHOAL CREEK
KINKAID AREA WATERSHED
KISHWAUKEE RIVER
LAKE CALUMET
LA MOINE RIVER
LOWER DES PLAINES RIVER
LOWER KASKASKIA/SILVER
CREEK
LOWER ROCK RIVER
LOWER SANGAMON VALLEY
MACKINAW RIVER
MISSISSIPPI WESTERN FIVE
NORTH BRANCH OF THE
CHICAGO RIVER
OZARK

PRAIRIE PARKLANDS

ROCK RIVER
SALINE BASIN
SHAWNEE WATERSHED
SPOON RIVER
SUGAR-PECATONICA RIVERS
THORN CREEK MACROSITE
UPPER DES PLAINES RIVER
UPPER KASKASKIA RIVER
UPPER LITTLE WABASH
UPPER ROCK RIVER
UPPER SALT CREEK OF THE
SANGAMON
VERMILION RIVER
VERMILION WATERSHED TASK
FORCE

ACKNOWLEDGMENTS

The Illinois Comprehensive Wildlife Conservation Plan & Strategy (Plan/Strategy) has been made possible by tremendous cooperation and collaboration among many agencies, organizations and individuals. All of the agencies and organizations participating in the planning process are acknowledged on the previous pages. A number of excellent conservation plans were consulted and incorporated into this document (Table 3). The Plan/Strategy steering committee provided helpful guidance to the process (Table 2). Special thanks to the scientists who contributed to status assessments, objectives, and natural division assessments. The U.S. Fish & Wildlife Service was most helpful in guiding development of the Plan/Strategy, and the International Association of Fish & Wildlife Agencies provided much-appreciated support to Illinois and the other states.

Though the Illinois Comprehensive Wildlife Conservation Plan & Strategy documents much work needs to be done, the accomplishments of yesterday's and today's conservationists provide an excellent foundation for the future. Thanks to the Teaming With Wildlife Coalition, the Wildlife Conservation & Restoration Program and State Wildlife Grants Program are providing additional support to habitat and wildlife conservation. Development of the Illinois Comprehensive Wildlife Conservation Plan & Strategy was supported by State Wildlife Grant Program funding (Federal Aid Project T-2-P-1).

FOREWORD

Illinois' Comprehensive Wildlife Conservation Plan is a truly historic effort; never before has such a detailed, science-based plan for conserving our state's wildlife been undertaken. This process stretched over several months, and involved professional wildlife biologists, and also a knowledgeable steering committee representing several non-governmental wildlife and conservation organizations. In addition, the draft plan was presented at a number of regional meetings open to other interested groups and the general public, and was available to all on the Illinois Department of Natural Resources website. Wildlife and habitat data from public and private sources were evaluated and incorporated into the evolving plan.

Most importantly, the final plan presented here is one which involves action. It is not just an inventory of species, but a plan to address the particular needs of wildlife that are declining so that populations can be stabilized and then increased. Many conservation projects in the past have been opportunistic and lacked a true sense of direction that could be plotted, tracked and designated as successful. Long-range landscape-level planning is one important component that leads to successful recovery efforts like those exemplified by wild turkeys and waterfowl.

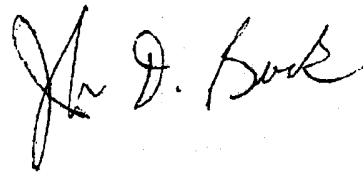
The Comprehensive Wildlife Conservation Plan is a way to make habitat management and land protection targeted at ecosystems as exciting and successful as the aforementioned restoration efforts. It will guide future conservation efforts by outlining specific areas where limited dollars can be targeted to make positive impacts that are measurable.

At the same time, all those entities with a vested interest in conservation--who have been part of the planning process--can work together more effectively in achieving the wildlife habitat goals which have been identified. The strategies outlined herein will focus future action by the Illinois Department of Natural Resources and many not-for-profit organizations which are involved in saving, restoring and managing wildlife habitat. It will determine the best use of State Wildlife Grants and should lead to additional future dollars for wildlife habitat conservation in Illinois.

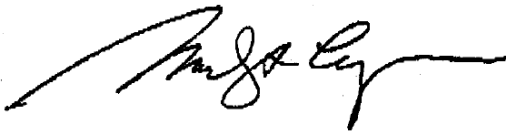
Every state is currently involved in this same wildlife conservation planning process. Grant programs are highly competitive, and additional federal revenues will depend on having an outstanding national conservation plan. This effort is not about regulating land use, and is not a new manual for protecting threatened and endangered species. It is a comprehensive plan to manage public and private lands in the best way possible to benefit all Illinois wildlife, and especially those with declining populations. This Comprehensive Wildlife Conservation Plan is a blueprint for the future of successful wildlife management in Illinois.



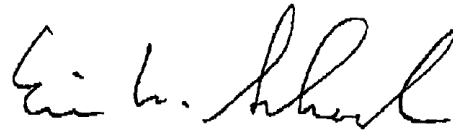
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John Burk
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Marilyn Campbell
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Eric Schenck
Regional Biologist
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11 July 2005

iv. Guide to the Eight Required Elements in the Illinois Comprehensive Wildlife Conservation Plan & Strategy for the National Acceptance Advisory Team

This section is provided for the National Acceptance Advisory Team (NAAT) to aid their determination that the State of Illinois has satisfactorily addressed the eight congressionally required elements of a comprehensive wildlife conservation plan & strategy. The National Acceptance Advisory Team offered guidance to the states as to how the NAAT would determine that each element had been addressed. Below, Illinois has considered each point of the National Acceptance Advisory Team’s guidance, and indicated the sections, tables, figures, and appendices of the Illinois Comprehensive Wildlife Conservation Plan & Strategy (Plan/Strategy) most responsive to that guidance. Further, a brief narrative is provided under each element, describing how that element is fulfilled within the Illinois Plan/Strategy.

Element 1: Information on the distribution and abundance of species of wildlife, including low and declining populations as the state deems appropriate, that are indicative of the diversity and health of the state’s wildlife:

NAAT Guidance	Location in the Illinois Plan/Strategy...					
	Section	Page	Table or Figure	Page	Appendix	Page
A. The Strategy indicates sources of information (e.g., literature, data bases, agencies, individuals) on wildlife abundance and distribution consulted during the planning process.	II-C, D VI	14-16 250-257	Table 3	260-261	II	315, 323, 327, 336, 340
B. The Strategy includes information about both abundance and distribution for species in all major groups to the extent that data are available. There are plans for acquiring information about species for which adequate abundance and/or distribution information is unavailable.	III-F	100-106	Figs. 4-9	278-285	II See also add'l disk	310-343
C. The Strategy identifies low and declining populations to the extent data are available.	II-D III-B	15-16 30-32			I II	294-309 310-340

D. All major groups of wildlife have been considered or an explanation is provided as to why they were not (e.g., including reference to implemented marine fisheries management plans). The State may indicate whether these groups are to be included in a future Strategy revision.	II-D	15-16			I II	294-309 310-340
E. The Strategy describes the process used to select the species in greatest need of conservation. The quantity of information in the Strategy is determined by the State with input from its partners, based on what is available to the State.	II-D	15-16	Table 4	262	I	294

Biologists from several agencies and organizations reviewed eight criteria to identify Illinois’ species in greatest need of conservation. The Endangered Species Technical Advisory Committees were largely responsible for applying these criteria to their taxon of expertise (invertebrates, fishes, amphibians and reptiles, birds, and mammals). [Endangered Species Technical Advisory Committees are ad hoc subcommittees of the Illinois Endangered Species Protection Board, and are composed of scientists drawn from several agencies, institutions and universities.]

A large body of survey, research, collections and professional experience are available for describing the distribution and abundance of Illinois’ Species in greatest need of conservation, readily available to natural resource professionals, and too voluminous for thorough inclusion. Examples of these sources of information for several taxa are provided in Figures 4-9, and all available accounts for are species in greatest need of conservation are provided on the supplemental disk. Species with poorly known status (distribution, abundance, and/or population trend) are readily identified in the yellow and red “Status” columns (indicating low and very low confidence) of Appendix II.

The Illinois plan/strategy acknowledges the selection criteria have been least-thoroughly applied to invertebrates (with the possible exception of freshwater mussels), and augmenting information on invertebrate species will be important for updates to the plan/strategy (Section II-D, at pages 15-16)

Element 2: Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1):

NAAT Guidance	Location in the Illinois Plan/Strategy...					
	Section	Page	Table or Figure	Page	Appendix	Page
A. The Strategy provides a reasonable explanation for the level of detail provided; if insufficient, the Strategy identifies the types of future actions that will be taken to obtain the information.	II-D III-F	16 111-118	Table 5	263-265	II	341-343
B. Key habitats and their relative conditions are described in enough detail such that the State can determine where (i.e., in which regions, watersheds, or landscapes within the State) and what conservation actions need to take place.	III-B See also Sect. IV natural division accounts	36-39 119-246	Figs. 10, 12-16	286, 288-292	II	341-343

Three available tools and a new analysis were particularly powerful in describing the location and relative condition of key habitats and community types:

1. The Illinois Land Cover, and its statistical summary based on satellite imagery from 1999-2000, identified the location and extent of many major habitat types. As acknowledged in several places, this tool is not particularly useful in identifying grassland habitat (i.e., much of the grassland in Illinois is heavily manicured and not functional as habitat), or from differentiating savanna-type habitats from the partial canopies of successional areas.
2. The Illinois Natural Areas Inventory is a 30-year effort to identify high-quality remnant natural communities and grade them according to their ecological integrity. Far less than 1% of Illinois qualifies as an Illinois Natural Areas Inventory site.
3. The Critical Trends Assessment Project periodically samples randomly-selected forest, wetland, grassland and stream plots statewide for biological integrity. The

relative condition of habitats, among sites or regions of the state, and long term changes, are being inferred from the Critical Trends Assessment Project.

4. Using available information, we identified the locations most important for conserving Illinois' species in greatest need of conservation, by considering the habitat associations of forests, emergent vegetation wetlands, forested wetlands, grasslands, and streams (see Figures H, I, J, K, L). Using a Geographic Information System, we ranked all points in the state, for each habitat association, based on:

- a. patch size
- b. Illinois Natural Areas Inventory designation (high quality natural communities)
- c. expected diversity of species in greatest need of conservation, based on GAP Analysis hyperdistributions for terrestrial vertebrates, and fish and mussel collections databases for streams
- d. known presence of threatened and endangered species since 1995, as recorded in the Illinois Department of Natural Resources Biotics 4 database.

Element 3: Descriptions of problems which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats:

NAAT Guidance	Location in the Illinois Plan/Strategy...					
	Section	Page	Table or Figure	Page	Appendix	Page
A. The Strategy indicates sources of information (e.g., literature, databases, agencies, or individuals) used to determine the problems or threats.	II-C, D VII	14-17 250-257	Table 3	260	II	315, 323, 327, 336, 340, 343
B. The threats/problems are described in sufficient detail to develop focused conservation actions (for example, "increased highway mortalities" or "acid mine drainage" rather than generic descriptions such as "development" or "poor water quality").	II-D III-D III-E ("Issues") See also Sect. IV accounts	17 352-57 60, 66, 71, 77, 81, 84, 88 119-246	Table 6	266-267	II	310-343

C. The Strategy considers threats/problems, regardless of their origins (local, State, regional, national and international), where relevant to the State's species and habitats.	II-D III-D	17 52-57	Table 4 Table 6	262 266-267	I II	294-309 310-343
D. If available information is insufficient to describe threats/problems, research and survey efforts are identified to obtain needed information.	II-D III-D III-F	17 52-57 100-118			II	310-343
E. The priority research and survey needs, and resulting products, are described sufficiently to allow for the development of research and survey projects after the Strategy is approved.	III-F	100-118				

At the statewide scale, the Illinois plan/strategy considers twenty stresses, grouped into the major classes of habitat, community, population, and direct human stresses. Each of these stresses was ranked on its affects or potential affects on each of the mussel, fish, amphibian, reptile, bird and mammal species in greatest need of conservation and habitat types. Additionally, each stress score for each species and habitat is given a confidence indicator on the quality of available information.

Sources of these stresses are highly variable among species and regions. Large-scale sources of stress are indicated in the summary "Challenges for Wildlife & Habitat Resources" (Sect. III-D). Sources of stress that are to be addressed by specific prioritized conservation actions are also described in the "Issues" prefaces immediately before each of the seven Campaigns outlined in "Priority Conservation Actions for Illinois Wildlife & Habitat Resources (Sect. III-E). At smaller geographic scales, more refined perspectives on stresses and sources of stress are outlined. These are presented under the heading of "Major Habitats & Challenges" within the assessments of each of the fifteen natural divisions (Sect. IV).

Research and surveys essential to identifying problems, and developing effective conservation actions, are outlined taxonomically, by habitat, and topically (e.g., invasive species) (Sect III-F).

Element 4: Descriptions of conservation actions determined to be necessary to conserve the identified species and habitats and priorities for implementing such actions:

NAAT Guidance	Location in the Illinois Plan/Strategy...					
	Section	Page	Table or Figure	Page	Appendix	Page
A. The Strategy identifies how conservation actions address identified threats to species of greatest conservation need and their habitats.	III-E	59-91			III	344-353
B. The Strategy describes conservation actions sufficiently to guide implementation of those actions through the development and execution of specific projects and programs.	III-E	59-97	Table 8 Figs. 11-17	270-271 287-293		
C. The Strategy links conservation actions to objectives and indicators that will facilitate monitoring and performance measurement of those conservation actions (outlined in Element #5).					III	344-353
D. The Strategy describes conservation actions (where relevant to the State’s species and habitats) that could be addressed by Federal agencies or regional, national or international partners and shared with other States.	III-E See also Sect. IV accounts	59-97 119-246	Table 8 Figs. 11-17	270-271 287-293		
E. If available information is insufficient to describe needed conservation actions, the Strategy identifies research or survey needs for obtaining information to develop specific conservation actions.	III-E III-F	59-91 100-118				
F. The Strategy identifies the relative priority of conservation actions.	III-E	59-97	Table 8 Figs. 11-17	270-271 287-293		

The Illinois plan/strategy seeks to establish a common vision for wildlife and habitat conservation in Illinois. Thus, Illinois developed objectives for the year 2025 (Sect. III-C: “Desired Conditions for Illinois Wildlife & Habitat Resources”). When considered in the context of problems affecting species and habitats (Sect III-D: “Challenges for Illinois Wildlife & Habitat

Resources), identifying prioritized conservation actions was a more straightforward and rigorous process.

Based on existing plans, workshops with conservation partners, and public comments, conservation actions determined to be most feasible and most effective in reaching the State’s wildlife and habitat objectives were compiled into seven overlapping statewide “campaigns:” Streams, Forests, Farmland & Prairie, Wetlands, Exotic Species, Land & Water Stewardship, and Green Cities (Sect III-E). Only the highest priority actions for achieving statewide objectives are included in this section.

At the finer scale of the natural divisions, conservation actions are described for addressing problems affecting species and habitats, and for implementation within Conservation Opportunity Areas (locations identified by available data and conservation partners as high importance for conserving species in greatest need of conservation). Conservation actions applied at these smaller scales are necessary for achieving regional and local conservation objectives, and contribute toward statewide goals.

Element 5: Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions:

NAAT Guidance	Location in the Illinois Plan/Strategy...					
	Section	Page	Table or Figure	Page	Appendix	Page
A. The Strategy describes plans for monitoring species identified in Element #1, and their habitats.	II-E III-F	20-21 100-118				
B. The Strategy describes how the outcomes of the conservation actions will be monitored.	III-F	100-118			III	343-353
C. If monitoring is not identified for a species or species group, the Strategy explains why it is not appropriate, necessary or possible.	III-F	100-111				

D. Monitoring is to be accomplished at one of several levels including individual species, guilds, or natural communities.	III-F See also Sect. IV accounts	100-118 119-246			III	344-353
E. The monitoring utilizes or builds on existing monitoring and survey systems or explains how information will be obtained to determine the effectiveness of conservation actions.	II-E III-F	20-21 100-118				
F. The monitoring considers the appropriate geographic scale to evaluate the status of species or species groups and the effectiveness of conservation actions.	III-F See also Sect. IV accounts	100-118 119-246			III	344-353
G. The Strategy is adaptive in that it allows for evaluating conservation actions and implementing new actions accordingly.	II-E II-F III-C V	20-21 22-23 40 247	Table 9	272-273		

Plans for monitoring species and habitats in the Illinois plan/strategy build upon extensive, existing monitoring efforts. In several cases, specific protocols are available to begin monitoring species or species groups that are not currently considered (e.g., calling frogs and toads). In other cases, a need for monitoring is recognized, but techniques are not agreed upon or feasible. For example, the ephemeral nature of migratory shorebirds and their habitat challenges development of rigorous monitoring designs. Measuring demographic objectives, such as source-sink status for patches of Neotropical migratory bird habitat, are prohibitively expensive at large scales with current methods. Solutions are also described for habitats that are insufficiently quantified, characterized and monitored (e.g., grassland, savanna/open woodland, shrub-successional habitat) (Sect. III-F). For several species and communities with highly restricted distributions in Illinois, monitoring is only appropriate at local or site scales. Several such examples are found in the natural division accounts (Sect. IV), including annual surveys of greater prairie-chickens, which currently only occur in two units of a single conservation area, and the Northeastern Illinois Wetland Bird Survey that focuses on this unique concentration of wetland sites.

The Illinois plan/strategy is intended to be a dynamic process that can be readily updated as conditions change. We explicitly acknowledge that wildlife and habitat goals will

change as implementation proceeds, natural resource conditions change, and social priorities evolve (III-C at page 40), thus requiring a different set of conservation actions. Evaluating the effectiveness of conservation actions, and modifying them as indicated, is scheduled as an annual to biennial revision to the document; evaluating the status of species and habitats is to be completed on a two- to five-year basis (see Table 9).

Element 6: Descriptions of procedures to review the Comprehensive Wildlife Conservation Strategy at intervals not to exceed 10 years:

NAAT Guidance	Location in the Illinois Plan/Strategy...					
	Section	Page	Table or Figure	Page	Appendix	Page
A. The State describes the process that will be used to review the Strategy within the next ten years.	II-F V	22-23 247	Table 9 Table 10	272-273 274		

The Illinois plan/strategy includes guidance on interim updates, and a formal 10-year revision. Interim updates that are anticipated to be necessary at perpetual, annual to biennial, and 2- to 5-year intervals are described (Table 9). Other unanticipated updates likely will also be required. The process for formal 10-year revision is modeled on this initial development of the document (see Table 10, including a proposed 24-month timeline). This process likely will need to be modified to fit Illinois’ needs in 2015.

As the lead state natural resources agency, the Illinois Department of Natural Resources is charged with maintaining the Illinois Plan/Strategy and leading the formal 10-year revision process. The Department may elect to formally revise the entire document at any earlier time, if warranted (Sect. V).

Element 7: Plans for coordinating, to the extent feasible, the development, implementation, review, and revision of the Comprehensive Wildlife Conservation Strategy with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats:

NAAT Guidance	Location in the Illinois Plan/Strategy...					
	Section	Page	Table or Figure	Page	Appendix	Page
A. The State describes the extent of its coordination with and efforts to involve Federal, State and local agencies, and Indian Tribes in the development of its Strategy.	I, ii, iii I-C II-B II-C II-D III-C	i-vii 5-6 11-13 14 15-19 40	Table 3 Fig. 17	260 293		
B. The State describes its continued coordination with these agencies and tribes in the implementation, review and revision of its Strategy.	II-D II-E II-F III-E III-F V VI See also Sect. IV	15-19 20-21 22-23 59 98-99 247 248-249 119-246				

Please see narrative below for treatment of elements 7 and 8 in the Illinois plan/strategy.

Element 8: Provisions to ensure public participation in the development, revision, and implementation of projects and programs. Congress has affirmed that broad public participation is an essential element of this process:

NAAT Guidance	Location in the Illinois Plan/Strategy...					
	Section	Page	Table or Figure	Page	Appendix	Page
A. The State describes the extent of its efforts to involve the public in the development of its Strategy.	I, ii, iii I-C II-A II-B II-C II-D III-C	i-vii 5-6 9-10 11-13 14 15-19 40	Table 2 Table 3 Fig. 11 Fig. 17	259 260-261 287 293		
B. The State describes its continued public involvement in the implementation and revision of its Strategy.	II-D II-E II-F III-E III-F V VI See also Sect. IV	15-19 20-21 22-23 59 98-99 247 248-249 119-246				

In development, review and revision of the Illinois plan/strategy, elements 7 and 8 were broadly considered in combination, rather than separately, for practical reasons. In Illinois, private organizations control significant land and water resources, and administer programs that affect species in greatest need of conservation and their habitats, and thus fit the spirit of element 7 even though they are not Federal, State, or local agencies. These groups also represent very important segments of the public, in particular those who most highly value wildlife and habitat resources for recreational and economic reasons. Involving nongovernmental organizations and communicating through them was a key approach for reaching the public in development and revision of the Illinois plan/strategy (element 8). Successful implementation will require the cooperative efforts of many federal, state, and agencies, partnerships, institutions, and nongovernmental organizations.

More than 150 federal, state, and local agencies, partnerships, institutions, and nongovernmental organizations took part in development and revision of the Illinois plan/strategy. About 350 agencies and organizations were sent letters, informing them of the planning process and inviting their participation. Eventually, this developed into a list of about 350 persons who requested periodic updates on the planning process be sent to them via email. Various announcements and updates were periodically published in the Illinois Department of Natural Resources' publications. Through presentations at meetings and conferences (provided upon request), an estimated 600 persons were reached. In the autumn of 2004, a series of eight planning workshops held statewide involved about 250 conservationists. Additionally, the Illinois Department of Natural Resources developed a website to post information and updates on the planning process, documents (including draft lists of the species in greatest need of conservation) for review and comment, a grant application tool for competitive State Wildlife Grant Program funding, and opportunities for involvement in the planning process (<http://dnr.state.il.us/orc/wildliferesources/theplan/>).

A partial draft of the Illinois plan/strategy was made available to all agencies, organizations and the public for review and comment for 45 days in the winter of 2005. The final draft document was available to all agencies, organizations and the public for review and

comment for 60 days in the spring of 2005. Both documents were posted on the website (URL above), and provided free-of-charge, upon request, in hard copy and compact disc formats.

THE ILLINOIS COMPREHENSIVE WILDLIFE CONSERVATION PLAN & STRATEGY

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I. INTRODUCTION

The Illinois Comprehensive Wildlife Conservation Plan/Strategy (or “Plan/Strategy”) has been developed in cooperation with many agencies, organizations and individuals. As the State of Illinois’ primary natural resources conservation agency, the Illinois Department of Natural Resources accepted responsibility for developing and implementing, by 1 October 2005, a comprehensive wildlife conservation plan/strategy as a condition of receiving Wildlife Conservation and Restoration Program and State Wildlife Grant Program funding.

Within the Illinois Department of Natural Resources, The Office of Resource Conservation is the unit directly charged with conservation of habitat, fisheries and wildlife. Comprised of the Divisions of Habitat Resources, Fisheries, Wildlife Resources and the Watershed Protection and Program Support Sections, the Office of Resource Conservation’s vision, and primary challenges are:

Vision

Consistent with science-based natural resource management principles, to increase the amount and quality of habitat available to support Illinois’ native plant and animal species and other game species; promote their population viability, and regulate the recreational, commercial, and scientific utilization of those species; to ensure their long-term persistence and abundance and provide for their appreciation and enjoyment by future generations of Illinoisans while also expanding the frontiers of natural resource management.

Challenges

- 1. Increase the percentage of Illinois’ lands which are not plowed, paved, drained, or landscaped.*
- 2. Increase the quality of Illinois’ natural lands as measured by their ability to support robust (abundance and richness) communities of native plants and animals.*
- 3. Improve the capacities of Illinois’ agricultural and urban lands to support populations*

of native fish and wildlife. Increase access to Illinois' lands and waters for outdoor recreation purposes.

4. Meet or exceed recreational and commercial demands upon Illinois' plant and animal populations.

5. Restore populations of plant and animal species that have become rare or are declining.

6. Eradicate, control, and prevent the introduction of invasive exotic species.

I. A. The Need for a Comprehensive Wildlife Conservation Plan/Strategy

The Illinois landscape has changed dramatically since the time of European settlement with natural lands being manipulated and developed. Illinois has lost over 90% of its original wetlands, 99.99% of its original prairie, and currently has 424 state and 24 federally listed threatened and endangered species within it's boundaries. Over the past 30 years, populations of many wildlife species have fallen dramatically, and over the past decade, expenditures for the recovery of federally endangered species have increased more than 600%.

To prevent the need for listing more species, reduce the need for costly recovery efforts, and address a chronic shortage of funding for wildlife conservation efforts, the U. S. Congress has responded with a number of federal aid programs. Two of those programs are the Wildlife Conservation & Restoration Program and the State Wildlife Grant Program (also known as the State & Tribal Wildlife Grant Program). Since 2001, Illinois has received more than \$10 million in federal aid for Illinois' nongame wildlife through these two programs, in addition to the continuing funding provided by fees and excise taxes derived from hunters and anglers. A condition placed on the Wildlife Conservation & Restoration Program and the State Wildlife Grant Program funding has been for each state to develop a comprehensive wildlife conservation plan/strategy. With guidance from the U.S. Fish and Wildlife Service, The Illinois Department of Natural Resources must begin implementation of the plan/strategy by October 1, 2005.

I. B. Required Elements of a Comprehensive Wildlife Conservation Plan/Strategy

Congress has identified eight required elements for each state's Comprehensive Wildlife Conservation Plan/Strategy through the Wildlife Conservation & Restoration Program and State and Wildlife Grants Program legislation. Plans must identify and provide for:

- (i) Information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife;
- (ii) Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (i);
- (iii) Descriptions of problems which may adversely affect species identified in (i) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats;
- (iv) Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions;
- (v) Proposed plans for monitoring species identified in (i) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (iv), and for adapting these conservation actions to respond appropriately to new information or changing conditions;
- (vi) Descriptions of procedures to review the State Comprehensive Wildlife Conservation Plan/Strategy at intervals not to exceed ten years; and
- (vii) Plans for coordinating the development, implementation, review, and revision of the State Comprehensive Wildlife Conservation Plan/Strategy with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats.
- (viii) Provisions to ensure public participation in the development, revision, and implementation of projects and programs.

I. C. The Purpose of a Comprehensive Wildlife Conservation Plan/Strategy for Illinois

The Plan/Strategy identifies habitat areas that demonstrate the greatest conservation need and potential, and establishes specific conservation goals for the enhancement and protection of these sites. The plan identifies tools to achieve specific and broad conservation goals. Monitoring wildlife responses through protocols described in the Plan/Strategy will ensure conservation actions are contributing to natural resource goals. Through adaptive management and a dynamic Plan/Strategy, new challenges and opportunities that arise will be addressed quickly.

Well over 90% of Illinois is privately-owned, and recreational demands on public lands are great and likely to increase. Wildlife and habitat objectives must be addressed in this context, and the Plan/Strategy considers actions for both public and private lands. Similarly, the Plan/Strategy attempts to integrate non-game and game management by focusing, as possible, on habitat resources. Such a “comprehensive” approach promises the most benefit for Illinois’ species in greatest need of conservation.

The Illinois Department of Natural Resources is statutorily responsible for protecting, conserving and managing the State’s natural resources, though many other agencies and organizations assist in this endeavor. Protection, conservation and management is on-going, but implementation has been traditionally multi-focused. Illinois has been involved with several large-scale landscape management efforts (e.g., Conservation 2000 Ecosystem Program, Interagency Pilot Watershed Program, the Conservation Reserve Enhancement Program, Acres for Wildlife, Illinois Forestry Development Act) as well as more geographically focused efforts to document and describe our resources (e.g., Illinois Natural Areas Inventory, Resource Rich Areas, Important Bird Areas). With the diversity of conservation goals and programs being implemented by various agencies and organizations, it has become increasingly difficult for conservationists to identify priorities, efficiently direct funding and staffing to address priorities, and effectively evaluate the success of efforts.

The Illinois Department of Natural Resources will use the Plan/Strategy in the selection of projects and distribution of services. Besides fulfilling the legal requirements for receiving federal aid funding under Wildlife Conservation and Restoration Program and State Wildlife Grant Program, the Plan/Strategy will support future grants, direct habitat programs, guide the management of Illinois Department of Natural Resources sites and land protection, and facilitate partner projects with federal, local and not-for-profit conservation organizations and private landowners. This plan will be useful for prioritizing allocations from the State Wildlife Grants Program, Federal Aid in Sportfish and Wildlife Restoration, waterfowl stamp, habitat stamp, furbearer fund, Wildlife Preservation Fund, C2000 Ecosystem Program, Natural Areas Acquisition Fund, and other sources.

The Plan/Strategy and its implementation will be valuable to the Department of Natural Resources' consultation program that assesses the impacts on State endangered species and Natural Areas of actions authorized, funded or carried out by State agencies and local government. In particular, the Plan/Strategy provides better information on the occurrence and distribution of threatened and endangered species, on the habitats and community types that are key to these species, and on the problems that may adversely affect them. The Plan/Strategy can aid in developing recommendations to avoid, minimize, or compensate for adverse impacts, through its descriptions of conservation actions that will conserve particular threatened and endangered species and their habitats. The consultation program in turn will demonstrate research priorities or needs for special surveys as a result of reviewing potential development projects.

I. D. Assumptions

Implicit in the Plan/Strategy are many important assumptions, including:

1. Resource needs and opportunities vary geographically and change over time. The Plan/Strategy cannot be a document that prescribes conservation actions for all situations, but it can be a process for making such decisions and provide a “big-picture” context that can guide locally-led conservation.
2. Past and on-going conservation activities have been highly beneficial; without them, current conditions would be poorer. However, important lessons can be drawn from past successes and failures. As needs and priorities evolve, improvements to on-going programs will become evident.
3. Resource opportunities vary by ownership of land and water resources. Private and public areas each have important, but different, roles in habitat conservation.
4. Not all needs can be met simultaneously at one location, yet more needs and benefits may be present at one location than are fully realized under existing management.
5. Every wildlife objective requires habitat of adequate extent and quality to be met.
6. Not every wildlife species or habitat has sufficient recognition or professional or popular support base to be addressed. Indeed, biases in available information, participating expertise, and past conservation planning are evident throughout this document (e.g., a vertebrate-bias in the Species in Greatest Need of Conservation). Bias needs to be acknowledged, and then accepted or minimized, when identifying priorities for “comprehensive” wildlife conservation.
7. Habitat conservation has benefits beyond wildlife. Wildlife habitat is complimentary with agricultural sustainability, soil conservation, water and air quality, economic stability, public health and safety, property values, and quality-of-life of Illinois’ citizens.

8. It is not possible to fully distinguish between resource needs (based on factors such as population size, trends and viability) and human needs (including funding sources and local support). Resource needs reflect human desires for biodiversity, wildlife viewing/encounter opportunities, harvest and other uses. Human needs reflect wildlife and habitat conditions that people experience while forming expectations.

9. Conservation actions taken (or neglected) in other states, nations and continents will be manifest in the wildlife and habitat conditions experienced in Illinois, and vice versa.

10. Wildlife is a resource held in public trust. Governmental agencies are mandated to manage wildlife accordingly. Organizations and individuals engaged in habitat conservation are working to fulfill individual goals, but the public is also a benefactor of those actions.

II. APPROACH & METHODS

II. A. Organizational Structure

To develop the Plan/Strategy, the Illinois Natural History Survey, a scientific branch of the Illinois Department of Natural Resources, hired a Planning Coordinator to work closely with the Department of Natural Resources's Office of Resource Conservation. Direct oversight and guidance of the Planning Coordinator was provided by Office of Resource Conservation Executive Staff—division chiefs from Fisheries, Habitat Resources, Program Support, Watershed Protection, and Wildlife Resources, and the Office of Resource Conservation Office Director (Table 1).

A steering committee was formed, chaired by the Planning Coordinator, composed of Department of Natural Resources staff from the Offices of Resource Conservation, Realty and Environmental Planning, and Land Management and Education, and representatives from four external not-for-profit partner organizations (Ducks Unlimited, Illinois Audubon Society, National Wild Turkey Federation, and The Nature Conservancy; Table 2). The Office of Resource Conservation invited these groups to serve on the steering committee, based upon several factors, including: (1) a statewide presence of the groups, (2) a habitat-conservation mission, (3) a balance of traditionally sporting and environmental organizations, (4) staffing levels within the organization that would allow steering committee representatives to devote significant time to the planning process, and (5) representatives that would be able to communicate with diverse constituents on the planning process.

The purpose of the steering committee was to assist broadly in all aspects of developing, reviewing, implementing, and updating the Plan/Strategy for Illinois. Specifically, the committee guided the identification of conservation priority areas; information-sharing on the distribution, abundance, and threats to conservation elements within Illinois; development of conservation objectives and prioritization of conservation opportunity areas for management intervention; and the proposal, design and implementation of conservation actions and monitoring/evaluation protocols. Committee members assisted the Plan Coordinator in

communicating with partner agencies and organizations, and facilitated public participation in the planning process through outreach to their constituents and broader audiences. The steering committee met on six (6) occasions between February 2003 and May 2005, plus eight (8) workshops for Department of Natural Resources staff and partner organizations in September and October of 2004 (see below). It is anticipated that the steering committee will be modified and expanded into a group providing broad oversight and coordination to implementation, evaluation and revision of the Plan/Strategy.

II. B. Public & Partner Involvement

A concerted effort was made to inform and involve the public throughout the planning process. D.J. Cases & Associates, with the Plan Coordinator, developed a strategy for public participation that outlined the expected audiences, public involvement objectives for each audience, and strategies for reaching those objectives (DJ Case & Assoc. 2004).

Print media - An article announcing the planning process appeared in the First Quarter 2004 issue of the newsletter "DNR Update," and provided contact information for the Planning Coordinator and a link to the Plan/Strategy website. The Spring/Summer issue of "The Conservation Communicator" (a Department of Natural Resources newsletter for the C2000 Ecosystems Program, EcoWatch Network, Critical Trends Assessment Program, and Illinois Natural Resources Information Network), discussed the planning process, introduced the steering committee, presented the eight 'required elements,' and provided a link to the Plan/Strategy website. In the November 2004 issue of *Outdoor Illinois* (the Department of Natural Resources' primary publication), the opening article from Director Joel Brunsvold discussed the need for the Plan/Strategy, and encouraged readers to get involved by commenting on the Plan/Strategy and supporting organizations that develop and implement conservation activities. The article also included a link to the Plan/Strategy website, and direct contact information for the Planning Coordinator. An announcement of the final review of the draft Plan/Strategy was published in the March 2005 *Outdoor Illinois*.

In July 2004, a letter introducing the planning process, and invitation to participate, and contact information for the Plan/Strategy coordinator was sent to about 350 agencies, organizations, and institutions. This contact list encompassed the Illinois Department of Natural Resources' Conservation Congress database, constituent lists maintained by the Divisions of Fisheries, Wildlife Resources, and Habitat Resources, C2000 Ecosystem partnerships, universities, museums, zoos and aquaria. Also included were land use planning commissions and development and agricultural groups. Entities received update letters periodically if printed updates were requested; most preferred periodic electronic updates (email; see below).

Electronic media - As the planning process advanced, the Plan/Strategy website was developed and expanded (<http://dnr.state.il.us/orc/wildliferesources/theplan/home.htm>). The website featured information on the need and justification for the Plan/Strategy; the eight required elements; the criteria used to identify the Species in Greatest Need of Conservation and an explanation of why the list was necessary and how it was to be used; taxonomic lists of the Species in Greatest Need of Conservation, their habitat associations and criteria by which they were selected; the expected benefits of the Plan/Strategy for Illinois; an explanation of the responsibility of Department of Natural Resources to coordinate and deliver the Plan/Strategy to the National Acceptance Advisory Team by 1 October 2005, and the composition of the steering committee; a "Get Involved!" link where upcoming presentations, workshops, grant applications, and documents for review were posted; a periodically-updated status segment, including a timeline for developing and delivering the Plan/Strategy; a gallery of conservation maps; copies of slide-show presentations on the Plan/Strategy given at various workshops; and an outline of the Plan/Strategy. Most importantly, the partial and complete drafts of the Plan/Strategy were posted on the website, with roughly 50-day comment periods each, and contact information for sending feedback to the Planning Coordinator.

Email addresses were collected from participating agencies, organizations and individuals who asked to receive periodic updates on the planning process, including opportunities to participate, such as comment periods on the draft Plan/Strategy. This list grew to about 190 contacts outside of Department of Natural Resources, and about 160 Department of Natural Resources staff who requested direct updates.

Presentations at meetings, conferences - Upon request, the Planning Coordinator gave presentations on the planning process, progress, and results at various meetings and conferences of partner agencies and organizations. From December 2004 through May 2005, the planning coordinator made 31 presentations, consisting of a 20-40 minute slide show, question-and-answer sessions, and assorted handouts. This process reached an estimated 600 persons.

Planning workshops - To develop familiarity with the planning process, present information on the status of wildlife and habitat resources, and gather input on priority conservation strategies and local priorities, workshops were organized for Department of Natural Resources staff, partner agencies and organizations. Workshops for Department of Natural Resources field staff were held in each of the five Department of Natural Resources administrative regions from 15-24 September 2004, and facilitated with assistance from the U. S. Department of Agriculture Natural Resources Conservation Service and Southern Illinois University. These workshops reached 177 agency staff. Workshops for partner agencies and organizations were held October 4-6 in Bartlett (northern Illinois), Springfield (central Illinois), and Whittington (southern Illinois), facilitated by D.J. Case & Associates. These workshops were attended by about 75 attendees.

Involvement in the planning process was open to all citizens, agencies and organizations in Illinois. Direct invitations to participate were sent to about 350 agencies, organizations, partnerships and institutions. Whether to be involved and the level of involvement was entirely at the discretion of each agency or organization. All of the agencies and organizations that participated in any way (requested updates, specified persons to contact, reviewed documents, arranged meetings, attended workshops, etc.) are acknowledged at the beginning of this document. Other agencies and organizations may have reviewed the Plan/Strategy and not responded to the planning coordinator.

II. C. Other Planning Efforts Incorporated Into the Plan/Strategy

Conservation plans developed previously were consulted for natural resource objectives, strategies, delivery systems and monitoring/evaluation mechanisms to incorporate into the Plan/Strategy. In total, more than 40 plans were used to help develop the Illinois Comprehensive Wildlife Conservation Plan & Strategy (Table 3). Because of the differing scopes and purposes, changes in conditions since plan development, and the volume of documents involved, the degree of incorporation varied and was dependent on agencies and organizations assisting the planning coordinator in integrating components of other plans into the Plan/Strategy.

II. D. Identifying Priorities, Problems & Actions

Identification of Illinois' Species Greatest Need of Conservation - In determining Illinois' Species in Greatest Need of Conservation, the state considered the description provided by Congress in required element 1, "...including low and declining populations..." and "...indicative of the diversity and health of the state's wildlife." From this, eight criteria were adopted for selecting the Species in Greatest Need of Conservation (Table 4). These criteria reflect the concepts of abundance (rarity), population trend, vulnerability, responsibility, usefulness as indicators, and lack of information. When determining the Species in Greatest Need of Conservation, scientists considered whether these eight criteria applied to a species at any life stage or in any portion of its range (e.g., many migratory birds are affected by habitat loss or degradation on wintering or breeding grounds outside of Illinois, but still considered Species in Greatest Need of Conservation).

The plan coordinator developed initial lists of Species in Greatest Need of Conservation for all taxonomic groups based upon unambiguous criteria (1, 2; Illinois Endangered Species Protection Board 1999, 2004; NatureServe 2004) and conservation priority species identified in other plans or publications [U.S. Forest Service Regional Forester's Sensitive Animals (2000, 2002); Williamson (2003); Phillips et al. (1999); The North American Waterbird Conservation Plan, *Upper Mississippi-Great Lakes regional draft*; Partners in Flight Physiographic Areas 14, 31 and 32; US Fish & Wildlife Service's Birds of Conservation Concern (2002); Upper Mississippi Valley/Great Lakes Regional Shorebird Conservation Plan (de Szalay et al. 2000); North American Waterfowl Management Plan (2003); National Audubon Society Watch List (2002)]. These species lists were then reviewed and augmented by Department of Natural Resources biologists and Endangered Species Technical Advisory Committees (committees of the Illinois Endangered Species Protection Board) and linked to the appropriate criteria. The proposed species and the criteria applying to them were posted on the Plan/Strategy website, and feedback was solicited for involved partners via an email/mail update letter.

With the possible exception of freshwater mussels, these criteria were incompletely applied to all groups of invertebrates due to lack of available information and/or expertise.

Organizing available knowledge and completing additional surveys to better determine the statewide status of invertebrates will be important for updates to the Illinois Plan/Strategy. Many participants in the planning process identified the exclusion of native plant species from the Species in Greatest Need of Conservation as a knowledge gap to be addressed and incorporated into the Plan/Strategy.

Determination of Distribution, Abundance & Habitat Association of Illinois' Species Greatest Need of Conservation - As Department of Natural Resources biologists and Endangered Species Technical Advisory Committees were developing the lists of Species in Greatest Need of Conservation, and applying the selection criteria, they were asked to briefly describe the species' habitat association(s) into one or more broad habitat categories (Table 5), modified from the Illinois Natural Areas Inventory (White 1978).

Where available, distribution and abundance were referenced to a number of printed, online, and Department of Natural Resources publications (all terrestrial vertebrates - Illinois GAP Analysis; mammals - Hoffmeister 1989; breeding birds - Sauer et al. 2004, Kleen et al. 2004; amphibians and reptiles - Phillips et al. 1999; fishes - Department of Natural Resources basin surveys and fisheries database; mussels - INHS mussel database; all threatened and endangered species - Department of Natural Resources Biotics 4 database). For other species, distribution and abundance were characterized by state experts in each taxonomic group, or indicated as unknown or poorly known. Where possible, abundance was quantified (i.e., population estimates or number of extant populations/locations), a population trend was estimated (quickly increasing, increasing, stable, declining, quickly declining), and official status (threatened/endangered) recorded. Persons completing these tasks confidence-ranked (medium to high confidence, low confidence, and very low confidence/no available information) each datum to indicate the strength of available scientific information and/or degree of expertise (see Appendix II). Matrices of distribution, abundance, and habitat association information (and confidence qualifiers) were posted on the Plan/Strategy website and open to internal and external peer review.

Examination of Stresses to Illinois' Species and Habitats in Greatest Need of Conservation - Based on published literature and discussions with biologists, potential stresses to the Species in Greatest Need of Conservation were developed (Table 6). Teams of state-wide experts in freshwater mussels, fishes, amphibians and reptiles, birds and mammals were assembled to complete rapid assessments of the stresses to the Species in Greatest Need of Conservation, based upon their knowledge of available scientific literature and field experience in Illinois. For each of the Species in Greatest Need of Conservation, each potential stress was scored on a 3-point scale: the stress has had, is having, or is likely to have little or no effect on population viability or abundance (1); the stress has had, is having, or is likely to have a moderate effect on population viability or abundance (2); and the stress has had, is having, or is likely to have a severe effect on population viability or abundance (3). Stresses were considered regardless of their point of origin (i.e., even if outside of the State of Illinois). Each stress score was also given a confidence-ranking (medium to high confidence, low confidence, and very low confidence/no available information) to indicate the strength of available scientific information and/or degree of expertise (see Appendix II). Completion of this exercise took 2 to 5 hours for each of the taxonomic groups. Habitat stresses were similarly ranked and qualified for each of the major habitat classes (Appendix II). Matrices of stress scores to the Species in Greatest Need of Conservation and their habitats (and confidence qualifiers) were posted on the Plan/Strategy website and open to internal and external peer review.

With the exception of freshwater mussels, these stresses were not scored for other groups of invertebrates due to lack of available information and/or expertise. Assessing the stresses to the other invertebrate Species in Greatest Need of Conservation will be important for updates to the Illinois Plan/Strategy.

Establishment of Goals for Illinois' Species and Habitats in Greatest Need of Conservation - Goals for wildlife populations and habitat resources were extracted from existing conservation plans and from Department of Natural Resources program managers within the Office of Resource Conservation. Unless otherwise noted, goals considered a 20-year (2025) time horizon. Goals were expressed variously as population sizes, numbers of populations, abundances/densities, distributions, population trends, and official changes in status (Appendix

II). When wildlife goals were suggested, biologists were also asked to identify any changes in habitat extent or conditions required to achieve wildlife objectives. Based on the Land Cover of Illinois 1999-2000 (Luman et al. 2004) and changes in habitat necessary to reach wildlife objectives, statewide goals for land cover/habitat distribution were estimated (Appendix II).

Determination of Conservation Actions - Conservation actions were derived from existing plans, proposed by Office of Resource Conservation program managers as goals were being developed, and solicited from Department of Natural Resources biologists and partner agencies and organizations through the workshops and meetings described above. At planning workshops, participants were asked to identify the most effective conservation actions and the most feasible conservation actions. The planning coordinator compiled these proposed actions, considered their support (consensus, frequency of suggestion), perceived effectiveness and perceived feasibility, and arranged them into the overlapping, complimentary campaigns of this document (Section III, E).

Identification of Natural Division Priorities - Based on current land use, historical vegetation cover, the relative size of the natural divisions and socio-economic factors, statewide land cover/habitat objectives were stepped-down to the natural division scale (Table 7). Combined with this information, and statewide goals that specifically mentioned natural divisions or regions of the state, biologists with the Department of Natural Resources Divisions of Fisheries, Habitat Resources and Wildlife Resources, and the Illinois Nature Preserves Commission compiled assessments of the 15 Illinois natural divisions (Schwegman 1973), including Lake Michigan. These scientists provided information on the major habitats, challenges, and opportunities of the natural division, and management guidelines for landscapes, natural communities, critical species (threatened, endangered and localized populations), emphasis game species, and non-game indicator species. Information from field staff formed the basis of the natural division assessments in this document (Sect. IV).

Identification of Conservation Opportunity Areas - Conservation Opportunity Areas are described as locations with significant existing or potential wildlife and habitat resources, where partners are willing to plan, implement and evaluate conservation actions, where financial and

human resources are available, and where conservation is motivated by an agreed-upon conservation philosophy and set of objectives (Table 8, see also Sect. IV). In developing the Plan/Strategy, selection of Conservation Opportunity Areas was approached from a natural resources and human dimensions perspective.

To identify the most important locations for the Species in Greatest Need of Conservation, habitats were ranked in the categories of upland forest, grassland, wooded wetlands (swamp and floodplain forest), emergent/shallow water wetlands, and streams. For each of these habitat types (except streams), a Geographic Information System was used to rank the entire state on the basis of habitat patch size (larger patches ranked higher), designation as Illinois Natural Areas Inventory sites (from Biotics 4 database), known presence of one or more threatened or endangered wildlife species (since 1995; Biotics 4 database), and diversity of vertebrate Species in Greatest Need of Conservation associated with each habitat type, based upon modeled distribution maps (Illinois GAP Analysis Project). As the Critical Trends Assessment Program indicated, land cover representation of grassland does not reflect grassland functioning as wildlife habitat, so patch size was excluded as a ranking factor for grassland. Streams were ranked by their designation as Illinois Natural Areas Inventory sites (from Biotics 4 database), known presence of one or more threatened or endangered wildlife species (since 1995; Biotics 4 database), and diversity of fish and freshwater mussel Species in Greatest Need of Conservation known to occur in the stream, based upon Department of Natural Resources Fisheries basin surveys, ongoing mussel surveys, and the Illinois Natural History Survey mussel database.

Participants in planning workshops helped identify Conservation Opportunity Areas by placing five markers per participant on maps of the State of Illinois. To assist in their decision-making, the habitat maps described above and maps of previously identified priority areas were made available. Further, participants were challenged to place at least one marker on a location where current conditions were not exceptional or conservation is not on-going, to identify restoration opportunities. For each location indicated, workshop participants described the site, the priority resources, and active partnerships.

II. E. Monitoring & Adaptive Management

The Plan/Strategy is designed to be used as a scientific process. Based on existing conditions (assumed to be changing) and existing knowledge (assumed to be imperfect and incomplete), various conservation actions have been hypothesized to address stresses affecting species and habitats, resulting in predicted outcomes or objectives. Maximizing conservation benefits and increasing efficiency requires an iterative process of planning (setting priorities and goals, selecting strategies), implementation (carrying out conservation actions, such as habitat restoration), and evaluation (monitoring results, measuring effectiveness).

Existing monitoring programs - On-going protocols for assessing the condition of wildlife and habitat resources at a statewide scale were considered for use in evaluating implementation of the Plan/Strategy. Biologists familiar with each program described the purpose of the monitoring effort, the parameters that are measured, the geographic scale of monitoring, and the history of the program (e.g., how long has data been collected and analyzed). Some of these programs have been recently evaluated for robustness of design, inference strength, usefulness/duplicity with other programs, and cost functions. Those findings have been summarized. Other programs are in need of evaluation to determine if it needs continuation, modification, and/or augmentation. Similarly, at regional and local scales, biologists were asked to identify on-going monitoring programs that can assess progress towards regional and local wildlife and habitat objectives. Few of these programs have been critically evaluated.

Augmenting monitoring programs - Using the methods described above to describe the status, stresses, and actions needed to conserve wildlife and habitats, a number of information gaps were identified for taxonomic groups, guilds, and habitat types (see Appendix II). Further, as conservation actions were related to stresses alleviated and species and habitats benefitted, performance indicators were identified. Not all performance indicators are currently measured.

Having identified these monitoring gaps, several programs have been proposed and can be implemented in the short-term if resources (especially trained personnel) are available. In

other cases, current information is too sparse and/or monitoring/sampling protocols must be developed before programs can be designed and implemented.

Coordination of monitoring - On-going monitoring needs to be coordinated among agencies and organizations to avoid duplicate efforts and ensure necessary information is being collected. Many monitoring programs are cooperative efforts, but a statewide system for accessing diverse monitoring information on wildlife and habitat resources does not exist. One of the essential functions of Plan/Strategy implementation and revision will be coordinating monitoring programs, summarizing results, and sharing those data with resource professionals, administrators, research scientists, and the public.

Adaptive management - The basis for adaptive management is evaluating the effectiveness of conservation actions by treating them as *experiments*. Such experiments require thoughtful design, adequate controls, data collection on appropriate environmental variables and index species, and robust analysis. Responses are difficult to measure unless such “experiments” are undertaken at appropriate spatial and temporal *scales*. Opportunity-driven implementation, with dispersed conservation actions and little fore-thought given to evaluation, make it very difficult to measure conservation effectiveness. Watersheds within natural divisions are an example of the scale at which focused implementation and monitoring will be necessary to assess the relative effectiveness (in terms of costs and benefits) of alternative actions. Based on past experiences, the effects of many conservation actions can be accurately predicted; in other cases, information is less exhaustive and actions have a higher level of *uncertainty*. Effective resource management is an exercise in managing uncertainty.

II. F. Plan Review & Revision

Review and revision has been an iterative process in developing the Plan/Strategy, within the Department of Natural Resources, among other agencies and organizations, and with the public. For the Plan/Strategy to remain a timely and effective document, this process for review and revision will need to continue. This section provides an overview of how review and revision were part of this planning process, and how the Plan/Strategy will need to be revised over the next decade.

Internal Review - As described previously, Department of Natural Resources staff have been involved in developing components of the Plan/Strategy at all stages of the planning process. In many cases, development involved relatively few individuals with particular areas of expertise, whereas review was open to all staff. The stages at which review was specifically requested of agency staff were (1) on the criteria for selecting the Species in Greatest Need of Conservation, (2) the lists of Species in Greatest Need of Conservation and the criteria applying to each, (3) the ranking of stresses to the Species in Greatest Need of Conservation and their habitats, (4) the proposed conservation actions to address the stresses affecting Species in Greatest Need of Conservation and their habitats, and (5) the draft Plan/Strategy. In all cases, documents were made available on the Plan/Strategy website, an email notice and deadline were sent, and printed documents were made available upon request. The first three of the above topics were addressed by individual review procedures. The first four topics were addressed by a 47-day comment period on a partial draft Plan/Strategy (12 January 2005 to 1 March 2005). The final draft Plan/Strategy covered all topics and was available for a 52-day comment period (9 May 2005-30 June 2005).

Partner Review - The involvement of partners in developing and reviewing the Plan/Strategy was very similar to internal staff participation, as described previously. Review was specifically requested from partners on (1) the lists of Species in Greatest Need of Conservation and the criteria applying to each, (2) the ranking of stresses to the Species in Greatest Need of Conservation and their habitats, (3) the proposed conservation actions to address the stresses affecting Species in Greatest Need of Conservation and their habitats,

and (4) the draft Plan/Strategy. In all cases, documents were made available on the Plan/Strategy website, an email notice (or hard copy notice, if requested) and deadline were sent, and printed documents were made available upon request. Additionally, review periods were posted on the Plan/Strategy webpage, and an announcement of the final review of the draft Plan/Strategy was published in the March 2005 *Outdoor Illinois* magazine (the Illinois Department of Natural Resources' primary publication). The first two topics were addressed by individual review periods. The first three topics were addressed by a 47-day comment period on a partial draft Plan/Strategy (12 January 2005 to 1 March 2005). The final draft Plan/Strategy covered all topics and was available for a 52-day comment period (9 May 2005-30 June 2005).

Public Review - Through the planning, review and revision processes, private conservation organizations and citizens' groups played a dual role as "conservation partners" and important representatives of the "public." As described previously, various efforts were made to inform the interested public in the planning process. The vast majority of persons contacting the planning coordinator claimed affiliation with one or more partner organization. Other individuals were given the same opportunities for review and notices as described for partners (above). Additionally, an announcement of the final review of the draft Plan/Strategy was published in the March 2005 *Outdoor Illinois* magazine.

Ten-Year Revision - Experiences from developing the initial Plan/Strategy are the foundation for the outline to updating and revising the Plan/Strategy through the year 2015 (Tables 10, 11). At least 24 months should be scheduled for a thorough revision to the Plan/Strategy to allow adequate time for updating information, hosting planning workshops, and review of draft documents. Keeping with an adaptive management framework, the need and process for revising the Plan/Strategy will be influenced by changing resource conditions, development of challenges and opportunities, and the relative success of conservation actions taken during implementation. Having accepted the responsibility of developing a Plan/Strategy, the Department of Natural Resources needs to commit staff to oversight of implementation, revision, and coordination with partners of the Plan/Strategy. It is estimated that interim revisions, and oversight of implementation, will require staffing of 1.5 full-time equivalents.

III. STATEWIDE OVERVIEW

III. A. Ecological Divisions of Illinois

Although there is less than 1,000 feet of elevation difference across the nearly 58,000 square miles of Illinois from 1,235-foot Charles Mound in northwestern Illinois, to 279 feet on the Mississippi River in southern Illinois, the state spans nearly 400 miles from north to south. Across that range of latitude, Illinois hosts a tremendous biological diversity. A number of classification schemes have been developed to help characterize areas with geological, climatological, and ecological similarities rather than by geopolitical borders. While these classifications, as described below, share many common features, the Illinois Natural Divisions classification is the most appropriate for recognizing distinct portions of Illinois, and is the primary method used in the Action Plan for sub-dividing the Illinois landscape.

The Nature Conservancy Ecoregions

Based on original work by Robert Bailey and the U.S. Forest Service, ecoregions were modified by The Nature Conservancy in cooperation with the network of state Natural Heritage Programs. This set of ecoregions has been established in order to place each of The Nature Conservancy's conservation projects within an ecological context and to serve as a planning unit for Ecoregional Planning. Eight ecoregions include part of Illinois: the Central Tallgrass Prairie, Great Lakes, Interior Low Plateau, Mississippi River Alluvial Plain, North Central Till Plain, Ozarks, Prairie-Forest Border, and Upper East Gulf Coast Plain (Figure 1). For more information, please visit: <http://gis.tnc.org/>.

Bird Conservation Regions

Parts of four Bird Conservation Regions, as defined by the North American Bird Conservation Initiative, occur in Illinois (Figure 2). In this context, Illinois shares a natural affinity with areas ranging from eastern Nebraska to central Wisconsin, eastern Kentucky and southern Louisiana. The Eastern Tallgrass Prairie, including most of the northern three-fourths of Illinois, was formerly tallgrass prairie and oak-dominated savanna, and is now dominated by

agriculture. High priority species include the greater prairie-chicken, Henslow's sparrow, cerulean warbler, and red-headed woodpecker. The Prairie Hardwood Transition only includes a small portion of northern Illinois. Priority species occurring in the Illinois portion of the region include cerulean warbler, Henslow's sparrow, and American woodcock. The Central Hardwoods Bird Conservation Region includes most of the southeastern quarter of Illinois. The region includes some of the most extensive forests in the middle of the continent and is probably a source for populations of these birds for many surrounding areas. Priority species include cerulean warbler, worm-eating warbler, Louisiana waterthrush, and eastern Bewick's wren. The floodplains of the river systems support large concentrations of migratory waterfowl and nesting wood ducks. The extreme southwestern tip of Illinois is part of the Mississippi Alluvial Valley—about 24 million acres of alluvial floodplain of the lower Mississippi River. Formerly the greatest bottomland hardwood forest on earth and subject to massive annual flood events, this was the main wintering area for mid-continent mallards, wood ducks, and other waterfowl species. Today, with 75% deforestation and 90% flood reduction, the region winters about 9 percent of the continental duck population. Many shorebird species also use managed wetlands for migration stopover sites. Priority species occurring in the Illinois portion of the region include Swainson's warbler, prothonotary warbler, and yellow-crowned night-heron. For more information, please go to: <http://www.nabci-us.org/>.

Natural Divisions of Illinois

A common classification scheme used in Illinois, developed by John Schwegman and coworkers, recognizes fourteen Natural Divisions, plus Lake Michigan--geographic regions having similar topography, soils, bedrock, plants, and animals (Figure 3). Natural Divisions are an important tool for recognizing biological variation across Illinois, and organizing regional needs, objectives and strategies of the Comprehensive Wildlife Conservation Plan/Strategy.

The Wisconsin Driftless Natural Division is part of an area extending from the northwestern corner of Illinois into Iowa, Wisconsin and Minnesota that apparently escaped Pleistocene glaciation. Bordered by the Mississippi River Bottomlands on the west and

characterized by rugged terrain that was originally mostly forested with some prairie, the division contains northern and pre-Ice Age relict species (e.g., Iowa Pleistocene snail), dolomite outcrops, hill prairies, extensive savannas, coolwater streams and caves.

The Rock River Hill Country Natural Division of north-central and northwestern Illinois is a region of rolling topography drained by the Rock River. Prairie formerly occupied the larger expanses of level uplands, with forest equally abundant along water courses and in the dissected uplands.

The Northeastern Morainal Natural Division is the most recently glaciated in Illinois. Drainage is poorly developed, thus abundant marshes, natural lakes, and bogs are distinctive features. With diverse wetland, prairie, forest, savanna, and lake communities, this northeastern section of Illinois hosts the greatest biodiversity in Illinois, and the largest human population. As is true statewide, natural land cover has been extensively altered, though urbanization is considerably more extensive than elsewhere.

Lake Michigan, about 6% or 1 million acres of which occurs in Illinois, is one of the Great Lakes and part of the largest freshwater ecosystem in the world. While water quality in Lake Michigan has improved in recent decades, declining water levels and invasive animals now pose the greater threats to the ecosystem. Characteristic fishes of the Lake Michigan Natural Division include yellow perch and lake trout.

The Grand Prairie Natural Division of central and east-central Illinois is a vast plain formerly occupied primarily by tallgrass prairie, now converted extensively to agriculture. Natural drainage of the fertile soils was poor, resulting in many marshes and potholes. Bison, Blanding's turtles, and Franklin's ground squirrels are distinctive animals of the Grand Prairie, but are now extirpated or imperiled—as is the native prairie.

The Upper Mississippi River and Illinois River Bottomlands Natural Division of western and west-central Illinois encompasses the river and floodplains of the Mississippi River above the confluence with the Missouri River, and of the bottomlands and backwater lakes of the Illinois River and its major tributaries south of LaSalle. Much of the division was originally forested but prairie and marsh occurred. Agriculture is the primary land use in the floodplains today. The big rivers, their fish and mussel communities, and the backwater lakes of the Illinois River are distinctive.

The Illinois River and Mississippi River Sand Areas Natural Division are several discrete patches of sand areas and dunes in the bottomlands of the Illinois and Mississippi rivers, and 'perched dunes' atop bluffs near Hanover in JoDaviess County. Several relict western amphibians and reptiles are known only from these sand areas, including the plains hognose snake, Illinois mud turtle, and Illinois chorus frog.

The Western Forest-Prairie Natural Division of west-central Illinois is a strongly dissected glacial till plain of Illinoian and Kansan age. Forest was the predominant vegetation, with considerable prairie on the level uplands. This character is retained with forests in riparian zones and on steep hillsides, and agriculture and rural grasslands in upland areas. Land use patterns of this division and the Southern Till Plain are similar, and five-lined skink, ground skink and ornate box turtle are animals characteristic of these two divisions.

The Middle Mississippi Border Natural Division of west-central Illinois consists of a relatively narrow band of river bluffs and rugged terrain bordering the Mississippi River floodplain from Rock Island County to St. Clair County and the lower Illinois floodplain. Forest is the predominant vegetation with interspersed hill prairies common on west-facing bluffs. Limestone cliffs are common features, and the dark-sided salamander and western worm snake are restricted to this division. Forests of this division, close to river foraging areas, are important winter roosting sites for significant concentrations of bald eagles.

The Southern Till Plain Natural Division of south-central Illinois is a dissected Illinoian till plain south of the terminal Wisconsinan moraine. Forest was found along streams and prairie occupied the level uplands. Soils are poor because of high clay content and frequent “claypan” subsoil. Post oak flatwood is a characteristic community. Crayfish frog, ornate box turtle and remnant populations of greater prairie-chickens are characteristic of the Southern Till Plain Natural Division.

The Wabash Border Natural Division includes the bottomlands and the loess-covered uplands bordering the Wabash River and its major tributaries in southeastern Illinois. Lowland oak forests with beech, tuliptree and other eastern species are characteristic, and the Wabash River drainage contains several distinctive fishes, including river chub, greenside darter, bluebreast darter and harlequin darter.

The Ozark Natural Division consists of the part of the Ozark uplift that extends into southwestern Illinois. Topography is of a maturely dissected plateau with bluffs along the Mississippi River, and a sinkhole plain in the northern section. Natural vegetation of the area is mostly forested with many hill prairies. Several Ozark, southern and southwestern animals are present only within this division in Illinois, such as plains scorpion, spring cavefish, eastern narrow-mouthed toad, coachwhip, and northern flat-headed snake.

The Lower Mississippi River Bottomlands Natural Division includes the Mississippi River and its floodplain from Alton to the Thebes Gorge. The Mississippi River, silt-laden below the confluence with the Missouri River, contains a distinctive fish assemblage of silt-tolerant plains species (plains minnow, sturgeon chub, flathead chub, sicklefin chub). Natural vegetation included prairies, marshes and rich forests with several southern lowland tree species.

The Shawnee Hills Natural Division extends across the southern tip of Illinois. The unglaciated hill country is characterized by an east-west escarpment of sandstone cliffs and a series of lower hills. Originally, the division was mostly forested, and is presently the most

heavily forested of Illinois' natural divisions. Like the Northeastern Morainal Natural Division, the Shawnee Hills hosts outstanding biodiversity.

The Coastal Plain Natural Division of extreme southern Illinois is a region of swampy forested bottomlands and low clay and gravel hills that is the northernmost extension of the Gulf of Mexico Plain Province of North America. Baldcypress-tupelo swamps are a unique feature of the natural division, as are many southern animals such as bird-voiced treefrog and cottonmouth. The floodplain at the confluence of the Mississippi and Ohio rivers and Cache and Ohio rivers host rich bottomland forests, while the "Cretaceous Hills" section is a steep to rolling area of unconsolidated sand, gravel and clay hosting Cretaceous period fossil beds.

Illinois Administrative Regions

The Illinois Department of Natural Resources divides the state into five administrative regions for fisheries, wildlife, forestry, and restoration ecologists. These regions are further divided into a total of 35 districts. It is generally at the district level that field staff interact with local landowners on private lands projects. The Illinois Nature Preserves Commission has field staff covering nine areas of Illinois. Illinois is within the U.S. Fish & Wildlife Service's Region 3, with Ecological Services offices in Chicago, Rock Island and Marion, and nine national fish & wildlife refuges. The U.S. Army Corps of Engineers' Chicago, Rock Island, St. Louis, Louisville and Memphis Districts serve Illinois with navigation and flood control projects. Though part of southern Illinois is geographically within the Central Hardwoods Joint Venture area, the Upper Mississippi River/Great Lakes Joint Venture, used for waterfowl, waterbird and shorebird planning and conservation, administratively encompasses all of Illinois.

III. B. Current Status of Illinois Wildlife & Habitat Resources

The following section contains brief summaries on the status of groups of wildlife. Species-specific information and references are provided in Appendices I and II, Sect. VI, and on the supplemental disk.

Species in Greatest Need of Conservation

Non-consumptive wildlife recreation activities are enjoyed by more than 2.6 million Illinoisians, with an economic impact of about \$1.3 billion annually, supporting more than 13,000 jobs. The most recent survey found these wildlife resources provided 176 million user-days of recreation. Five year trends show increases of about 50% (U. S. Fish & Wildlife Service 2003).

Eight criteria were used to identify “Species in Greatest Need of Conservation” for Illinois (Table 4, Appendix 1). These criteria helped to identify species with small populations, declining populations, populations dependent on rare or vulnerable habitats, and indicative of the health and diversity of the state’s wildlife and habitat resources. Information to determine Species in Greatest Need of Conservation was adequate for most vertebrates and mussels. For other groups of invertebrates, information was sparse for determining whether one or more of the criteria applied to species. Thus, the Species in Greatest Need of Conservation list for invertebrates should be regarded as preliminary and only reflecting species known to be rare, threatened or endangered (i.e., species meeting criteria 1-3).

Information on the distribution and abundance of all threatened and endangered species (criterion 1), largely derived from the Illinois Department of Natural Resources’ Biotics 4 database are available in Nyboer et al. (2004) (see Figure 4 for an example, the red-veined leafhopper, *Aflexa rubranura*). Information on all mussels in greatest need of conservation was obtained from the Illinois Natural History Survey’s mussel database (see Figure 5 for an example, the ellipse, *Venustaconcha ellipsiformis*). Information on all fishes in greatest need of conservation was obtained from the Illinois Natural History Survey’s fish collections database (see Figure 6 for an example, the central mudminnow, *Umbria limi*). Information on all amphibians and reptiles in greatest need of conservation is available in Phillips et al. (1999)

(see Figure 7 for an example, the crayfish frog, *Rana areolata*). The Illinois Breeding Bird Atlas (Kleen et al. 2004) documents the distribution and abundance of all bird species nesting in Illinois, and contains recent data from the North American Breeding Bird Survey (Sauer et al. 2004) (see Figure 8 for an example, the bobolink). The Illinois GAP Analysis Project created expected distribution maps for all terrestrial vertebrates (see Figure 9 for a mammalian example, the least weasel). Accounts for all of Illinois' Species in Greatest Need of Conservation from the above sources are provided on the accompanying disk, "Information on the Distribution and Abundance of Illinois' Species in Greatest Need of Conservation."

Mussels - Twenty-nine species of Illinois' 61 extant freshwater mussels were identified as Species in Greatest Need of Conservation (48%)--an additional 19 species are extinct or extirpated. Twenty-four of the Species in Greatest Need of Conservation are listed as threatened or endangered, and 41 have a Global Conservation Rank of G1, G2 or G3. Roughly equal proportions of these species are found in large rivers and smaller streams, and none are primarily found in lakes or impoundments. Some large river species are now known from only stream locations, and some stream species currently occur only in large rivers.

Fishes - Scientists selected 80 fish species as Species in Greatest Need of Conservation, representing about 38% of Illinois' fish diversity. Thirty-one species are threatened or endangered, 9 have a Global Conservation Rank of G1, G2 or G3, and some of these are species occurring on the periphery of their natural range, where conservation beyond protecting existing populations and habitat may not be appropriate. These species are found in habitats ranging from Lake Michigan to vegetated backwaters, and large, turbid rivers to high-gradient cool-water streams.

Amphibians - Fourteen of Illinois' 41 amphibians (34%) were selected as Species in Greatest Need of Conservation, eight are threatened or endangered, and 1 has a Global Conservation Rank of G3. The distribution, abundance and population trend of several species is poorly understood. Many of these species are forest/wetland species in eastern and southern Illinois. The Illinois chorus frog is endemic to sand areas of the state.

Reptiles - Twenty-three of Illinois' 60 reptiles (37%) were selected as Species in Greatest Need of Conservation, 16 are threatened or endangered, and 1 has a Global Conservation Rank of G3. Like the fishes and amphibians, the reptilian Species in Greatest Need of Conservation list includes edge-of-range and poorly-known species. Diversity of reptiles is highest in southern Illinois. Species in Greatest Need of Conservation include prairie, savanna, marsh, swamp, and bluff species. The eastern massasauga is a candidate for federal protection under the Endangered Species Act.

Birds - Eighty-three bird species, about 28% of the state's avian diversity, met criteria as Species in Greatest Need of Conservation, 32 of which are threatened or endangered, and 1 species has a Global Conservation Rank of each G1 and G3. Relative to other groups, bird populations are the best-monitored. Many of the birds in greatest need of conservation are wetland, grassland, and long-distance migratory species, including king rails, greater prairie-chickens, American golden plovers, and cerulean warblers.

Mammals - Twenty of Illinois' 59 mammals (34%) were identified as Species in Greatest Need of Conservation. Nine of these species are threatened or endangered, and four have a Global Conservation rank of G2 or G3. More information is needed on the status of some nocturnal or cryptic species. Bobcats and river otter are increasing and no longer listed as threatened species in Illinois. Reports of cougars, wolves and armadillos have also become more frequent. Black bears occur in southern Indiana, eastern Kentucky and central Wisconsin, and may be reported from Illinois. Elk are native to Illinois but were extirpated in the early 1800s. A study in the Shawnee Hills natural division indicated reintroduction was biologically feasible, though agricultural conflicts were likely (Buhnerkempe and Higgins 1997).

Harvested Wildlife Resources

Sport fishes and game animals are regulated and monitored by the Illinois Department of Natural Resources. Sport fishes support about 33 million quality angler-days of recreation with an economic value of \$1.6 billion annually, and game animals support about 7 million hunting and trapping days with an economic value of \$949 million annually (Miller et al. 2003, 2004ab; U.S. Fish & Wildlife Service 2001).

Mussels

Commercial mussel harvest was an important economic endeavor in the late nineteenth and early twentieth centuries. Degradation of rivers led to a collapse in mussel populations and this industry. At present, harvest is restricted to ten species, in limited waters of Illinois, with regulations on individual size, quantities and methods of harvesting mussels.

Sport fishes

Trout & salmon - In Lake Michigan, several species of trout and salmon are stocked by Illinois and other states to maintain fishable populations. Demand far exceeds supply of fish available. Brook trout have been extirpated from coolwater streams in northern Illinois, and few self-sustaining populations of brown trout occur. Catchable rainbow trout are also stocked in inland streams and lakes during spring and fall.

Northern pike, muskellunge - Pike and muskie are stocked in 66 lakes statewide. Demand continues to be high for these fish, which are capable of reaching large size and are highly valued by sport anglers.

Walleye, sauger, and perch - These fish are highly valued for their sporting and eating qualities. Some natural reproduction occurs in streams (walleye, sauger) and Lake Michigan (perch). Walleye and sauger fisheries in impoundments are maintained by stocking, and demand far exceeds current supplies for all three species.

Black bass - Largemouth, smallmouth, and spotted bass occur in Illinois waters. Largemouth bass are intensively managed to provide recreation and as a predator for forage and panfish populations. Natural reproduction of largemouth bass occurs in both streams and impoundments, however supplemental stockings are required to maintain quality fisheries in some impoundments. Smallmouth bass are largely restricted to better-quality streams in the northern half of the state. Bass are generally managed with restrictive size and creel limits. Demand far exceeds bass supply.

Panfish - Panfish are a group of highly sought-after, small sport fish, including bluegill and crappies. Panfish are managed via predator introduction (bass) and by angler harvest and creel limits. Current supply and demand are nearly equal, though demand exceeds supply in high-quality public fisheries.

White Bass, Striped Bass & Hybrids - These popular sportfish are available in many impoundments and streams. Demand exceeds supply.

Catfish - Channel, flathead, and blue catfish make up the majority of Illinois catfish. Natural reproduction is common in larger lakes and streams. Channel catfish do not reproduce well in smaller lakes, thus they are commonly stocked to produce quality fisheries. Current supply and demand are nearly equal.

Commercial fish - Commercial fish include buffaloes, carp, carpsuckers, and freshwater drum (and catfish as well). Asian carp have become a commercial resource, a tool that may aid in control of these invasive species. Supply far exceeds the demand for these fish generally found in abundance in Illinois' largest streams. Commercial harvest values for these fish in 2002 was estimated at nearly \$1.7 million.

Herptiles

Bullfrogs and common snapping turtles are the species most commonly harvested. Both species are common statewide in streams, impoundments, lakes, and ponds, and populations apparently are stable (Phillips et al. 1999).

Birds

Waterfowl - The Canada goose harvest is comprised primarily of birds from Illinois' giant Canada goose population and the migratory Mississippi Valley Population. Changing weather patterns and land uses are implicated in changing wintering distribution for geese in Illinois. Resident Canada geese are a local nuisance. Snow goose populations are at higher than desired levels and these birds have become common migrants in Illinois. Mallard, wood duck, gadwall, and green-winged teal are the species most commonly harvested in Illinois, and

are near or above population objectives established in the North American Waterfowl Management Plan.

Coots, rails & shorebirds - The coot harvest is small, decreasing, and largely incidental to harvest of other waterfowl. Few Illinois hunters pursue rails (sora, Virginia rail) or Wilson's snipe. While the status of rails and snipe are poorly understood, marsh, sedge meadow and wet prairie habitats used by them are scarce and in poor condition. Harvest of woodcock in Illinois has decreased as the regional population has declined dramatically in recent years.

Wild turkey - Following successful reintroduction to Illinois in the late 20th century, turkeys now occur in almost all counties in Illinois. As these birds continue to pioneer unoccupied habitat, the population (and harvest) is increasing.

Upland gamebirds - Populations and harvests of bobwhites, pheasants and gray (Hungarian) partridge have decreased by more than 75% since 1970. Changing agricultural practices, development, and invasive species have reduced the quality (plant diversity, structure and disturbance patterns) and amount of available habitat, especially grassland and shrubs.

Doves & crow - The harvest of mourning doves in Illinois exceeds the harvest of all other gamebirds combined. Populations and harvest of mourning doves are stable to slightly decreasing. Eurasian collared-doves are beginning to appear in the bags of dove hunters as populations exponentially increase. American crows are abundant in Illinois and a local nuisance. West Nile Virus reduced crow abundance in some areas in recent years, with indications populations are rebounding.

Mammals

White-tailed deer - White-tailed deer, the most popular game mammal in Illinois, are abundant statewide, and the harvest is increasing. The herd is estimated at 750,000 to 800,000, with recent hunter harvests of about 180,000 animals. Efforts are on-going to contain and eradicate Chronic Wasting Disease in northern Illinois. Deer-vehicle collisions,

crop/property damage and adverse effects of heavy browsing on natural areas are persistent issues, and herd size somewhat exceeds desired levels.

Rabbits & squirrels - Although cottontail and squirrel populations have been stable in recent years in Illinois, the harvest is shrinking as fewer hunters pursue them. Swamp rabbits are localized and uncommon in floodplain forests in southern Illinois.

Furbearers - Many furbearers are common to abundant in Illinois and harvest is limited by trapper/hunter effort rather than population size. Badgers are widespread. Abundance of red foxes may have decreased in recent decades due to interactions with coyotes and limited availability of grassland habitat. Declines in the gray fox population are suspected with unknown causes. While not legal to harvest at present, conservation efforts have recovered the bobcat and river otter in Illinois. Reports of otter damage to fisheries (particularly in small impoundments) are increasing.

Habitats

Much of the following summaries have been adapted from the *Critical Trends Assessment Program*, a program that measures land cover (Figure 10), changes in extent, condition, and ecological indicators of Illinois' forests, grasslands, wetlands and streams at randomly-selected statewide locations (Critical Trends Assessment Program 2001). Acreage categorized as "high quality" are Grade A and B Illinois Natural Areas Inventory communities. The Illinois Natural Areas Inventory was first completed in 1978 with the objectives of identifying, monitoring, and prioritizing the protection of the best remaining examples of the state's natural communities (White 1978). Grade A and B Illinois Natural Areas Inventory sites show little or no evidence of degradation and display climax communities, including conservative plant species.

Forest - Currently about 12% of Illinois is covered by forest, or 4.5 million acres, excluding the partial canopy/open woodland land cover category, considered in Open Woodland/Savanna/Barren, below (Figure 10). The 1.1 million acres of floodplain forest, treated as a wetland habitat in various sources, are considered as a part of broader forest

habitat in the plan/strategy unless otherwise specified (Table 5). About 14,000 acres (<0.3%) are high quality communities such as floodplain forest, upland forest, sand forest and flatwoods. Most of the present-day forests have been fragmented into small parcels of land, and the abundance of species that require large forested tracts to survive have declined. Small fragmented parcels are also more susceptible to intrusion by invasive species of plants and animals, such as garlic mustard and brown-headed cowbirds. Available evidence suggests no forests in Illinois are of sufficient size to reliably function as “sources” (i.e., recruitment exceeds mortality) for Neotropical migratory birds (Robinson et al. 1995), though small woodlots and riparian forests are important stopover habitat during migration. Upland forests were predominantly oak-hickory, and bottomland forests were predominantly ash-elm-maple. Because of historic grazing and poor forestry practices, many forests have lost valuable disturbance-sensitive plants, are dominated by introduced or invasive species, and contain undesirable canopy tree species. Several possible factors, including a decrease in timber harvest and fire suppression, are contributing to increases in sugar maples and other mesophytic trees in many oak-dominated forests. Between 1962 and 1985 sugar maples increased 41-fold while oaks were down 14%. In the shrub layer, bush honeysuckle, buckthorn (*Rhamnus* sp.) and other invasive species average more than 70% of all shrub stems counted.

Open Woodland/Savanna/Barren - Open woodlands, savannas, and barrens are communities with tree canopy cover intermediate of forest and prairie, and exist within a matrix of environmental factors related to fire, topography and soil type. In these distinct plant communities, slender glass lizard and red-headed woodpecker are among the characteristic wildlife. The extent and condition of savanna, barren and open woodland habitats in Illinois is poorly understood, but certainly more scarce and in poorer condition compared to recent and historical standards. Nuzzo (1986) estimated savanna had been reduced in the Midwest by 99.98% compared to the early 19th century. Land Cover of Illinois, 1999-2000, classified 615,000 acres as ‘partial canopy/open woodland. About 1,500 acres of high quality savanna and barren are known, 1,300 acres of which is sand savanna. The restoration potential for degraded savannas and barrens is high, and the Kankakee Sands area contains among the best and most concentrated remaining oak savanna (U. S. Fish & Wildlife Service 1999).

Savanna remnants, associated with forests, prairie remnants and primary communities likely exist and can be prioritized for restoration and management.

Grassland - Native prairie covered 21 million acres of Illinois in the early 19th century. Less than 2,600 acres (<0.01%) of high-quality prairie remain. Although native prairie has been destroyed, 19.2% of the state is categorized as “grassland” habitat (Figure 10). More than 780,000 grassland acres (17%) are in temporary agricultural programs. Most grasslands have been plowed, heavily grazed, or frequently mowed. Few grasslands are large enough and unfragmented by woody vegetation and human structures to support area-sensitive species. Often dominated by planted introduced grasses, especially fescue, these grasslands do not resemble native prairies. Of the terrestrial habitats, grasslands are the most heavily dominated by introduced species. Most of Illinois’ grasslands are planted in monocultures or are otherwise highly manicured. Far less than the 19.2% of the state’s land cover that is classified as grassland habitat is actually functioning as a natural grassland ecosystem.

Shrub/successional - The extent and condition of shrub/successional habitats in Illinois is poorly understood, though 1999-2000 land cover reported 615,000 acres of ‘partial canopy/open woodland,’ which presumably includes some shrub/successional habitat. Regional declines in populations of bird species using this habitat type, including northern bobwhite, field sparrow and brown thrasher, are well-documented.

Wetland - Illinois has lost approximately 90% of its 8.2 million acres of wetlands as a result of draining, filling, clearing, and urban development. The remaining natural wetlands (excluding floodplain forest) now occupy about 1% of Illinois (Figure 10), and only 6,800 acres (0.05%) are graded as high quality. Marsh-type wetlands are scarce, highly degraded, and critical for the Species in Greatest Need of Conservation. Remaining wetlands are in poor condition due to fragmentation, siltation, altered hydrological conditions, and the invasive species. Invasive plant species such as reed canary grass, common reed, Eurasian milfoil and purple loosestrife can dominate disturbed wetlands and exclude native plant species, resulting in a loss of biodiversity. Wetland bird and insect communities are especially sensitive to changes in hydrology, plant species composition, and habitat loss.

Lake & pond - More than 644,000 inland acres of Illinois is water (including streams), much of that human-created reservoirs and impoundments (Figure 10). About 2,000 acres of natural lakes and ponds are considered high quality natural communities. About 6%, or nearly 1 million acres, of Lake Michigan is within Illinois. Water quality has improved greatly in recent decades, and exotic species and water levels are priority issues for this Great Lakes ecosystem.

Streams - At the dawn of the 20th century, most of Illinois' 26,000 miles of streams and rivers had sinuous courses with associated rich marshes and swamps. The stream banks were lined with protective vegetation that reduced the likelihood of bank failures and heavy erosion. Since then agriculture and development have drastically reduced the health of our streams — marshes and swamps have disappeared, streams have become turbid, and their channels have been straightened and levied. Coolwater streams, probably always uncommon in Illinois, have been degraded by thermal pollution. Some species of freshwater mussels, environmentally sensitive aquatic insects, and fish that were once common to Illinois waters have been extirpated from the state. Habitat quality scores most readily confirm this degradation, and only 240 acres of stream and river habitat are considered high quality natural areas in Illinois. Improvements in point-source pollution and better agricultural practices have improved water quality, although centers of high human population density and agriculture have changed the chemical signature of streams. Exotic species are likely to continue increasing. The recovery of sensitive aquatic organisms will be delayed because of the distances between remaining populations, and may require reintroduction along with improving stream habitat and water quality.

III. C. Desired Conditions for Illinois Wildlife & Habitat Resources in 2025

Meeting the conditions described in this section will require continued and increased partnerships, additional resources, effectiveness monitoring (i.e., ensuring conservation actions are having the intended effects), research, and statewide and local monitoring of habitat and wildlife resources (see Section IV, F). A 20-year horizon was arbitrarily chosen, as a reasonable time frame within a conservationist's career. These goals will need to be periodically revised as natural resource conditions and social priorities change. As implementation proceeds, local objectives and shorter-term benchmarks will need to be refined. In future iterations of the plan/strategy, longer-term goals (e.g., related to climate change) may be appropriate to consider.

Wildlife and habitat goals were adopted from a number of existing conservation plans, such as the Partners in Flight objectives for several bird species in greatest need of conservation. All programs with Illinois Department of Natural Resources' Office of Resource Conservation were also asked to develop wildlife objectives, and habitat objectives to support them, considering a 20-year horizon, and habitat/wildlife conditions that could be achieved with conservation resources (funding/staffing) that could realistically be attained over that time. Several of these goals and objectives were further augmented and refined by other agencies and organizations at planning workshops and through review of the plan/strategy.

Species in Greatest Need of Conservation

Only species or groups of species for which explicit population or habitat objectives have been established are discussed in this section. It is expected that improved habitat conditions will result in increased populations of other Species in Greatest Need of Conservation relying on similar habitats, as well as increased populations sport fishes and game animals. Please see Appendix II for more information on population status and objectives.

Mussels -

1. Populations at all currently-occupied locations are maintained and re-established at 50% or more of historic locations where suitable habitat persists or can be restored.

Fishes -

1. Populations at all currently-occupied locations are maintained and re-established at 50% or more of historic locations where suitable habitat persists or can be restored.
2. The Index of Biotic Integrity is maintained or improved for stream fish communities (Yoder 2003).
3. Self-sustaining populations of brook trout are restored in at least 4 streams.

Aquatic nuisance species -

1. Unintentional introductions are avoided, and range expansions and harmful effects of invasive species are minimized.
2. Ballast water standards are implemented.
3. Rapid Response plans are in place for the Great Lakes and Mississippi River Basins.

Amphibians & Reptiles -

1. The distribution and abundance of reptile and amphibian populations are understood with confidence, and sentinel monitoring can identify conservation needs.
2. Key species (eastern massasauga and Blanding's turtle) have been recovered and adequate habitat is secure.

Birds -

1. At least 2 forests larger than 50,000 acres (assumed to be large enough to reliably function as population sources for Neotropical migratory birds) are restored and managed in the Shawnee Hills and Ozark natural divisions.
2. Breeding populations of Partners In Flight priority forest species, including Acadian flycatcher, cerulean warbler, ovenbird and Kentucky warbler have increased by 50%.
3. Migratory use of forests, open woodlands, savannas, and barrens by Neotropical migratory birds has increased by 20%.
4. Breeding populations of red-headed woodpeckers have increased by 100% and eastern kingbirds by 50%.
5. Breeding populations of Partners In Flight priority shrub/successional species, including northern bobwhite, American woodcock and Bell's vireo, have doubled.

6. Breeding population of Partners In Flight priority grassland species including upland sandpiper, loggerhead shrike, bobolink and grasshopper sparrow have doubled.
7. Use of grassland habitats by migratory grassland sparrows, bobolinks, and meadowlarks has increased by 20%.
8. Implementation of the greater prairie-chicken recovery plan (Walk 2004) is completed, including recovery of northern harrier, short-eared owl, upland sandpiper, Henslow's sparrow, loggerhead shrike and other endangered species.
9. Breeding populations of Wilson's snipe, sora, Virginia rails, willow flycatchers, and marsh wrens have increased by 50%.
10. The number of multiple-species wading bird rookeries has increased by 25%.
11. Migratory shorebird use in the state has increased by 20%.
12. State-listed wetland birds, including king rail and Wilson's phalarope, are recovered. At least two breeding populations of black rails are reestablished.
13. Breeding and migratory wetland birds are monitored satisfactorily to identify conservation needs.

Mammals -

1. The Illinois Department of Natural Resources' Eastern Woodrat Recovery Plan has been implemented and the species delisted.
2. Golden mouse and rice rat have been recovered and delisted.
3. Indiana bat maternity colonies are monitored with comprehensive statewide surveys (summer months).
4. Key bat hibernacula (focal species: Indiana bat, southeastern bat, gray bat, Rafinesque's big-eared bat) in Illinois, including natural caves and abandoned mines, and monitored with comprehensive surveys (winter months).
5. Summer habitat for Indiana bats has been restored and enhanced at the 2-3 most significant areas.
6. Winter hibernacula for Indiana bats and other bats are established by opening abandoned/sealed mines or protected by gating appropriate caves and mine entrances.
7. Distribution and abundance of Franklin's ground-squirrel are known, and conservation needs addressed.

8. The recovery of the recently-delisted bobcat and river otter are monitored.

Harvested Wildlife Resources

Only species or groups of species for which explicit population, harvest or habitat objectives have been established are discussed in this section. It is expected that improved habitat conditions will result in increased populations (that could support increased harvests) of sport fishes and game animals not specifically mentioned and of Species in Greatest Need of Conservation relying on similar habitats. Please see Appendix II for more information on population status and harvest objectives.

Sport fishes

Objectives for sport fishes are derived from the "Strategic Plan for Illinois Fisheries FY02 - FY06," for the year 2015.

Trout & salmon -

1. Maintain the supply of quality angling days in streams and Lake Michigan.
2. Increase supply by 30,000 angling days in impoundments.
3. Re-establish a naturally reproducing population of lake trout in Illinois waters of Lake Michigan.
4. Self-sustaining populations of brook trout are restored in at least 4 streams.

Northern pike, muskellunge -

1. Maintain the supply of quality angling days in streams.
2. Increase supply by 2,600 days in impoundments.

Walleye, sauger, and perch -

1. Maintain the supply of quality angling days for walleye and sauger in impoundments and streams.
2. Maintain the supply of quality angling days for yellow perch in Lake Michigan.

3. Increase the supply of coolwater fish (walleye, sauger and hybrid striped bass) by 108,000 days in reservoirs.

Black bass -

1. Maintain the supply of quality angling days in reservoirs and streams for largemouth bass.
2. Increase the supply within impoundments to 5.6 million days.
3. Maintain the supply of smallmouth bass in streams.

Panfish -

1. Increase the supply of quality angling days by 21,000 within reservoirs and by 55,800 days per year within impoundments to 10.5 million.

White Bass, Striped Bass & Hybrids -

1. Increase the supply of striped bass and hybrid striped bass by 97,000 days in streams.
2. Increase the supply of coolwater fish (walleye, sauger and hybrid striped bass) by 108,000 days in reservoirs.

Catfish -

1. Maintain the supply of quality angling days in reservoirs and streams, and increase by 33,000 days within impoundments.

Commercial fish -

1. Increase demand for quality angling days by 16,000 in reservoirs, 100,000 days in impoundments, and 600,000 days in streams.
2. Maintain the commercial harvest in reservoirs, and increase the commercial harvest in impoundments and streams.

Birds

Waterfowl -

1. Achieve and maintain 1970's levels of use-days by migrant duck populations (September-

January) on important waterfowl areas in the Illinois and Mississippi River valleys (an increase of 38.9 million duck use-days, or 147%). Assuming average weather conditions and continental duck populations at North American Waterfowl Management Plan levels, harvest could be 500,000 birds annually.

2. Manage migratory waterfowl in the Wabash River corridor.
3. Support breeding duck densities of 5.0 pairs/sq. km or annual breeding mallard population of 20,000 in the Glacial Lakes region of northeastern Illinois.
4. Maintain statewide nesting populations of wood ducks and other species.
5. Achieve and maintain 1991 through 1995 levels of migrant Canada goose populations as measured by U.S. Fish and Wildlife Service Midwinter Waterfowl Survey (an increase of 175,000 birds). With migratory and resident goose populations at target levels, harvest could be 150,000 geese annually.
6. Facilitate giant Canada goose conflict mitigation in areas where human-goose conflicts such as property damage, risks to human health/safety, and damage to crops exist.

Wild turkey -

1. Increase the current population of wild turkeys in Illinois by 20%. Increase the harvest of wild turkeys by 20%, to approximately 22,000 birds.

Upland gamebirds -

1. Add about 124,000 coveys to the pre-hunt autumn population, estimated at 95,000 coveys in 1999 (Dimmick et al. 2002). This population could support an annual harvest of 876,000 birds.
2. Increase the autumn pre-hunt flock of wild ring-necked pheasants to 2 million birds from an estimated current 800,000 birds.

Mammals

White-tailed deer -

1. Short-term: increase the deer harvest to reduce the overall pre-hunt herd size to about 700,000 animals (currently at 750,000 to 800,000).

2. Long-term: maintain a herd of about 700,000 animals and annual harvest of about 140,000 deer.
3. Deer populations in urban and suburban settings are effectively managed.

Habitats

Goals for these major habitat types are compilations of habitat objectives derived for individual species or guilds in the previous section. Please see Appendix III for relationships among wildlife objectives, habitat objectives, and proposed conservation actions. Note that habitat objectives are complimentary in nature, e.g., restoring and managing terrestrial habitats contributes to reduced sedimentation in wetlands and streams, and thus will benefit multiple habitats, Species in Greatest Need of Conservation, sport fishes and game animals.

Forest -

1. Implement sustainable forestry practices, including timber stand improvement, prescribed fire, timber harvesting and invasive species control to enhance oak-dominance and maintain understory diversity on 1 million acres of forest.
2. Increase statewide forest acreage by 350,000 acres, emphasizing restoration of floodplains and riparian corridors, increasing ecological connectivity among forests and other habitat patches, and reducing fragmentation of forests 500 acres and larger.
3. High-quality examples of all forest communities, including all Grade A and B Illinois Natural Areas Inventory sites, are restored and managed within all natural divisions within which they occur.
4. Urban forests are healthy and well-maintained.

Open Woodland/Savanna/Barrens -

1. Implement sustainable forestry practices, including timber stand improvement, prescribed fire, timber harvesting and invasive species control to enhance oak-dominance and maintain understory diversity of savanna/barren/open woodland habitat.

2. Extent and condition of open woodland, savanna, and barrens habitats are known and monitoring can identify conservation needs.
3. Degraded habitats have been identified and restored as possible; small woodlots are managed as open woodlands/savannas as appropriate.
4. High-quality examples of all open woodland, savanna and barren communities, including all Grade A and B Illinois Natural Areas Inventory sites, are restored and managed within all natural divisions within which they occur.

Grassland -

1. An additional 1 million acres of grassland, emphasizing upland, treeless grasslands larger than 0.5 mile wide and ecological connectivity among grasslands and other habitat patches, are established and maintained.
2. Wildlife-value (structure, floral diversity, disturbance regimes) of 1 million existing acres of grassland are enhanced.
3. Five additional “ecological pattern” grassland Bird Conservation Areas (see Fitzgerald et al. 2000) have been established.
4. Three wet prairie areas of 1,000 to 2,000 acres, connected by dispersal corridors, are restored and managed in the Grand Prairie natural division.
5. At least 6 areas (300-500 acres each) of ephemeral wetlands and accompanying upland sand prairie habitat are restored and managed for Illinois chorus frogs in the inland sand areas.
6. High-quality examples of all prairie communities, including all Grade A and B Illinois Natural Areas Inventory sites, are restored and managed within all natural divisions within which they occur.

Shrub/successional -

1. Extent and condition of shrub/successional habitats are known and monitoring can identify conservation needs.
2. Additional habitat has been established and is being managed.

3. As appropriate, small woodlots and forests have native shrub-dominated, early successional edges and perennial herbaceous borders.
4. Herbaceous and shrub corridors link isolated upland habitat patches in areas of intensive agriculture.

Wetland -

1. A net gain of 20% of marsh wetland types is achieved through restoration, enhancement and management.
2. A net gain of 40% of combined wetland types is achieved in the river bottomlands natural divisions of Illinois.
3. Ephemeral and fishless semi-permanent wetlands (i.e. vernal pools, prairie potholes, landscape depressions) support objectives for dependent species of wildlife (e.g., dragonflies, amphibians).
4. Moist-soil management strategies adopted on public waterfowl management areas and other sites increase wading bird, waterfowl, shorebird, and other wildlife use.
5. The integrity of water quality is maintained on a statewide basis.
6. Local residents in areas under high development pressure and/or within fragile geographic zones (i.e. karst terrain) are educated and manage lands and waters to maintain or improve water quality.
7. Total sediment delivery to wetlands is reduced.
8. High-quality examples of all wetland communities, including all Grade A and B Illinois Natural Areas Inventory sites, are restored and managed within all natural divisions within which they occur.

Lake & Pond -

1. No net loss of the productive capacity of habitat supporting Lake Michigan's fish communities, including suppressing sea lamprey, sustaining native fish communities, and restoring riverine spawning and nursery areas.

2. The supply of quality angling days is increased by 2.0 million by expanding and improving accessible impoundments.
3. Total sediment delivery to lakes and ponds is reduced.
4. Sediments are removed from lakes and ponds for beneficial uses.
5. Rapid Response plans are implemented for the Great Lakes basin and Mississippi River basin (covering all of Illinois). An aquatic nuisance species barrier protects the Great Lakes and Illinois River basin from biological invasions.
6. The integrity of water quality is maintained on a statewide basis.
7. Local residents in areas under high development pressure and/or within fragile geographic zones (i.e. karst terrain) are educated and manage lands and waters to maintain or improve water quality.
8. High-quality examples of all lake and pond communities, including all Grade A and B Illinois Natural Areas Inventory sites, are restored and managed within all natural divisions within which they occur.

Streams -

1. Baseline conditions of system functioning and sustainability, against which change can be measured, are understood. A stream classification system ensures all stream types are represented in conservation planning and implementation.
2. Tributary streams are restored to reduce head-cutting and sediment transmission to large rivers. Streambank erosion control techniques address instream habitat needs and incorporate natural riparian buffers.
3. Total sediment delivery to Illinois' rivers and streams is reduced. Excessive sediment delivery is eliminated to specific high-value habitat along main channels and tributaries of rivers and streams.
4. Sediments are removed for beneficial uses and compacted to improve substrate conditions for aquatic plants, fish, and wildlife.
5. Backwaters are restored and rehabilitated to provide a diversity of depths.

6. Main stem and main stem-to-tributary connectivity are restored and maintained, where appropriate, on major rivers and streams. Dysfunctional dams and spring impoundments are removed, and necessary dams are modified to accommodate fish passage. All existing connections between backwaters and main channels are maintained.
7. Riparian habitats are restored and protected.
8. Isolated and connected floodplains are restored and managed along rivers and streams to promote floodplain function and habitats.
9. Side channel habitats are restored and maintained.
10. Land alterations that contribute to unnatural water level fluctuations, flow regimes and water temperatures in rivers and streams are identified and addressed.
11. Low-water fluctuations are reduced where possible, particularly during the months of May through October.
12. Peak flows are reduced by 2 to 3 percent for 2- to 5-year recurrence storm events, reducing peak flood stages and high-water fluctuations.
13. The dramatic water level changes associated with operation of wicket dams have been removed. Water releases from reservoirs are managed to protect downstream flow needs and the integrity of floodplain ecosystems.
14. System-wide limiting factors for representative native species or communities, including altered disturbance regimes (hydrology, connectivity), excessive sedimentation, thermal pollution, reduction and fragmentation of aquatic and riparian habitat, water and sediment quality problems, and invasive species, are identified and addressed.
15. Natural habitats, including concentrations of flora and fauna, areas that are especially vulnerable to disturbance and/or important in fulfilling a life-history requirement of the species present, and specific suitable habitat for endangered or special concern species, are restored and enhanced.
16. Rapid Response plans are implemented for the Great Lakes basin and Mississippi River basin (covering all of Illinois). An aquatic nuisance species barrier protects the Great Lakes and Illinois River basin from biological invasions.
17. The integrity of water quality is maintained on a statewide basis.

18. Local residents in areas under high development pressure and/or within fragile geographic zones (i.e. karst terrain) are educated and manage lands and waters to maintain or improve water quality.

19. High-quality examples of all river and stream communities, including all Grade A and B Illinois Natural Areas Inventory sites, are restored and managed within all natural divisions within which they occur.

Cave -

1. Water quality within cave recharge areas is improved and maintained.
2. Local residents in areas under high development pressure and/or within fragile geographic zones (i.e. karst terrain) are educated and manage lands and waters to maintain or improve water quality.
3. Destruction of surface and sub-surface watersheds is avoided.
4. Natural vegetation buffers are maintained around caves/springs.
5. Water quality monitoring within significant cave systems is adequate to identify system changes.
6. High-quality examples of all cave communities, including all Grade A and B Illinois Natural Areas Inventory sites, are restored and managed within all natural divisions within which they occur.

Primary -

1. High-quality examples of all primary communities, including all Grade A and B Illinois Natural Areas Inventory sites, are restored and managed within all natural divisions within which they occur.

III. D. Challenges for Illinois Wildlife & Habitat Resources

This section highlights the stresses affecting groups of wildlife and habitats. Stresses were categorized as habitat-related, population-related (e.g., genetics), community-related (e.g., predation), and directly human-related (e.g., killing), and ranked as weak, moderate, and strong effects. These assessments were completed by teams of experts, but for many Species in Greatest Need of Conservation, high quality scientific information was not available. Thus, scientists also scored every stress assessment with moderate-to-high confidence, low confidence, or very low confidence.

It is important to note that stresses were considered as factors directly affecting wildlife and habitat (see Appendix II), and not the sources of those stresses. (For example, loss of habitat is a stress, whereas an agriculture practice or development may be the source of that stress.) In many cases, the sources of stresses are apparent or well-known. Others are not well-understood, and require investigation. Sources of stress (including lack of knowledge) are primarily described in the “Issues” segments, and immediately addressed with specific conservation actions, in the seven campaigns of Sect. III, E (Priority Actions for Conserving Illinois Wildlife & Habitats).

Many of the Species in Greatest Need of Conservation, sport fishes, and game animals are limited by similar factors. Interestingly, stresses relating to habitat quality and condition, such as composition and disturbance patterns, are as problematic as the total amount, or extent of habitat. Please review Appendix II for stress assessments of individual species and habitat types.

Species in Greatest Need of Conservation

Invertebrates

Mussels - Water quality and sedimentation were identified as the primary threat to these species. Recruitment, availability of host species, and changes in hydrology are also

challenges. Fragmentation of streams by dams is impeding the movements mussel hosts (fishes). Most aspects of mussel ecology are poorly understood.

Other Invertebrates - Data are lacking for most of the invertebrate species, making it difficult to determine Species in Greatest Need of Conservation, and to evaluate stresses that may be affecting those species. Biologists presume similar stresses are affecting invertebrates as the other Species in Greatest Need of Conservation, but perhaps more intensely. For example, many insects are dependent on specific host plants or animals, and likely are more adversely affected by degrading natural communities. Aquatic invertebrates, often with smaller body size, shorter lifespans, and lesser abilities to seek out new, better habitats, may be more affected by periods of poor water quality.

Fishes Water quality and sedimentation, which also affect the composition and structure of aquatic habitats, are stressing fishes in greatest need of conservation. Quality of many aquatic habitats, defined by vegetation, water temperature, flow, substrate and other factors, are limiting most species. Fragmentation of remaining aquatic habitats, by other unsuitable aquatic habitats, dams and levees, stresses small, isolated populations. Competition of invasive species is increasing.

Amphibians The extent of habitat, disturbance regimes and altered hydrology, structure and composition of habitat, and habitat fragmentation are the primary challenges to the amphibian Species in Greatest Need of Conservation. Recruitment is also thought to be problematic, but not well understood. Given amphibians' sensitivity to environmental factors, it will be increasingly important to minimize local stressors such as habitat loss and pollutants in order to reduce the effects of climate change (Inkley et al. 2004).

Reptiles Recruitment (specifically relating to high predation rates on eggs and juveniles), while not well understood, is thought to be a serious threat to the reptiles in greatest need of conservation. Mortality due to roadways, habitat extent, composition and structure, disturbance regimes and fragmentation, and genetics are also challenges to these populations.

Birds All habitat issues (extent, composition and structure, fragmentation, disturbance regimes, and invasive plants) are and likely will continue to challenge the avian Species in Greatest Need of Conservation. Recruitment (relating to high predation rates of eggs and juveniles), mortality, and human structures and infrastructures (windows and wind turbines) are also of high concern for many of these species.

Matthews et al. (2004) modeled the effects of climate change on 150 species of birds in eastern United States. Generally, ranges are predicted to shift northward, with many species expected to become restricted in or extirpated from Illinois (e.g., red-headed woodpecker, bobolink) . Other species are likely to expand their range or pioneer into Illinois (e.g., little blue heron, Bachman's sparrow).

Mammals The severity of challenges vary considerably among the mammal species in greatest need of conservation, though habitat extent and fragmentation are the most important for the group as a whole. High bat mortality at wind turbines has been reported in other states, and wind energy is a rapidly growing industry in Illinois. Disturbance of hibernacula is a serious potential stress to wintering bats.

Harvested Wildlife Resources

Sportfishes Recruitment is an on-going challenge for many native sport fish, which in many lakes and rivers are maintained by stocking (black bass, channel catfish, lake trout, sauger). Other stocked fishes (e.g., brook trout, muskellunge) seldom reproduce naturally in Illinois, but may when high-quality habitat and conditions (e.g., coolwater streams) are restored. Water quality and sedimentation, which also affect the composition and structure of aquatic habitats, are stressing some sport fisheries. Smallmouth bass are negatively affected by stream channelization and lack of riparian habitat. Invasive species, such as Asian carp, are a growing challenge.

Birds The major challenges to the game birds are habitat-associated, especially with wetlands, grasslands, and shrub/successional habitat. The related factors of composition and structure,

disturbance patterns, invasive plants, and fragmentation are greater challenges than the current extent of habitat. Changing forest composition may affect wild turkey abundance in the future. Nearly all climate change models predict reduced soil moisture (strongly correlated with the abundance of small wetlands) for the Prairie Pothole region of the northern United States and southern Canada (Inkley et al. 2004), where most ducks harvested in Illinois are produced.

Mammals Relative to other groups, the furbearers and game mammals are perceived as secure in Illinois. While habitat quantity and quality are important, most of these species have proven adaptable to a wide range of habitat conditions. Chronic Wasting Disease, currently restricted to a few counties in northern Illinois, is a threat to the white-tailed deer herd.

Habitats

The following key statewide findings are from a report of the Critical Trends Assessment Program (2001), and highlight a number of the most significant challenges to the streams, wetlands, grasslands, and forests of Illinois:

- *habitat fragmentation is a widespread problem that limits attempts to maintain and enhance biodiversity,*
- *habitat degradation is a widespread problem that could be slowed or minimized by simply removing the degradation factors, such as improper grazing,*
- *if degradation is severe, restoration to predisturbance condition will likely require intensive vegetation management,*
- *restoring native vegetation along streams would shade the streams, stabilize banks, and filter sediment and chemicals from runoff before they reached the streams, resulting in less siltation and desiccation and lower water temperatures, and*
- *setting prescribed fires in terrestrial ecosystems, such as prairies, marshes, savannas*

and oak-dominated forests, that need regular burning would maintain and enhance their characteristics and diversity.

Based on a assessment process similar to that used for the Species in Greatest Need of Conservation (only habitat-related stresses; see Appendix II), the stresses affecting eight major important habitat classes in Illinois are summarized in the following section.

Forest - Maintaining and improving the quality of Illinois' forest will be considerably more challenging than maintaining or increasing the amount of forest acreage, which has been steadily increasing since the 1920s. Composition and structure, disturbance regimes, and invasive species all received the highest stress scores. Fire exclusion, poor timber harvest practices (namely high-grading and single tree selection methods), grazing/over-grazing, increasing sugar maple and mesophytic tree species, invasive exotic plants and insects, and diseases are changing Illinois' forests. Illinois' forests are highly fragmented, a trend accelerating due to exurban development.

Open Woodland/Savanna/Barren - Composition and structure, disturbance regimes and invasive species are priority concerns, as is the extent of savanna habitat. Savanna-like habitats apparently continue to decline due to destruction, improper grazing, and succession into closed forest in the absence of fire, timber harvest and other disturbances. Oak savannas, especially mesic savannas, are vulnerable to rapid invasion by shade tolerant species in the absence of fire. When undesirable trees are too large to be affected by prescribed fire, they must be physically removed for restoration.

Grassland - Once the dominant land cover in Illinois, native prairie has been eliminated from The Prairie State. The remaining "postage stamps" of prairie are threatened by succession, fire suppression, invasive species, and conversion to other land uses. In spite of an increase of more than 780,000 acres of idle grassland through the Conservation Reserve Program since 1985, Illinois has experienced a net loss of more than half of its grassland habitat over 50 years as grasslands, including hay and pasture, have been converted to rowcrops and developed lands. Stresses to habitat quality (fragmentation, composition and

structure, disturbance regimes such as poorly-timed and unnecessary mowing, invasive species), severely limit the ability of existing grasslands to function as a natural community that provides suitable habitat for wildlife. Most remaining grasslands are too small to attract area-sensitive species, and the juxtaposition of grassland, relative to wetlands, savannas, shrub/successional habitat, and cropland are very important to many farmland species.

Climate change over the next century may make grassland habitat, and tallgrass prairie in particular, more difficult to maintain in Illinois. Simulated vegetation responses by 2100 to climate change models predict a shift from a savanna/woodland climate of present to a temperate deciduous forest and southeastern mixed forest climate. Atmospheric CO₂ enrichment further favors plants with C₃ photosynthesis (e.g., trees, shrubs and cool-season grasses) over the many tallgrass prairie species with C₄ photosynthesis physiology (see discussion in Inkley et al. 2004).

Shrub/successional - Though reliable knowledge is not available, anecdotal reports and population trends of certain species suggest concern for the extent and condition of shrubland and early successional habitats. Loss of pastures, old fields, idle areas and fence rows in agricultural areas and reduction of timber harvest and burning in woodlands have contributed to a decrease of this habitat type. Invasive shrub species are replacing native shrubs and increasing in forest understories, with unknown effects on shrubland wildlife.

Wetland - The quantity and quality (fragmentation, composition and structure, disturbance regimes, invasive species, pollution and sedimentation) of wetlands in Illinois are problematic. While conservation actions have led to localized increases in wetland acres and improvement in condition, the statewide trend is towards wetland loss and deterioration. Many restored wetlands are isolated, poorly managed after construction, and could be greatly improved for wildlife benefits (Phillips and Brown 2004).

Lake & pond - Volume loss to sedimentation is the primary stress for lake and pond habitat in Illinois. Invasive species, sedimentation, shoreline development, and boat traffic have

reduced submersed and emergent vegetation, harming composition and structure. Nutrient loading has lead to eutrophication in many bodies of water as well.

Streams - Substrate composition and structure of streams is negatively affected by sedimentation, dredging and channelization. Dams and levees fragment stream reaches and adjacent habitats in many watersheds, and rapid run-off from agricultural and urban areas combined with water releases from dams, result in extreme flow regimes. Invasive fishes and invertebrates are significant problems in the larger rivers.

Cave - Water quality and availability and human disturbance or damage are the primary issues for the conservation of cave habitats and the sensitive species they support. Groundwater protection and pollution prevention are critical in karst regions. Abandoned mines can provide additional habitat for hibernating bats if entrances are properly protected for human safety and to prevent disturbance.

III. E. Priority Conservation Actions for Illinois Wildlife & Habitat Resources

Based upon the status of Illinois' wildlife and habitat resources, objectives for conservation, problems affecting wildlife and habitat resources, and discussions of priorities among conservation agencies and organizations, the following seven "campaigns" were developed. These campaigns seek to address the most widespread and the most urgent issues affecting wildlife and habitats, in an efficient, effective, and comprehensive manner. Each campaign overlaps broadly with the others, and the campaigns should be considered in combination rather than in isolation. Please see Appendix III for the how the priority conservation actions within the campaigns address the problems affecting habitat and wildlife resources, and performance measures for each conservation action.

While many other conservation actions are on-going or were proposed, only the highest priority actions for achieving statewide objectives are included in this section. In several cases where actions must be undertaken in one or few natural divisions to reach statewide objectives, those locations are indicated in this section. Conservation actions that are essential to reaching regional and local objectives are further described in treatments of the 15 natural divisions, which include descriptions of priority actions within conservation opportunity areas (Sect. IV).

Many of the actions described in this section are currently being undertaken by various agencies, organizations and citizens. These actions are intended to build upon and improve on-going conservation to achieve statewide objectives. Existing programs and staff with local, state, regional and federal interests are in place, and likely will be avenues for future changes and improvements.

Streams Campaign

Issues

Many problems with Illinois' streams originate on uplands and at headwaters. Waters from agricultural fields and urban areas carry nutrients (from natural sources and fertilizers) and other pollutants, contributing to eutrophication at locations far downstream. Retirement of environmentally-sensitive lands from rowcrop production and conservation tillage practices have greatly reduced the amount of silt that enters streams in recent decades. Tiling and channelization of headwater streams have increased the speed at which waters enter the state's river systems. In developed areas, waters accumulate high loads of nutrients and pollutants, and drain very rapidly from impervious surfaces. Wastewater treatment and reduction in industrial pollutants have significantly improved water quality downstream of urban centers.

Improved drainage on agricultural and developed lands, coupled with levee systems that disconnect rivers from floodplains, have altered the hydrologic patterns in Illinois' streams, with flooding becoming more frequent and more severe. High-energy drainage waters are contributing to gully, stream bank erosion and channel incision—important sources of sediment that add to the “legacy” sediments from uplands that are currently moving through Illinois' streams. The lack of riparian forests along many streams contributes to banks becoming unstable and for allowing direct sunlight to warm waters. In some locations, ground water supplies have become contaminated by pollutants, and water tables are being drawn down as a result of municipal, industrial and irrigation usage.

Dams on many of Illinois' rivers have created “silt traps” in impoundments and reservoirs. Lakes and ponds with connections to streams have lost significant volume to sediments. The lock-and-dam system on the Illinois, Mississippi and Ohio Rivers has created a series of lakes in place of a continuous stream, changing habitat conditions and substrate composition to the detriment of many species. Dams fragment stream reaches for many species of aquatic wildlife, and levees isolate important spawning habitats.

Invasive species, including zebra mussels and Asian carp, are particularly problematic in larger rivers in Illinois. Common carp have destroyed submersed and emergent aquatic vegetation in many rivers and backwaters. Several fishes and freshwater mussels have become extirpated within the past 200 years, and many more are endangered in the state. Only 200 acres of streams in Illinois are recognized as high-quality natural communities.

Actions

1. Develop and promote upland agricultural practices that decrease the energy, sediment load, temperature, and pollutant load of drainage waters
 - a. establishment of native perennial vegetation on highly erodible soils
 - b. use of buffer vegetation at land-water transitions
 - c. wetland enhancement and restoration
 - d. conservation tillage or no-tillage practices
 - e. precision nutrient applications
 - f. limiting livestock access to streams
 - g. water control structures on subsurface tile drains for seasonal use
 - h. continued protection of stream waters and groundwater from nitrates, bacteria and other contaminants derived from livestock waste

2. Develop and promote practices that decrease the energy, sediment load, temperature, and pollutant load of drainage waters from developed (urban, suburban) lands
 - a. wetland enhancement and restoration, and other tools for flood water retention; use retention facilities to hold floodwaters for an adequate length of time
 - b. minimizing impervious surfaces
 - c. zoning guidelines to promote smart growth and minimize effects on environmentally-sensitive lands (e.g., highly erodible soils)
 - d. maintenance and improvement of wastewater treatment facilities
 - e. appropriate nutrient applications on landscaped vegetation

3. Protect, restore and enhance near-stream and in-stream habitats and processes
 - a. restore and manage grassy buffers, wetlands, riparian forests, and flood plains

- b. restore tributary streams to reduce head-cutting and sediment transmission to large rivers
 - 1. buffer and restore channels of the Vermilion (Wabash), Embarras, and Little Wabash rivers and their tributaries to benefit the high diversity of aquatic Species in Greatest Need of Conservation in the Wabash River Natural Division
 - 2. restore and manage the Wabash River, the largest unchannelized and unimpounded river in Illinois
 - 3. buffer and restore channels in 8-10 small headwater stream segments >5 miles to support listed fishes and mussels in each the Northeastern Morainal, Grand Prairie, Rock River Hill Country, Wisconsin Driftless, and Illinois River and Mississippi River Sand Areas natural divisions
- c. re-meander channelized streams; provide technical assistance, publish and market to drainage districts best practices that reduce erosion and improve habitat while lowering costs
- d. re-establish and maintain connectivity of the main stem, main stem-tributary, channel-floodplain, and channel-backwater on rivers and streams where appropriate
- e. restore normal flood-pulse and hydrologic patterns
 - 1. remove the dramatic water level changes associated with operation of wicket dams
 - 2. reduce low-water fluctuations where possible, concentrating on the months of May through October
 - 3. reduce peak flows by 2 to 3 percent for 2- to 5-year recurrence storm events—this will help to reduce peak flood stages and reduce high-water fluctuations along the river
- f. dredge sediments where necessary
- g. compact sediments to improve substrate conditions for aquatic plants, fish, and wildlife
- h. restore and rehabilitate backwaters to a diversity of depths (5% >9 feet, 10% 6-9 feet, 25% 3-6 feet, and 60% <3 feet)
- i. remove unnecessary dams and fit necessary dams with effective fish passage structures

- j. restore and maintain side channel habitats
 - k. regulate reservoir releases to assure seasonal inundation of oxbows and backwaters and to maintain the integrity of floodplain forests
4. Restore populations of imperiled and extirpated aquatic animals
- a. maintain populations at all currently-occupied locations and re-establish populations at 50% or more of historic locations where suitable habitat persists or can be restored. The recovery of aquatic endangered and threatened animals will depend on restoration and enhancement of existing aquatic habitats, such as pools, riffles, and lateral wetlands. It will be necessary to re-create wetland habitats for amphibians and dragonflies.
 - 1. protect and enhance Round Pond for the river cooter and other reptile species
 - 2. protect the Vermilion River (Illinois), lower Fox River and tributaries for benefit of listed redhorse species
 - 3. restore the Saline River and its tributaries to benefit Ohio River drainage mussels and crayfish in the Shawnee Hills natural division
 - 4. restore and protect Crane Creek (Sangamon River) and other groundwater fed, well-vegetated streams supporting unique fish communities
 - 5. restore coolwater streams, particularly within the Apple and Rock River watersheds
 - b. reintroduce native species into stream habitat where decimating factors have been eliminated and natural recovery is unlikely
 - c. collaboration among the Illinois Endangered Species Protection Board, Illinois Department of Natural Resources, U.S. Fish & Wildlife Service and other agencies, organizations and institutions on recovery plans and actions for rare and declining species
5. Prevent and control invasions of detrimental exotic species
- a. implement Rapid Response plans for the Great Lakes basin and Mississippi River basin, covering all of Illinois

1. Prevent invasion by black carp in the Upper Mississippi River and Illinois River watersheds
 - b. install an aquatic nuisance species barrier that protects the Great Lakes and Illinois River basin from biological invasions
 - c. continue removal and control (chemical, mechanical and biological) of invasive exotic species, especially within high quality natural areas

6. Restore and manage high-quality examples of all river, stream, lake, and pond communities, including all Grade A and B Illinois Natural Areas Inventory sites, in all natural divisions within which they occur

7. Fill information gaps and develop conservation actions to address stresses
 - a. understand baseline conditions of system functioning and sustainability, against which change can be measured
 - b. identify and address system-wide limiting factors for representative native species or communities, including, but not limited to, altered natural disturbance regimes (hydrology, connectivity, etc.), excessive sedimentation, reduction and fragmentation of aquatic and riparian habitat (habitat patch size, habitat spacing, lateral and longitudinal connectivity), water and sediment quality problems, and invasive species
 - c. develop flow standards for all rivers
 - d. evaluate drainage maintenance procedures in Illinois' rivers to protect important remnant habitats and avoid stream bed erosion
 - e. identify and quantify land alterations that contribute to unnatural fluctuations and flow regimes in rivers and streams.
 - f. identify local opportunities (isolated backwaters, potential moist-soil floodplain areas) and implement projects to provide basis for larger restoration projects.
 - g. identify areas in the Green River and Rock River drainages that can be conserved to sustain populations of weed shiner and blacknose shiner
 - h. identify beneficial uses of sediments
 - i. develop and implement guidelines for sustainable use of surface and ground waters for residential, commercial, agricultural and recreational uses by all of Illinois' citizens

8. Coordinate stream and watershed conservation actions with other agencies, organizations and upstream and downstream states to meet system-wide objectives

9. Increase water quality education efforts in areas under high development pressure and/or within fragile geographic zones (i.e. karst terrain)

10. Marketing and technical assistance will be required for adoption and appropriate implementation of the streams campaign.

Forests Campaign

Issues

The quality of Illinois' wooded habitats—forest, open woodlands, savannas, barrens, and shrublands—is a major concern. Alteration of natural disturbance processes, including flooding regimes and suppression of fire, but also inappropriate timber harvest done without professional forestry assistance, are contributing to changing composition of forested habitats, notably the increase in maples, other mesophytic trees and closed forests types, and decrease in oak-hickory dominance and open forest types.

A general decline in management of wooded habitats (prescribed fire and lack of professional forestry staff to assist private forest owners), has led to stark transition areas between open agricultural fields or grasslands and closed forest. Drainage waters leaving agricultural and urban areas at high velocity and entering the sparsely-vegetated floors of closed forests leads to gully erosion, delivering sediment and high energy waters to streams.

The rate at which invasive exotic species degrade forested habitats is increasing. Chestnut blight and Dutch elm disease have reduced the diversity of canopy species, whereas Osage orange and black locust dominate canopies of former pastures and reclaimed mine lands, respectively. Oak decline is a local, poorly-understood problem. Gypsy moths, Asian long-horned beetles and emerald ash borers have the potential to devastate urban and rural forests. Shrubs, including honeysuckles and buckthorns, degrade forest communities by reducing the abundance and diversity of native shrubs and herbaceous plants, increasing bare soils and erosion potential, reducing wildlife diversity, and inhibiting recruitment of desirable tree species. Vines (e.g., kudzu) and herbaceous plants (e.g., garlic mustard) further reduce biodiversity. Each invasion tends to reduce stability of forest systems, increasing the probability and severity of the next invasion.

Illinois' forests were naturally dissected along riparian areas, but have been further fragmented by clearing for agriculture and development. Fragmentation contributes to the invasion of nonnative species, and exacerbates natural wildlife interactions such as high rates

of predation by generalist predators and parasitism of songbird nests by brown-headed cowbirds to undesirable levels. Fragmentation of forests continues from a variety of sources, with exurban development a noteworthy challenge.

Available information suggests populations of Neotropical migratory birds in most, if not all, of Illinois forests are “sinks” with low recruitment and sustained by immigration from forests beyond Illinois (Robinson et al. 1995). However, whether a specific forest patch is a “source” or “sink” is difficult to quantify with available methods, and likely varies among species and years. While value as nesting areas is debatable, isolated woodlots and forests along rivers and streams are important during spring and fall migration, though these benefits are also difficult to measure.

The white-tailed deer herd is very large in Illinois, as deer have proven highly adaptable to fragmented forests and tolerant of proximity to people, resulting in increasing deer-human conflicts (including automobile accidents and crop damage) and damage to natural community composition through intensive browsing. Hunter access to forests to control the deer herd is a growing concern, as an increasingly urbanized public has fewer ties to rural and agricultural landowners, landowners face increased demand for access and changing liability risks, and suburban and exurban development restricts the proportion of wooded habitats that can be hunted.

To aid private forest owners, the Illinois Department of Natural Resources administers the Illinois Forestry Development Act, a program for managing forests for wood products. Illinois Forestry Development Act offers reduced property tax liabilities, technical assistance, and state cost-sharing to achieve improved wildlife habitat, soil stabilization, and improved water quality.

Actions

1. Maintain and enhance the composition of Illinois’ forested habitats
 - a. reintroduce natural disturbances or suitable substitutes on a large scale
 1. prescribed fire should be applied, where appropriate, to maintain or restore

open woodland habitats (e.g., savanna, barren), promote oak-hickory regeneration, stimulate the germination and production of native ground-layer plants and control invasive species

2. sustainable forestry practices will be necessary to restore and manage open forest habitat types in locations that have matured to closed forest or been invaded by undesirable woody species, to mimic natural processes in areas where fire is not an appropriate management tool, to supplement fire where undesirable trees have grown too large to be controlled safely with fire, and create diverse age classes of forest necessary to sustain wildlife species requiring various successional forest stages. The economic benefits of sustainable forestry practices provides an incentive for landowners to improve the quality of their forests.

b. edges of forested habitats should be widened to create broader transition areas from grassland, shrub/successional, savanna/open woodland, to closed forest, thus providing more and better habitat for most wildlife species in greatest need of conservation and slowing drainage waters from agricultural or developed lands prior to entering streams

c. in regions of Illinois where upland forests are highly fragmented, management for shrub/successional, savanna/barren and open woodlands should be emphasized. While “interior” forest conditions are fully achieved for many species only in compact forests exceeding 50,000 acres (e.g., low brood parasitism rates of nests of Neotropical migratory songbirds), management of area-sensitive species is a high priority in forests >1,000 acres. In all cases, care should be taken to conserve and enhance high-quality Illinois Natural Areas Inventory communities.

d. continued removal and control (chemical, mechanical and biological) of invasive exotic plants, especially within high quality natural areas

e. reintroduce native species into forest habitat where decimating factors have been eliminated and natural recovery is unlikely

f. collaboration among the Illinois Endangered Species Protection Board, Illinois Department of Natural Resources, U.S. Fish & Wildlife Service and other agencies, organizations and institutions on recovery plans and actions for rare and declining species

- g. reduce, then maintain a white-tailed deer herd of about 700,000 animals by increasing hunter opportunity (permits, season framework, incentives-based access to private lands). It is expected that forest habitat conditions will improve as the deer herd is reduced through harvest.
 - h. address deer populations in locations where browse is degrading habitat quality and/or preventing recovery of vegetation
- 2. Expected increases in statewide forest acreage (the continuation of an 80-year trend) should emphasize:
 - a. restoring floodplains and riparian corridors
 - b. ecological connectivity among forests and other habitat patches
 - c. reducing fragmentation of forests >5,000 acres (Shawnee Hills, Ozarks, lower Kaskaskia River corridor, Pere Marquette State Park, Lowden Miller State Forest/Castle Rock State Park, and Mississippi Palisades State Park/Hanover Bluff/Witowski/Winston Tunnel areas)
 - d. reducing fragmentation of forests 500 acres and larger
- 3. Develop and expand programs to assist private forest owners in managing forest resources
 - a. incentives or tax benefits and technical assistance should be provided (and expanded, as under the Illinois Forestry Development Act) to encourage the conservation and wise management of forest habitat. Riparian forests are especially critical for delivering environmental benefits (wildlife habitat, flood control, stream protection, water quality improvement)
 - b. programs to promote access to private wooded habitats, including liability reform and financial incentives, need to be developed to provide hunter access for managing populations of deer and other wildlife, and for meeting increasing demands for outdoor recreation
- 4. Promoting the increased use of prescribed fire and sustainable forestry practices will require a campaign of marketing, demonstration areas on public and private forests, technical

assistance, professional training, access to fire equipment, cooperation with fire protection districts, and reform or clarification of liability issues.

5. Local and state authorities, citizens and stakeholders need to cooperate to develop zoning criteria and local greenway plans that protect important habitats and ensure “smart growth.”

6. Fill information gaps and develop conservation actions to address stresses.

- a. a comprehensive program for preventing, eliminating and controlling invasive species is essential
- b. determine the extent and condition of open woodland, savanna, and barrens habitats
- c. determine the extent and condition of shrub/successional habitats
- d. degraded savannas and barrens are identified for restoration with cutting of undesirable plants, prescribed fire and invasive species control

7. Restore and manage high-quality examples of all forest, savanna and barrens communities, including all Grade A and B Illinois Natural Areas Inventory sites, in all natural divisions within which they occur.

Farmland & Prairie Campaign

Issues relating to farmland habitats and native tallgrass prairie remnants are distinct and described in separate sections, below. Actions are then discussed together, as most cropland occurs on areas that were formerly prairie, some agricultural uses of grasslands (e.g., light to moderate grazing) are desirable for maintaining wildlife habitat, and a number of farm programs and delivery systems have been developed that are useful tools for conserving habitats, including prairie restoration.

Farmland Issues

Agriculture is the largest industry in Illinois, and dominates the landscape. Society's demands of agriculture continue to change, from prairie conversion and wetland drainage in the 19th century, to government programs that encouraged maximized production in the second half of the 20th century, to shifts towards sustainability and resource conservation in the present. Important groups of wildlife, namely grassland birds and upland game, thrived in Illinois' farmlands for much of the 20th century. Grasslands, wetlands, shrub/successional area and woodlots were interspersed with cropland that provided waste grain, weed seeds and invertebrates as food for wildlife. Today, more than half of the State is planted to just two species of plants - corn and soybean. After World War II, acreage devoted to rowcrops increased, and small grains, hay and pasture acreage decreased. Concurrently, field size and farm size increased as the number of farms decreased. Cropping practices have become less physical (with reduced and no-tillage systems) leading to reductions in soil erosion from fields. The relative benefit of cropland to wildlife has decreased in Illinois as "clean" farming practices have resulted in less waste grain, weed seeds, and arthropods available to wildlife (Warner et al. 2005). Livestock populations have shifted from pasture to confinement operations.

These factors have all contributed to a decline in the amount and juxtaposition of grassland, early successional/shrub, and wetland habitats. As a result, wildlife populations, formerly considered common in Illinois' agricultural landscape, have declined precipitously, including economically important species such as northern bobwhite, ring-necked pheasant, and eastern cottontail. Grassland habitat is especially degraded in Illinois, with most areas

seeded to monocultures of introduced species. Tall fescue and reed canary grass—species commonly recommended for pasture and erosion control purposes—have little beneficial value for wildlife relative to other native and introduced grasses. Disturbance regimes in grassland habitat further limit wildlife values. Many pastures are over-grazed. Grass waterways, field borders, rural roadsides and some fields idled through farm programs are often mowed once or more annually, reducing standing vegetation that can serve as habitat, and destroying nesting wildlife when conducted from April to July. Other grasslands, idled through programs such as the Conservation Reserve Program or abandoned from cultivation, are often disturbed too infrequently, resulting in degraded vegetation structure, low plant diversity and succession into woody cover (typically invasive shrubs). In general, the perspective of natural resource professionals is that Illinois is becoming increasingly divided into lands that are heavily disturbed (cropped annually, frequently mowed, heavily grazed or developed) and those given little or no management (fire, mowing, grazing, forestry) that are maturing into low quality closed forest.

Soil erosion from farmland has decreased, though problems remain. Sediment already in transport in Illinois' rivers will remain an issue for decades or centuries. Leaching of nutrients and pesticide residues from Illinois' rich soils into drainage waters has led to eutrophication of surface waters and occasional contamination of drinking waters (ground water and impounded water). Tiling, stream channelization, destruction of wetlands and riparian vegetation, and other drainage improvements have increased the energy of drainage waters, resulting in water level extremes in streams, stream bank erosion, and channel incision.

Suburban and exurban development primarily occur on agricultural lands, with significant long-term economic, social and ecological implications. As the farm population has decreased as Illinois' total population has increased, more citizens have found access to private property to be increasingly difficult to obtain. Questions about liability, and increased demand for access as natural resources have declined, have tempered private landowners' willingness to allow access to their properties. Leasing property for recreational use (e.g., hunting) is a growing trend in Illinois, changing the context within which various agencies are mandated to conserve wildlife resources as a public trust.

Prairie Issues

Most of the lands currently used for crop production in Illinois were tallgrass prairie at the time of European settlement. Of an estimated 21 million acres of prairie, less than 2,600 acres of high-quality remnants remain—a loss of more than 99.99%. Most of these remnants are smaller than 40 acres, and plant and animal populations in many of the smallest are sometimes considered “the living dead” because they are gradually going extinct. Goose Lake Prairie and Lost Mound National Wildlife Refuge are the largest remnants of native tallgrass and sand prairie, respectively. Prairie Ridge State Natural Area hosts the most complete prairie bird community (but not on native prairie), and Midewin National Tallgrass Prairie is an on-going 19,000-acre restoration effort.

Small size and isolation of plant and animal populations are among the greatest stresses to native prairies. Though the best-quality prairie remnants have been identified and many are intensively managed by conservationists, degradation and loss continues. Invasive species, including introduced cool-season grasses and teasel, are chronic problems. Invasive shrubs, such as autumn olive, and succession encroach on remnants not managed with prescribed fire and physical removal of woody vegetation. Development continues to consume prairie remnants and hill prairies.

The art and science of prairie restoration has progressed significantly in recent decades. However, most ‘prairie restorations’ are little more than plantings of native warm-season grasses, with few native forbs and limited wildlife benefits. Even diligent restorations often lack the biological diversity and complexity of interactions of native prairies, and require many years to establish.

Farmland & Prairie Actions

1. Through incentives-based programs and technical assistance, establish or restore grassland, early successional/shrub, wetland, and riparian habitat.
 - a. emphasize treeless grasslands larger than 0.5 mile wide and ecological connectivity among grasslands and other habitat patches to conserve grassland Species in Greatest Need of Conservation

- b. establish additional shrub/successional habitat with native species, and use prescribed fire and mechanical disturbance to manage habitats
 - c. work with conservation partners and private landowners statewide to enhance small woodlots and forests with native shrub-dominated, early successional edges and perennial herbaceous borders
 - d. unlike guidelines for forest and grasslands where large unfragmented patches are desired, expanses of rowcrop cultivation ought to be integrated with grassland, shrub/successional and open woodland habitats to increase wildlife access to land area and beneficial values (e.g., waste grain) of cropland
2. Through incentives-based programs and technical assistance, moderate disturbance regimes and enhance the condition of farmland habitats.
- a. re-seeding/restoring habitats dominated by undesirable species (e.g., conversion of tall fescue to native warm-season grasses)
 - b. use soil disturbance, prescribed fire and managed grazing to enhance grassland structure and floral diversity, and to control woody vegetation
 - c. discourage mowing of idle grasslands during wildlife nesting seasons, and eliminate unnecessary mowing
 - d. use mechanical removal and prescribed fire to maintain shrub/successional habitat and broad transitions between open and wooded habitat types
 - e. limit access of livestock to streams
 - f. moderate the velocity of drainage water with wetlands, water control structures, stream meanders, and buffer vegetation
 - g. develop property tax codes and farm programs that reward good stewardship of wildlife habitats on private lands
3. Restore and manage native prairie communities and populations of imperiled and extirpated prairie wildlife.
- a. continue removal and control (chemical, mechanical and biological) of invasive exotic plants, especially within high quality natural areas

- b. reintroduce native species into prairie habitat where decimating factors have been eliminated and natural recovery is unlikely
 - c. establish five additional “ecological pattern” grassland Bird Conservation Areas (see Fitzgerald et al. 2000), each of $\geq 3,000$ acres, in the Southern Till Plain (2) and Grand Prairie (3) natural divisions (Midewin National Tallgrass Prairie, Prairie Ridge State Natural Area [Jasper and Marion county units], and Pyramid State Park are considered as existing grassland Bird Conservation Areas, but need restoration or augmentation)
 - d. restore and manage 3 wet prairie areas of 1,000 to 2,000 acres, connected by dispersal corridors, in east-central and northwestern portion of Grand Prairie natural division
 - e. restore and manage at least 6 areas (of 300-500 acres each) of ephemeral wetlands and accompanying upland sand prairie habitat in the inland sand areas
 - f. restore and manage high-quality examples of all prairie communities, including all Grade A and B Illinois Natural Areas Inventory sites, in all natural divisions within which they occur
 - g. collaboration among the Illinois Endangered Species Protection Board, Illinois Department of Natural Resources, U.S. Fish & Wildlife Service and other agencies, organizations and institutions on recovery plans and actions for rare and declining species
4. Emphasize multiple-resource benefits of conservation in agricultural landscapes.
- a. evaluate soil condition and carbon budgets for agricultural lands, and promote actions that improve soil condition and sequester atmospheric carbon
 - b. continue working with and targeting voluntary farm programs to meet wildlife and habitat objectives compatible with and in addition to soil and water conservation
 - c. reduce total sediment delivery to rivers, streams, wetlands, lakes and ponds
 - d. improve water quality in rivers, streams, wetlands, lakes and ponds
5. Inter-agency cooperation and coordination to ensure agricultural programs do not have conflicting objectives.

6. Fill information gaps and develop conservation actions to address stresses.
 - a. a comprehensive program for preventing, eliminating and controlling invasive species is essential
 - b. determine the extent and condition of shrub/successional habitats
 - c. better quantify the extent and wildlife-value (floral diversity, nesting season disturbance, winter cover, patch width and juxtaposition relative to other habitats) of grassland

7. At local, county and regional scales, involve stakeholders in discussions of long-term land use planning to meet agricultural, conservation, economic, residential and recreational needs.

8. Clarification or change in liability statutes to promote private land access for wildlife-associated recreation.

Wetlands Campaign

Issues

Wetlands are important habitats that provide a number of valuable ecological services. By holding drainage waters, wetlands help to dampen changes in water levels in rivers and streams, reducing flooding, and to recharge groundwater supplies. As natural locations where water and nutrients pool, wetlands are highly productive in plant and animal life. Similarly, by holding drainage waters and having rapid plant growth, wetlands improve water quality by trapping water-borne sediments and filtering pollutants and nutrients.

Wetlands were once a dominant feature of the Illinois landscape, but have been reduced by more than 90% for agriculture, development, and other land uses. Of the remaining wetlands in Illinois, most have been highly degraded. Invasive plants, including purple loosestrife, Eurasian milfoil, phragmites, and reed canary grass, have reduced biodiversity and degraded the habitat structure of wetlands. Remaining wetlands are increasingly isolated from other wetlands and adjacent habitats. Sedimentation has reduced wetland volume. Changes in hydrology and drainage have starved some wetlands of water, and overwhelmed others. Each of these stresses has reduced the ability of remaining wetlands to perform their ecosystem functions, including supporting diverse and abundant wildlife populations.

Over time, societal views of wetlands have changed. In the past wetlands were perceived negatively as breeding grounds for mosquitoes or undesirable animals and as wastelands or marginal areas for “productive” uses. In light of the increasingly-known benefits of wetlands, a number of regulations have emerged to protect remaining wetlands and mitigate for losses. Illinois’ Interagency Wetlands Act of 1989, for example, outlined a goal of no net loss of wetland acres or functional value due to state-supported activities. In addition to mitigation regulations, many agencies, organizations and programs encourage the voluntary restoration of wetlands. In general, restored wetlands have lesser ecological function than natural wetlands, though restoration techniques are improving. A number of large-scale partnership wetland restoration projects are underway in Illinois, including the Cache River

project in far southern Illinois, the Emiquon project on the middle Illinois River and the Hennepin & Hopper Lakes project on the upper Illinois River.

Actions

1. Improve the condition of existing natural and artificial wetlands.
 - a. continued removal and control (chemical, mechanical and biological) of invasive exotic plants, especially within high quality natural areas
 - b. manage water levels to enhance wetland condition and provide wildlife benefits
 1. adopt moist-soil management strategies on public waterfowl management areas and other sites that increase wading bird, waterfowl, shorebird, and other wildlife use
 2. maintain appropriate ground water levels and hydrologic function to support wetland habitat
 - c. provide buffer habitats, equal to or greater than wetland size, to protect ecological functions and provide additional habitat for wetland-dependent wildlife
 - d. promote connectivity among wetland complexes with habitat corridors
 - e. maintain existing lateral connections between streams and floodplain wetlands (restoring lateral connectivity of wetlands and streams, however, must carefully weigh benefits with the risks of sedimentation and other pollutants, invasive species, and water level fluctuations associated with unhealthy streams)
 - f. use prescribed fire to control encroaching woody vegetation in open wetland types
 - g. reintroduce native species into wetland habitat where decimating factors have been eliminated and natural recovery is unlikely
 - h. collaboration among the Illinois Endangered Species Protection Board, Illinois Department of Natural Resources, U.S. Fish & Wildlife Service and other agencies, organizations and institutions on recovery plans and actions for rare and declining species
 - i. restore and manage high-quality examples of all wetland communities, including all Grade A and B Illinois Natural Areas Inventory sites, in all natural divisions within which they occur

2. Develop and manage additional wetland habitat.
 - a. through incentives-based programs (such as Conservation Reserve Enhancement Program and Wetland Reserve Program) and with technical assistance, establish or restore and manage wetland habitat with native vegetation on private lands
 - b. recreate ephemeral and other fishless, semipermanent wetlands, including 10-15 per Illinois Department of Natural Resources region per year on public lands, for migratory shorebirds and waterfowl, amphibians, and other wildlife, focusing initially on Wabash Border, Coastal Plain, and Northeastern Morainal natural divisions to benefit amphibian Species in Greatest Need of Conservation
 - c. restore and manage at least 6 areas (of 300-500 acres each) of ephemeral wetlands and accompanying upland sand prairie habitat in the inland sand areas
 - d. restore basin marshes in the Northeastern Morainal and Grand Prairie natural divisions and stream-side marshes in floodplain areas

3. Fill information gaps and develop conservation actions to address stresses.
 - a. a comprehensive program for preventing, eliminating and controlling invasive species is essential
 - b. updated inventory of wetland habitat in Illinois
 - c. additional research is needed on the ecological aspects (such as quality, invasive species, and contaminants) of both restored and high-quality sites
 - d. evaluate the contribution of moist-soil management to wildlife objectives
 - e. status and distribution of amphibians, reptiles, marsh birds, migratory shorebirds

4. Inter-agency cooperation and coordination to ensure wetland programs do not have conflicting objectives.

5. Emphasize multiple-resource benefits of wetland conservation.
 - a. evaluate carbon budgets for wetlands, and promote actions that sequester atmospheric carbon
 - b. reduce total sediment delivery to rivers, streams, lakes and ponds

- c. reduce flooding and extreme water level variation in rivers and streams
- d. improve water quality

6. Increase water quality education efforts in areas under high development pressure and/or within fragile geographic zones (i.e. karst terrain)

Invasive Species Campaign

Issues

Species too numerous to mention have been introduced to Illinois, intentionally and by accident. Worldwide and within Illinois, invasive species are a primary threat to species of wildlife, the integrity of natural communities, and the quality of habitats. Invasive species are a tremendous economic problem as well, causing an estimated \$115 billion in economic loss nationwide each year (Pimentel et al. 2000).

Illinois is structured to promote biological invasions: international ports via air and water mean Illinois has been and should expect to continue to be a point-of-origin for biological invasions; the highly disturbed landscape of Illinois (developed and agricultural lands, fragmented and degraded natural areas) increases the probability of introduced species becoming established; and the state's massive transportation infrastructure facilitates the spread of established invasive species throughout the state and the continent (Cox 2000).

A lack of popular understanding of the negative effects of invasive species on wildlife and habitat, cultural fascination with 'new' or 'unique' plants and animals, intentions for finding 'better' exotic substitutes for native species (that often cannot survive in degraded natural systems), under-appreciation of the benefits of native species, natural communities and stable systems; and ineffective quarantine, eradication and control measures all contribute to the spread, if not promotion, of invasive species. Responses to invasive species that affect wildlife, habitats, and natural communities have been:

- limited by inadequate information for developing counter-invasion tools
- limited financial and human resources;
- piece-meal and localized instead of coordinated and widespread;
- overwhelmed by the rapidity, spatial scale, and diversity of invasions.

Governmental agencies have a long history of promoting exotic species for various agricultural, wildlife and horticultural uses as "clean"--low risk of escape or invasive behavior--that have later proven invasive (e.g., multiflora rose, Norway maple, black carp). At

present, *Miscanthus* is being considered as a perennial biofuel crop for marginal farmland. However, its vigorous growth behavior in Illinois' climate is an indicator of escape risk.

Actions

1. A comprehensive, integrated approach is essential to effectively addressing invasive species.
 - a. development of a strategy for preventing, controlling and managing biological invasions
 - b. inter-agency moratorium on the recommendation, use and distribution of exotic species that are known to be detrimental
 - c. inter-agency promotion of native species for environmental applications and wildlife habitat
 - d. inter-agency coordination for effective and rapid detection, quarantine, eradication and control of invasive species
 - e. cooperation with transportation, agricultural, and pet trade industries to curb introductions of invasive species.
 - f. cooperate with horticulture industry to reduce reliance on nonnative species and increase use of native species for landscaping
 - g. establish a trust fund with revenues from sales of intentionally introduced species for funding detection, eradication and control of plants and animals that escape cultivation or captivity
 - h. improved control of the transport and release of live wildlife, including bait fish, cervids and feral hogs
 - i. implement ballast water standards developed by U.S. Coast Guard
 - j. draft and implement Rapid Response plans the Great Lakes basin and Mississippi River basin, covering all of Illinois

2. Fill information gaps and develop conservation actions to address stresses.
 - a. evaluation of established invasive species with the greatest damage potential and possibilities for control to focus control efforts.
 - b. further research for screening species prior to introduction
 - c. development of more effective and cost-effective control techniques (e.g., biological

control measures)

- d. production of native cultivars to replace invasive species applications
- e. model biological invasions that might be facilitated or caused by climate change
- f. create "Invasive Species Center" at the Illinois Natural History Survey to coordinate research, knowledge sharing

3. Prioritize high-quality natural areas, large habitat patches, and other key locations for invasive species control.

- a. improved surveillance for early detection and resources for rapid response to new invasions
- b. maintain on-going control (chemical, mechanical and biological) of invasive species, until species are evaluated and prioritized for control and/or more effective techniques become available

4. Marketing, education, technical assistance, incentives and cost-sharing to prevent invasions, control invasive species (mechanical, chemical and biological), and restore natural disturbance regimes (e.g., fire) on private lands

Land & Water Stewardship Campaign

Issues

The vast majority of Illinois is privately owned, and conservation of wildlife and habitat resources is dependent upon the actions of property owners. With a large and growing human population and expensive land values, Illinois land owners are economically constrained in many cases to intensive use of their lands (agricultural production, development) and to the resources they may use to maintain or enhance habitat. As a result, the physical extent of non-developed and non-cropland in Illinois has been and will continue to be tightly constrained. To the extent possible, wildlife benefits must be incorporated into developed lands and cropland, and available habitat needs to be highly functional.

Illinois has been a leader in the identification and management of high quality natural communities. Since 1963, the Illinois Nature Preserves Commission has protected 71,700 acres of public and private land in perpetuity, often with little or no State investment. The Illinois Natural Areas Inventory (White 1978) was the first attempt to catalog and grade all remaining natural communities, monitor their condition, and prioritize them for conservation activities.

Cultural perceptions and liability issues affect the social acceptability of prescribed fire, timber harvest, and “recreational mowing.” Many landowners may not recognize the value or potential value of various habitats, and training and assistance to assess the health of these systems and address problems effectively are in short supply. Rapidly degrading natural systems, due to changes in natural disturbance regimes and chemical, physical and biological pollution, further complicate best management practices for private land habitats. Public programs to assist private land stewardship typically suffer from more than one problem--lack of clear objectives, poor design, inadequate marketing, inadequate technical assistance, inadequate funding, too complex, not being long-term, a lack of evaluation and adaptive management, an inability to consider larger scales, and a lack of reporting on effective and ineffective strategies (Warner et al. 2005).

With a low ratio of public lands to citizens, tremendous demands are placed on Illinois' public lands for wildlife and habitat conservation and outdoor recreation—demands that sometimes conflict. For a variety of reasons including lack of funding, staff availability, and natural resources training for site staff, public fish and wildlife areas suffer from lack of appropriate management and could provide more wildlife benefits. While having more public land and water would alleviate some of these pressures, the limiting factor at present in most locations is the ability to manage existing properties effectively. Too often, actionable knowledge and effective tools do not exist for addressing rapidly degrading habitats due to changes in natural disturbance regimes and physical, chemical and biological pollution.

Taken as a whole, the extent and quality of habitat resources are too low to maintain functional natural systems and viable populations of many species now rare or declining, too low to support game populations that satisfy harvest demands, and too inaccessible to meet demands for outdoor recreation opportunity. Landowners may not understand their opportunities for habitat management, and the public does not appreciate land stewardship—in terms of ecological, environmental and economic costs that are being incurred, and ecological, environmental and economic benefits that could be gained.

Actions

1. Improve the stewardship of private land and water resources.
 - a. public programs for private land management must have clear objectives, adequate staffing, funding and tools to achieve the objectives, well-defined “lifespans,” user-friendly enrollment and technical assistance features, and honest evaluation of the programs' results
 - b. provide technical assistance, cost-sharing and incentives for habitat restoration and management, invasive species control, use of prescribed fire and sustainable forestry techniques, and other forms of land stewardship on private lands
 - c. private lands technical assistance staff should be broadly-trained with local experience and familiarity.

- d. increase allocation of staff and funding for follow-up maintenance to habitats established on private lands
 - e. annually, offer habitat management workshops in each district of Illinois
2. Improve the stewardship of public land and water resources.
- a. public sites should be managed with the best available science and tools, in a way that clearly demonstrates habitat restoration, maintenance of natural communities, forest management, grassland management, moist-soil management, and invasive species control
 - b. public lands should be managed with a clear indication of the relative importance of providing wildlife habitat and resource-compatible outdoor recreation at each site
 - c. future public land protection (leases, easements, acquisitions) should be specifically targeted to achieve desired wildlife and habitat benefits, based on sound principles of reserve design, patch size, and long-term viability (of populations, communities and stewardship regimes)
 - d. at the time of lease, acquisition, or easement, funding should be allocated for initial restoration or enhancement, and an endowment for long-term stewardship
 - e. develop and maintain baseline information on wildlife and habitat resources of public sites
 - f. for the Illinois Department of Natural Resources, the Illinois Natural History Survey ought to serve as the source of best-available science to guide management decisions
 - g. inter-agency cooperation and coordination for habitat management, including prescribed fire teams and education and training of staff in stewardship techniques
3. Ecological and environmental education efforts for Illinois' citizens need to be re-doubled, and must be coupled with access to natural resources.
4. Market land stewardship, demonstrated on private and public properties, to the citizens of Illinois to develop their understanding and support.

5. Clarification or change in liability statutes and property tax codes to promote private land stewardship and access for outdoor recreation.

6. Continued removal and control (chemical, mechanical and biological) of invasive species, especially within high quality natural areas, on public and private lands

Green Cities Campaign

Issues

Illinois' large and growing population is concentrated in a few counties, especially in northeastern Illinois. In recent years, Illinois' population and development have primarily occurred in suburban areas on the fringes of larger metropolitan areas, and the urban core of Chicago is losing population. Suburban development, with larger houses, larger lot sizes, widely separated economic centers, and necessary transportation infrastructure, utilizes far more land per person than urban development in previous decades.

Development with a larger "footprint" reduces, degrades and fragments more wildlife habitat. Infrastructure further fragments habitat and poses collision hazards for wildlife. "Exurban" development, scattered single-family homes on large lots removed from municipalities, fragment larger tracts of forest and other habitat, and further parcelize ownership that complicates conservation actions and the ability of others to acquire permission to access private lands and waters for recreation. Managing nuisance wildlife in low-density development areas is complex. White-tailed deer, for example, which have adapted well to suburban areas, can simultaneously be a nuisance, a threat to natural communities, a threat to human safety, and a valued wildlife resource.

Increases in impervious surfaces result in higher energy drainage waters and contributes to extreme hydrologic patterns in streams. Many streams are tiled or channelized to facilitate development and drainage, and wetlands are often drained, filled, or isolated, reducing an area's ability to handle flood waters. High levels of nutrient runoff and pollution originate from developed areas and roadways. Soil erosion during development is typically severe. Demands for water are stressing reservoirs, lakes and aquifers in several areas.

Developed areas are sources for a variety of pollutants besides water-borne chemicals. As transportation hubs and population centers, urban areas are sources for many accidental and intentional biological invasions. Exotic plants used in landscaping have escaped cultivation and invaded natural areas. Heat from buildings, vehicles, and absorbed from sunlight create

warmer climate around cities (the urban heat island effect), especially at night and during the winter months. Carbon dioxide emissions from all sources are implicated in global climate change. Other atmospheric pollutants affect human health in Illinois (e.g., ozone) and natural systems outside the state (e.g., acid rain).

Importantly, people in developed areas often have less access to natural areas and wildlife habitat. All citizens have a need for ecological education. Understanding of and appreciation for wildlife, habitat, natural communities, ecological processes and disturbance regimes are important for urban residents to support statewide scientifically-driven conservation priorities.

Actions

1. Minimize the adverse effects associated with development on wildlife and habitats.
 - a. coordination among federal and state agencies and private groups with county and local units of government, citizens and stakeholders to develop strategic plans for smart growth, redevelopment, and infrastructure projects that protect or enhance important habitats, provide adequate green space and green infrastructure (e.g., flood protection), minimize the need for additional infrastructure and minimize loss of agricultural lands, yet allow for economic development and human population growth
 - b. mitigate loss, degradation and fragmentation of important wildlife habitats lost to development

2. Integrate wildlife and habitat conservation in developed areas, as possible or appropriate.
 - a. interagency cooperation and incentives for native plant landscaping that improve human quality of life, provide wildlife habitat, and do not pollute adjacent natural areas
 - b. interagency outreach and technical assistance for property owners and local units of government to establish and manage wildlife habitat within developed areas
 - c. administer and expand urban forestry programs
 1. add 5 communities per year to the Tree City USA program
 2. provide urban forestry grants to 10-20 communities per year

3. monitor the condition of urban forests and offer technical assistance to communities
- d. inter-agency coordination for addressing human-wildlife conflicts such as property damage, risks to human health/safety, and damage to crops
 1. promote the use of non-lethal forms of damage abatement such as exclusion, scaring, and habitat modification to the maximum extent possible to alleviate human-wildlife conflicts
 2. allow and encourage the use of hunting and trapping to the maximum extent possible as the first lethal control method considered to alleviate human conflicts with game species
 3. allow the use of other lethal control methods as permitted by Federal and local authorities where the previous strategies have been unsuccessful, are impractical, and/or are unlikely to be successful
 4. review and revise as necessary the licensing procedure for private animal control companies to perform permitted methods of control
3. Increase water quality education efforts in areas under high development pressure and/or within fragile geographic zones (i.e. karst terrain).
4. Make natural areas conservation, ecology and environmental education a mandatory part of school curricula.
5. Fill information gaps and develop conservation actions to address stresses.
 - a. better understand the rural-urban interface and improve actions with respect to deer, mesopredators (e.g., cats, raccoons), human-wildlife conflicts, invasive species, recruitment, dispersal and survival of wildlife, and infrastructure (e.g., roads)
 - b. develop effective strategies for deer harvest in urban and suburban settings
 - c. investigate the efficacy of managing desirable wildlife populations (e.g., open woodland species, migratory birds) in urban, suburban, exurban settings
 - d. study urban boundaries and growth patterns, in relation to important habitats and species locations, to inform land and water protection decisions

6. Increase access to open lands and waters within and near urban areas for wildlife-related recreation.

Priority Locations for Conserving Illinois' Species in Greatest Need of Conservation

Determining the priority locations for conserving Species in Greatest Need of Conservation represents a blended strategic and opportunistic approach (see Sect. II, D). Strategically, data on wildlife and habitat were used to develop the priority areas identified earlier by other agencies and organizations, and in the current analysis focused on Species in Greatest Need of Conservation. By considering locations prioritized by other agencies and organizations, and selected by participants in planning workshops, the process was opportunistic in that there was general consensus for prioritizing a location. A potential weakness of this approach is that well-known locations with advanced conservation actions were identified, and priorities (and opportunities) for restoration remain under-represented.

Previously-Identified Priority Locations

A number of previous planning and analysis efforts have identified high-priority locations in Illinois for conservation (Figure 11). The primary information sources considered include threatened/endangered species locations, Illinois Natural Areas Inventory sites, stewardship areas, High Quality Aquatic Resources, and Important Bird Areas. Only locations of endangered and threatened wildlife since 1995, as recorded in the Biotics 4 database were considered. Illinois Natural Areas Inventory represent the categories of high-quality natural communities, essential habitat for threatened and endangered species, and areas that support unique concentrations of species. Stewardship areas are publicly-held conservation lands, including county forest preserves, state fish and wildlife areas, national forests, and national fish and wildlife refuges. This information was developed as part of the Illinois GAP Analysis Project (<http://www.inhs.uiuc.edu/cwe/gap/>). Also shown are sections (one square-mile units) within the Illinois River basin with Conservation Reserve Enhancement Program contracts (note not all of these sections are established to Conservation Reserve Enhancement Program habitats). About 110,000 acres of 232,000 eligible acres have been enrolled in the program.

High Quality Aquatic resources are Biologically Significant Streams and 'A'-quality streams of the Biological Stream Characterization. Biologically Significant Stream designation

is based on a comprehensive evaluation of the state's aquatic resources, and indicates the presence of high quality aquatic systems (Page et al. 1992). The criteria included fish populations, water quality, macroinvertebrates, endangered and threatened species, and mussel diversity. Grade A streams of the Biological Stream Characterization are unique aquatic resources with an Index of Biotic Integrity (based on fish species richness and composition, trophic composition, and fish abundance and condition) score of 51 to 60 on a 60-point scale (Hite and Bertrand 1989). The Biologically Significant Stream and Biological Stream Characterization are based on dated information, and are currently being revised. The Important Bird Areas program, an international effort by the National Audubon Society to identify, conserve, and monitor a network of sites that provide essential habitat for bird populations, is relatively new in Illinois. Thus far, only sites meeting criteria as breeding habitat for rare and declining species and high concentrations of waterfowl, raptors, shorebirds, or wading birds have been designated as Important Bird Areas. For more information, please visit: <http://www.habitatproject.org/iba.asp>. The 1999-2000 Land Cover (Figure 10) is another source of biological data used in some of the applied analyses described below.

Applied analyses of priority conservation areas include The Nature Conservancy's Portfolio Sites and the Inventory of Resource Rich Areas of Illinois. The Nature Conservancy's Portfolio Sites were developed through their Conservation By Design framework (The Nature Conservancy 2001). Portfolio sites are conservation areas within and across ecoregions (see The Nature Conservancy Ecoregions map, Figure 1) that represent the full distribution and diversity of native species, natural communities and ecosystems. Designing ecoregion-based portfolios is a complex, iterative process based on five steps: (1) identifying the species, communities and ecosystems in an ecoregion, (2) setting specific goals for the number and distribution of these conservation targets to be captured in the portfolio, (3) assembling information and relevant data on the location and quality of conservation targets, (4) designing a network of conservation areas that most effectively meets the goals, and (5) identifying the highest priority conservation areas, wide-ranging targets and pervasive threats for conservation action. For more information, please go to: <http://nature.org/aboutus/howwework/cbd/>.

The Inventory of Resource Rich Areas in Illinois is a product of the Critical Trends Assessment Project and the Ecosystems Program of the Illinois Department of Natural Resources (Suloway et al. 1996). Watersheds were evaluated using four equally-weighted variables: percent of the watershed in forest, percent of the watershed in wetland, total area of Illinois Natural Areas Inventory sites, and total length of Biologically Significant Streams. In total, Resource Rich Areas cover 19.8% of the state. While nearly half the area within the Resource Rich Areas is in agricultural production, less than 15% of the state's total cropland occurs in the Resource Rich Areas. The Resource Rich Areas include over one-third of the forest, nearly half the wetlands, 76% of all Illinois Natural Areas Inventory acreage, and 48% of all Biologically Significant Stream mileage. For more information, please go to: <http://www.inhs.uiuc.edu/cwe/rra/rra.html>. Note the Portfolio Sites and Resource Rich Areas are contiguous features encompassing areas besides high-priority habitats, including agricultural and developed lands.

Current Analysis

To identify the most important locations for the Species in Greatest Need of Conservation, habitats were ranked in the categories of upland forest, grassland, wooded wetlands (floodplain forest and swamp), and emergent/shallow-water wetlands, and streams. (Please see Approach & Methods for more details on this analysis.) This approach gives a relative importance ranking to each parcel of habitat in Illinois for Species in Greatest Need of Conservation, and because the ranking process was highly selective, a very small proportion of the state scored highly for each habitat type.

Upland Forest - By far, the largest and most significant upland forest areas for Species in Greatest Need of Conservation were in southern Illinois and associated with the Shawnee National Forest (Figure 12). Other areas highlighted were forests of the Wisconsin Driftless area in northwestern Illinois, the Siloam Springs State Park area, lower LaMoine River area, and Pere Marquette State Park area, each in west-central Illinois.

Grassland - Given the poor condition of remnant prairie and poor status of many grassland species, it was not surprising that very little high priority grassland habitat exists in

Illinois (Figure 13). Prairie Ridge State Natural Area, while comprised of scattered, relatively small parcels of grassland, is significant, as is the large remnant sand prairie area at Lost Mound National Wildlife Refuge. Other small, but relatively high-ranking locations include Goose Lake Prairie, DesPlaines Conservation Area, Nachusa Grassland, Glacial Park, Iroquois County Conservation Area, and Sand Prairie-Scrub Oak Nature Preserve. (The high-ranking of Pine Hills Ecological Area is anomalous, due to its Illinois Natural Areas Inventory classification.) Improving the status of Illinois' grassland Species in Greatest Need of Conservation will be highly dependent upon augmentation of existing sites and large-scale restoration, such as is underway at Midewin National Tallgrass Prairie.

Wooded Wetlands - Highest-ranking wooded wetland areas (a combination of floodplain forest and swamp land cover categories) in Illinois are associated with large rivers, primarily in southern Illinois (Figure 14). The Cache River watershed and Oakwood Bottoms - LaRue Swamp areas are especially important for Species in Greatest Need of Conservation. The lower Kaskaskia River, middle Little Wabash River (Wayne County), Wabash-Ohio River confluence, Mark Twain National Wildlife Refuge, and Sanganois State Fish & Wildlife Area are also significant.

Emergent & Shallow Water Wetlands - As with prairies, losses and degradation to marsh-like wetlands has been severe and species dependent on this habitat have poor status. Though small and threatened by urban expansion, northeastern Illinois, especially along the Fox River in Lake and McHenry counties and Illinois Beach State Park, hosts the most significant concentrations of emergent/shallow water wetland habitats for Species in Greatest Need of Conservation in Illinois (Figure 15). Larger, but modestly-ranking, areas of emergent wetland habitat are located along the middle Illinois River floodplain, and immediately above Carlyle and Rend lakes. As with grasslands, successful conservation will be dependent on effective restoration, as is underway at Hennepin & Hopper Lakes and the Emiquon area.

Streams - Illinois hosts several stream segments of high value to Species in Greatest Need of Conservation (Figure 16). Fewer streams have high value along most or all of their length. Among these significant resources are the Wabash River, the Rock River, the Vermilion

River and its major tributaries in Vermilion County, the Kankakee River, and the upper Mississippi River (particularly above Keokuk, Iowa).

Partner-Selected Priority Areas

At planning workshops, given the previously-identified locations and current analysis, participants selected priority areas for conservation action based on current conditions and restoration potential (Figure 17). Updates to the Action Plan and discussions with conservation partners should specifically consider priorities for restoration, by habitat and location.

Conservation Opportunity Areas

Each of these three approaches to describing priority conservation areas showed a high degree of agreement. Highly-ranked habitats for Species in Greatest Need of Conservation correlated strongly with previously identified priority areas, public conservation lands, and areas indicated by planning participants. There are a number of likely reasons for this, including:

1. a highly altered Illinois landscape with little high-quality habitat
2. on-going conservation efforts that have placed many of the highest priority resources under long-term protection and/or public ownership
3. reliance on the same primary sources of information, such as Illinois Natural Areas Inventory sites, threatened and endangered species locations, and land cover (i.e., it is not appropriate to consider these approaches as independent)
4. many of the areas with greatest restoration potential are well-known among Illinois' conservation partners.

Based on these results, an initial set of Conservation Opportunity Areas are proposed as priority areas for conserving Illinois' species in greatest need of conservation (Table 8). Conservation Opportunity Areas are defined as locations (a) with significant existing or potential wildlife and habitat resources, (b) where partners are willing to plan, implement and evaluate conservation actions, (c) where financial and human resources are available, and (d) where conservation is motivated by an agreed-upon conservation purpose and set of objectives. These sites, and the opportunities and priorities for conservation within them, are detailed in the

appropriate natural division assessments (Section IV). ***Conservation Opportunity Areas have special importance in conserving Illinois' Species in Greatest Need of Conservation, but not all of these species occur within this set of locations, and restricting conservation actions to these areas will not necessarily maintain viable populations or meet the objectives outlined in the Plan/Strategy.***

III. F. Research, Monitoring & Evaluation

Illinois' natural resource management agencies are committed to employing a statewide wildlife management approach that is adaptive, ecosystem-based, and well-coordinated among conservation partners (Illinois Department of Natural Resources with other state, federal, and non-governmental organizations). A pillar of this progressive management approach is the integration of a robust program of science comprised of research, monitoring, and evaluation. The purpose of research, monitoring, and evaluation is to provide critical information on the status, trends, threats, and processes of Illinois' Species in Greatest Need of Conservation and the ecosystems upon which they depend. Rigorously acquired scientific information is a vital feed to enlightened management actions and policy decisions. The goal of research, monitoring, and evaluation is to provide the best possible and technically sound information to resource managers, decision-makers, and the public at large.

Research is an organized search for information about critical characteristics of an entity under study, and occurs along a continuum ranging from basic to applied questions. Too often, this continuum is incorrectly characterized as a dichotomy. Answers to more basic questions (e.g., "what are the effects of physiological stress on largemouth bass?") are a requisite for answering more applied questions (e.g., "will changes in angling regulations improve the condition of the largemouth bass fishery?").

Monitoring is the ongoing examination of a group or a system and takes three forms. *Sentinel monitoring* is an ongoing survey to detect unforeseen changes. The early detection of invasive Asian carp in the Illinois River system was possible because of an ongoing sentinel monitoring program. *Implementation monitoring* is an assessment that conservation actions are being practiced to the extent or intensity desired. *Effectiveness monitoring* is the measuring of the effects of some conservation action, relative to the effects of other actions (including no action), and the basis of modern adaptive management approaches. Effective monitoring, regardless of form, benefits from appropriate methodologies and effort across space and time scales. Traditional and emerging techniques (e.g., improved fish passage, de-channelization, wetland and floodplain restoration, re-introductions, reserve designs) are significant

investments of funding and personnel time, but seldom have been approached to rank the effectiveness of alternatives and measure cost efficiency.

Evaluation is a retrospective examination of a broad class of actions (e.g., land conservancy, easements, riparian buffers, prescribed fire, stream bank stabilization) undertaken as larger programs (e.g., Conservation Reserve program, Conservation Reserve Enhancement Program, Acres for Wildlife). The purpose of evaluation is to determine whether the programs are performing as advertised and thereby worth continued investment. Such evaluations are often the least “scientific” looking and may be less amenable to rigorous analysis given the large number of variables affecting outcomes. Nonetheless, information from monitoring and research feeds into coarse-scale evaluations.

Institutions - Illinois has many institutions and organizations contributing to the scientific information base available to managers. First are the Illinois Scientific Surveys (Illinois Natural History Survey, Illinois State Water Survey, Illinois State Geological Survey, and the Illinois State Museum) of the Illinois Department of Natural Resources. The Illinois Natural History Survey, in particular, has a critical mass of expertise, infrastructure, and effort contributing to the state’s living resource management mandate.

A host of universities (University of Illinois, Eastern Illinois University, Northern Illinois University, Western Illinois University, Southern Illinois University, and others) have varying expertise and commitment to studying ecological sciences as do other organizations (e.g., Field Museum, Shedd Aquarium, Illinois Academy of Sciences, The American Fisheries Society, The Wildlife Society). Illinois has formal relationships with many federal agencies for science and management including U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, and the Great Lakes Fishery Commission. Consequently, research, monitoring, and evaluation of diverse resource issues are on-going statewide.

Species in Greatest Need of Conservation

Knowledge of the distribution and abundance of wildlife species is a key element of Plan/strategy. The development of the Plan/strategy utilized species distribution information developed as part of the GAP Analysis Program conducted at the Illinois Natural History Survey. The GAP database provides a centralized and comprehensive source of data for all terrestrial vertebrate species in Illinois. These distributions need to be checked for accuracy and distributions with low accuracy need to be refined using additional survey data. This comprehensive database of predicted species information needs to be maintained, updated, and made accessible in order to help guide conservation management decisions in the future. An aquatic GAP Analysis could provide helpful distribution information for fishes, mussels and other aquatic wildlife.

Assessing the stresses to Illinois' Species in Greatest Need of Conservation also revealed several factors that might have profound effects on a number of populations, but are poorly understood (Appendix II). Genetics of rare species (often in small, isolated populations), recruitment, dispersal, mortality, and diseases were among the factors biologists suspected as problematic, but lacking in reliable information.

Invertebrates

Aquatic invertebrates - The Illinois Environmental Protection Agency maintains a large monitoring program and database of water quality and benthic macroinvertebrates for Illinois' streams. The Illinois Environmental Protection Agency and Illinois Department of Natural Resources would benefit from greater sharing of water quality, macroinvertebrate and fish data. Department of Natural Resources Restoration Ecologists are working with Fisheries biologists to begin sampling mussels at many of the same locations sampled for fishes in basin surveys. Historical and modern records of freshwater mussel communities in Illinois rivers and streams are compiled in the Illinois Natural History Survey's mussel database. It is possible to query the database for particular species, streams, scientists, and time periods. The objective is for data from all on-going mussel surveys to be incorporated into this system. The tool is valuable for examining species distributions, locating priority streams (with high diversity and conservative

species), and identifying gaps in sampling effort. All known occurrences of threatened and endangered species are further recorded in the Illinois Department of Natural Resources' Biotics 4 database. Basic and applied research is necessary to understand stresses to these populations and to develop conservation actions. Experimental propagation, modeled after work with *Lampsilis higginsii* in the Mississippi River, should be refined with other species in other systems (e.g., *Pleurobema clava* in the Vermilion River system) and evaluated as an effective conservation action.

Terrestrial Invertebrates - Entomologists with the Illinois Natural History Survey, universities, and other institutions and organizations have done surveys of particular sites within the state. However, for most species, information on statewide distribution, abundance, and conservation need are lacking or dispersed. Effects of management on insect populations remain poorly documented, but some evidence suggests conservative insect species are adversely affected by intensive disturbance-based management (e.g., annual prescribed burning), particularly in the highly fragmented native prairies and savannas present in the Midwest. More than 20% of the Species in Greatest Need of Conservation are insect inhabitants of prairies and savannas. These and related insect species may serve as indicators of the health of insect populations in general. Monitoring may be accomplished by sampling, at least once annually, randomly selected prairie and savanna sites, representing different natural divisions. Widespread use of insecticides, both for lawn care and agriculture, continues (e.g., large areas were sprayed for soybean aphid in 2004). Although less persistent than organochlorine pesticides, those commonly in use (e.g., pyrethroids) are highly toxic to invertebrates. The effects on invertebrate communities, both terrestrial and aquatic, and their vertebrate predators, are poorly known. For example, low abundance of invertebrates in intensively cropped areas is implicated in increased movements and reduced survival of pheasant broods (Warner et al. 1999).

Fishes

The Illinois Natural History Survey maintains a fisheries collections database (Fisheries Analysis System) for the state. Illinois Department of Natural Resources Fisheries biologists conduct regular basin surveys of all watersheds in the state on a 5-year rotation, at

approximately 500 sites. Population abundance and diversity are compiled into the Index of Biotic Integrity metric. The Department of Natural Resources also samples fish communities at 21 sites on the Illinois River, and 118 sites on the Mississippi, Wabash, and Ohio Rivers annually. In cooperation with U.S. Fish & Wildlife Service, U.S. Geological Survey, and Illinois Department of Natural Resources, the Long-Term River Monitoring Program measures ecological parameters on the Illinois and Mississippi rivers. All known occurrences of threatened and endangered species are tracked in the Department of Natural Resources' Biotics 4 database. Propagation of threatened species (e.g., red-spotted sunfish), or surrogates, needs investigation as an effective conservation action. Some evidence indicates that aquatic life (mussels and fish) are affected by endocrine disrupting compounds in sewage effluent and other sources, though the magnitude of this effect in Illinois is unknown. The Biologically Significant Streams analysis, completed in 1992 (Page et al. 1992), has received extensive use from watershed groups, environmental interests, municipalities, consultants and state and federal agencies. However, much more recent data are available, and the classification needs to be updated.

Amphibians

The Illinois Natural History Survey houses specimens and other records of amphibians reported from throughout Illinois. Recently, county-by-county distribution maps for each species (before and after 1980) have been compiled and published (Phillips et al. 1999). However, sampling is largely opportunistic, and distribution of many species is poorly known. Globally and in Illinois, there is concern for apparent local amphibian extinctions and widespread decreases in abundance. Data are largely inadequate to quantify changes in abundance and distribution, and to confidently identify causes for changes. Statistically-rigorous and easily-conducted protocols have been developed to survey calling frogs and toads (anuran calling surveys), but have not been widely attempted or maintained in Illinois. All of the states bordering Illinois are currently conducting anuran calling surveys, some for more than 15 years. Surveys for salamanders—and aquatic salamanders in particular—are very difficult. All known occurrences of threatened and endangered species are tracked in the Department of Natural Resources' Biotics 4 database.

Reptiles

Monitoring efforts for reptiles are very similar to those for amphibians (see Phillips et al. 1999 for recent county distribution maps). And, as with amphibians, data are largely inadequate to quantify changes in abundance and distribution, and to confidently identify causes for those changes. Survey methods for reptiles are varied (drift fences, pitfall traps, cover boards, aquatic traps/nets), but are laborious and not attempted in any systematic fashion. All known occurrences of threatened and endangered species are tracked in the Department of Natural Resources' Biotics 4 database.

Birds

Of all the groups, birds have the most complete monitoring. Because they are relatively easy to record, and large-scale distribution and abundance data are available for long time periods, birds are and likely will remain key indicators of conservation effectiveness. However, changes in migratory bird populations and communities may reflect conditions locally or those thousands of miles away. The North American Breeding Bird Survey is a well-known, long-term, continental sentinel monitoring program, with 103 routes through Illinois (Sauer et al. 2004). Though coverage is poor for many species (e.g., nocturnal birds), the Breeding Bird Survey is currently the most important monitoring program for Illinois' birds in greatest need of conservation. The Christmas Bird Count is a century-old effort to document early winter distribution and abundance (<http://www.audubon.org/bird/cbc/>). Volunteers count birds within a 15-mile diameter circle on one day from mid-December to early January in 73 circles in Illinois. The Great Backyard Bird Count is a recent effort to measure late-winter distribution and abundance (<http://www.birdsource.org/gbbc/>). Within Illinois, the Spring Bird Count is a 33-year old effort to document bird diversity and abundance in early May. Held on the Saturday on or between 4-10 May, Spring Bird Count gives a one-day, county-level view of the abundance of birds, coinciding with the peak of Neotropical bird migration, and supplementing Breeding Bird Survey data for early-nesting species.

Species-specific monitoring is on-going for wintering trumpeter swans (reports of collared birds), wintering bald eagles (along major rivers), and nesting bald eagles. Smaller-scale bird monitoring efforts are common for individual sites and guilds (e.g., migratory

shorebirds at Chautauqua National Wildlife Refuge, heron rookeries), but generally lack coordination and a central access structure. All known breeding season occurrences of threatened and endangered species are tracked in the Department of Natural Resources' Biotics 4 database.

The recreational birding community in Illinois is large and highly skilled. While their efforts are largely self-directed, the observations reported through the "Illinois Birders Exchange Thoughts" listserv, and published quarterly in Illinois Ornithological Society's journal, *The Meadowlark*, are remarkably thorough and detailed. Indeed, *The Meadowlark* is as close to a comprehensive bird information source as exists for Illinois, as Christmas Bird Count, Spring Bird Count, many Breeding Bird Survey, local surveys and other observations are reported here. Using citizen-scientists for conservation monitoring is the model adopted by the Bird Conservation Network to track grassland bird communities at various sites in the Chicago region.

Deficiencies in bird monitoring include protocols for effectively monitoring shorebirds and marsh birds. Marsh birds, including rails and bitterns, appear to be declining in abundance, but existing data on abundance, distribution, and population trends, primarily derived from Breeding Bird Survey data, are often not adequate for robust analyses. Conway and Timmermans (2004) detailed a standardized protocol for marsh bird monitoring, providing a framework for consistent data collection concurrent with monitoring in other regions of North America. Coordination will be particularly important with the Northeastern Illinois Wetland Bird Survey, conducted since 1980. These surveys are conducted in a part of the state with unique wetland features threatened by rapid urban growth. Analysis of Northeastern Illinois Wetland Bird Survey data is used to monitor status and trends of wetland bird species and their habitat, evaluate the impact of surrounding land use changes, and develop mitigation and conservation actions. Research on species such as least bitterns and pied-billed grebes may improve our understanding of factors affecting marsh-nesting birds.

Many species of shorebirds migrate long distances annually, from breeding grounds in arctic Canada to wintering regions in South America. They are a largely ephemeral group,

often spending only a few days in any one location. Combined with their small size and sometimes cryptic plumage, shorebird monitoring programs have been difficult to implement at large scales. Systematic ground counts of migratory waterbirds have been conducted weekly at Chautauqua National Wildlife Refuge, a Western Hemisphere Shorebird Reserve Network site (de Szalay et al. 2000), during fall and spring since 1996. Shorebirds are sometimes counted at Carlyle Lake and other locations. Because uncertainty exists about the amount and type of shorebird data collected, researchers should attempt to compile data on shorebird abundance, use and timing of migration from all possible sources, and develop a unified sampling strategy to reliably estimate populations of migratory shorebirds at a meaningful spatial scale (e.g., the Illinois River valley). Research on high priority species (e.g., American golden-plover, greater yellowlegs) frequently encountered in Illinois should examine turnover rates, habitat use, and body condition.

One goal is to increase the number of multiple-species wading bird rookeries by 25%. However, monitoring of rookeries is sparse and constrained by time and funding. A coordinated multi-state monitoring effort of mixed-species wading bird colonies is needed to monitor these species of concern. Additional information on the distribution, reproductive success, foraging ecology, habitat characteristic, survival and bio-accumulation of contaminants are needed to ensure healthy populations of wading birds, such as great egrets and black-crowned night-herons, in Illinois.

From 1906 to 1909, A. O. Gross and H. A. Ray, under the direction of S. A. Forbes, conducted a series of bird surveys throughout Illinois. These surveys were repeated by R. Graber and J. Graber from 1956 to 1958 (Graber and Graber 1963). Collectively these surveys provide a detailed record of the status of bird populations in Illinois. Illinois has the opportunity to build upon these classic and valuable surveys by repeating this work in 2006-2008, and integrating modern survey techniques to create a link between historical data and current monitoring efforts. Conducting these surveys will provide a view of how the distribution and abundance of bird species has changed over the last century.

A recent analysis using two climate-prediction models suggests Illinois can expect enormous shifts in bird distributions and communities over the next century with many species becoming rare or extirpated in Illinois, and others expanding their ranges into the state (Matthews et al. 2004). Over future decades if expected trends continue, prioritizing species for conservation action will have to consider climate-induced range shifts that cannot be managed—or at least must be addressed at scales well beyond Illinois.

Mammals

As a group, monitoring of the mammal Species in Greatest Need of Conservation is largely opportunistic, and distribution and abundance of several species is poorly known. Several caves and abandoned mines are surveyed annually for hibernating bats. Recent studies have documented wider-than-expected distributions and greater-than-assumed abundances of badgers and bobcats. The river otter was recently removed from the list of Illinois threatened species, now occurring in all major watersheds in Illinois, with an estimated population of 4,600 animals in the Illinois, Kaskaskia and Wabash landscape management units (Bluett 2004a). All known occurrences of threatened and endangered species are tracked in the Department of Natural Resources' Biotics 4 database. Better information is needed for Franklin's ground-squirrels on distribution, abundance, and dispersal abilities of juveniles and adults. Unanswered, but important, conservation questions include reserve design (large patches versus clusters of smaller grasslands to support a metapopulation) and life history differences between the state-threatened Franklin's ground-squirrel and the common 13-lined ground-squirrel.

Invasive Species

Invasive species are a primary threat to native ecosystems and to many of Illinois' Species in Greatest Need of Conservation. While hundreds of exotic species are known to occur in Illinois, not all species pose the same degree of ecological threat. Lowe et al. (2000) attempted to identify the most problematic invasive species on a global scale. In Illinois, a prioritization tool is needed to help resource managers direct limited control efforts to species causing or likely to cause the most harm. Such a prioritization will require estimates of the ecological "costs" (changes in diversity and productivity at the levels of primary producer,

primary consumer, secondary consumer, etc.) exacted by different invasive species in different habitats. Developing a spatial database of invasive species distributions and abundance, utilizing data from Critical Trends Assessment Project and other programs, could help predict the spread of invasive species, determine factors influencing this spread, and direct control efforts. The Illinois Natural History Survey should serve as a center for information on invasive species, including research for new, effective control techniques.

Wildlife Diseases

The Illinois Department of Natural Resources' Division of Wildlife Resources, Illinois Natural History Survey and the University of Illinois-College of Veterinary Medicine have an on-going partnership to investigate wildlife disease outbreaks and diagnose unknown causes of wildlife mortality. West Nile Virus was first confirmed in two dead crows in September of 2001. By the end of 2002, West Nile Virus had been confirmed in 100 of 102 counties, and Illinois led the nation with 884 human cases, and 66 deaths. The Illinois Department of Public Health maintains a sophisticated disease surveillance system to monitor animals and insects that can potentially carry the virus: dead crows and blue jays, mosquitoes and horses. The surveillance system also includes infectious disease physicians, hospital laboratory directors and infection control practitioners, local health departments and staff from Illinois Department of Public Health. Declines in blue jays, American crows and black-capped chickadees were apparent on Chicago-area Christmas Bird Counts in 2002 (Moskoff 2003).

Since the first case of Chronic Wasting Disease, a fatal neurological disease of cervids, was confirmed in Illinois in November of 2002, intensive and widespread testing has been conducted to determine the range and prevalence to the disease, and to monitor Chronic Wasting Disease-eradication efforts. In counties with confirmed Chronic Wasting Disease-positive animals, testing is done on all suspect animals (exhibiting clinical signs of Chronic Wasting Disease), some road-killed animals, and animals taken under urban population control permits and by Illinois Department of Natural Resources sharpshooters in Chronic Wasting Disease eradication zones. In the 2002-2003, 2003-04 and 2004-05 hunting seasons, voluntary samples were taken from deer brought to check stations within counties throughout Illinois as a

widespread surveillance effort to confirm the limited distribution of Chronic Wasting Disease in Illinois.

Harvested Wildlife Resources

Sportfishes

The Illinois Department of Natural Resources' Division of Fisheries collects distribution, abundance, and angler satisfaction information for sportfish in rivers and streams, impoundments, and Illinois' portion of Lake Michigan. Streams are sampled through 5-year rotational basin surveys, at about 500 stream sites statewide. Additionally, sportfish are surveyed annually at 21 sites on the Illinois River, and 118 sites on the Mississippi, Wabash, and Ohio Rivers. Annual surveys on 259 state and public impoundments evaluate sportfish populations, angler effort and success, and identify management needs. Supplemental fish stocking evaluations are conducted in 32 state and public impoundments. In Lake Michigan, lake trout, yellow perch, and salmonid species are monitored annually to measure relative abundance, food habits and demographics. Spring fish stock assessment surveys are conducted between Chicago and Waukegan, and available stocks of non-salmonid sportfish within harbors and nearshore areas on Lake Michigan are estimated.

The Illinois Department of Natural Resources has Species Management Plans for several sportfishes, including crappie (black, white, hybrid), bluegill, redear sunfish, channel catfish, grass carp, largemouth and smallmouth bass, muskellunge, northern pike, tiger muskie, rainbow trout, sauger, walleye, yellow perch, and white, striped and hybrid striped bass. These documents provide an overview of biology, status of the fishery, catch and growth rate data, propagation and stocking, regulations, stock assessment, and habitat management for each species.

Birds

The Illinois Department of Natural Resources has conducted spring call counts for northern bobwhite and ring-necked pheasants on established routes since the 1950s (Cole 2004a, b). Additionally, August brood surveys for pheasants help predict the size and age

structure of the autumn flock (Cole 2004c). Mourning dove abundance is indexed with spring call counts and in August prior to the hunting season (Cole 2004d). Successful archery and firearm deer hunters are asked to report locations and numbers of wild turkeys observed. Woodcock are surveyed by the U.S. Fish & Wildlife Service through the Singing-ground Survey, harvest Information program and Wing-collection Survey (Kelley 2004). In 2003, 17 singing-ground routes were sampled in Illinois. Harvest of upland game birds, doves and woodcock are estimated with annual harvest surveys completed by a random sample of Illinois hunters (e.g., Miller et al. 2004a), and harvests of wild turkeys are monitored via a call-in harvest reporting system.

Resident giant Canada geese are banded annually in Illinois. In the 1980s, samples were not large enough for robust analyses. Since this time banding effort has increased and better tools are available to estimate survival and emigration relative to environmental and other factors (i.e., band recovery models in Program MARK). Since 1993, Mississippi Flyway states have used helicopters to survey breeding giant Canada geese. These surveys use a stratified random sampling design (i.e., strata of low, medium, and high goose density) to obtain precise and reliable population estimates. Current surveys do not estimate the probability of detecting geese, and may be biased negatively. Pre-season wood duck banding is conducted annually in Illinois. Speculation exists that wood duck harvest has increased since the implementation of Adaptive Harvest Management; analysis of band recovery data for Illinois-banded wood ducks will help guide harvest and habitat management.

Waterfowl have been aerially inventoried along the Illinois and Mississippi Rivers of Illinois since 1948. These data are useful for identifying population trends, especially in light of their long-term nature. These data constitute an index of duck abundance, not a population estimate. Future monitoring should consider revising these aerial inventories so they constitute a formal sample survey and, therefore, generate population estimates. The Federal Parts Collection Survey estimates age ratios of waterfowl and other migratory game birds in the fall flight by examining wings of hunter-harvested birds. Generally, age ratios of ducks are declining over the long term and may not reflect habitat quality in Illinois (i.e., age-ratios are

largely dependent on breeding habitat conditions outside of Illinois). Waterfowl harvest is estimated annually with surveys of a random sample of waterfowl hunters (Miller et al. 2004b), and the harvest of Canada geese in quota zones is monitored with a call-in reporting system.

Mammals

Distribution and abundance of game mammals are indexed with a number of tools in Illinois. The spotlight survey has been conducted by Department of Natural Resources staff since 1981 on spring nights along standardized 25-mile routes, and assists in setting furbearer hunting and trapping seasons. The target species are raccoon, white-tailed deer, eastern cottontail, domestic cats, opossums and striped skunks, though other species, such coyotes, beavers, bobcats, river otters, muskrats, mink, and gray and red fox (Bluett 2004b). The archery deer hunter survey, developed in Missouri as a cost-effective and statistically-robust way to monitor terrestrial mammals, has been conducted in Illinois since 1991 (Bluett 2004c). Data are collected by archery deer hunters who volunteer to keep standardized daily logs of their efforts (hours afield) and wildlife observations from 1 October through 14 November. In 2003, 1,569 volunteers logged approximately 93,360 hours of wildlife observations. The archery deer hunter survey provides the most, and in some cases the only, reliable information on population trends of bobcat, coyote, gray fox and red fox. The technique also monitors raccoons, gray and fox squirrels, white-tailed deer and wild turkeys. Furbearer Sign Surveys are conducted in late winter and early spring by trained Department of Natural Resources staff at a stratified random sample of Basin Survey Sites to link the presence/absence of river otters, beavers, and mink to existing databases on biotic and abiotic features (Bluett 2004a). Basin Survey Sites are fixed stations established by the Illinois Environmental Protection Agency and Illinois Department of Natural Resources to monitor surface water quality, shoreline characteristics, diversity and abundance of fishes, and other metrics of biotic integrity for riverine systems. Eight survey sites have been established in southern Illinois to monitor occurrence of swamp rabbits (Cole 2004e).

Hunter harvest of furbearers, rabbits and squirrels are estimated by annual surveys of a random sample of Illinois hunters (Miller et al. 2004a). Trapper harvest is similarly estimated by

randomized trapper surveys (Miller et al. 2003) and with the Fur Harvest Survey. The Fur Harvest Survey provides estimates of (1) numbers of pelts sold by Illinois furtakers, (2) value of pelts sold by Illinois furtakers, and (3) distribution of the harvest among resource users (Bluett 2004d). State law requires licensed fur buyers to maintain records and submit reports of all raw furs purchased. Archery and firearm harvest of white-tailed deer has been monitored at check-in stations since modern seasons began in 1957.

Habitats

Multiple-Habitat Research, Monitoring & Evaluation

Critical Trends Assessment Program - Products of the Illinois Department of Natural Resources' Critical Trends Assessment Program, including a land cover atlas, inventories of resource rich areas, watershed assessments and ecosystem monitoring and have been used extensively in developing this report. Land cover provides detailed information on the extent of habitats in Illinois, and ecosystem monitoring is valuable for assessing the condition of and stresses to forests, wetlands, grasslands, and stream habitats throughout the state. Digital land cover databases need to be updated approximately every five years. Critical Trends Assessment Program professional scientists monitor 600 randomly-selected sites in four habitats (150 of each habitat) on public and private land. In forests, wetlands, and grasslands, data on herbaceous and woody vegetation, birds, and insects are collected. They measure ecological indicators such as the presence of threatened and endangered species, species richness, species diversity, and dominance of native vs. non-native species. In streams, aquatic insects are the primary assemblage used as indicators of condition.

Illinois Natural Areas Inventory - Identification and monitoring of areas with high quality habitat, presence of unique or important species and species assemblages, and rare natural areas is necessary to the preservation of the remaining valuable ecological areas in the state. Many forests, prairies, wetlands, grasslands, savannas, lakes, ponds, and streams were identified as high quality natural areas in the Illinois Natural Areas Inventory completed in 1978. An updated inventory of high quality sites is necessary to include important sites not identified

or included in the original Illinois Natural Areas Inventory. The Illinois Natural Areas Inventory database is a valuable source of information on condition of the state's natural resources. A program to monitor the health of these sites over time is necessary to protect and preserve them.

Owned, Managed & Leased Properties Project - Comprehensive and reliable information on the Illinois Department of Natural Resources' land holdings is critical for conservation planning, implementation, and assessment. A spatial database with detailed information on boundaries, ownership, funding source, management practices and goals, activities, and restrictions on these lands has been started for many of the Department-owned, managed, or leased properties. A complete and centralized geographic information system database that includes all state parks, conservation areas, forests, and fish and wildlife areas would provide valuable information for conservation-related activities.

Conservation Reserve Enhancement Program - The Conservation Reserve Enhancement Program is a voluntary program to assist landowners in protecting environmentally sensitive land, decreasing erosion, restoring wildlife habitat, increasing populations of threatened and endangered species, and safeguarding ground and surface water. This U.S. Department of Agriculture program supports conservation practices such as filter strips and forested buffers to help protect streams, lakes, and rivers from sedimentation and agricultural runoff, and development and restoration of wetlands. Currently limited to the Illinois River Basin, about 110,000 of 232,000 eligible acres have been enrolled. Demand exceeds funding to enroll additional acres. Research is underway to estimate the quality and quantity of Conservation Reserve Enhancement Program habitat and its use by resident and migratory wildlife. These evaluations of plants, wildlife, and quality of habitat will help evaluate the effectiveness of the Conservation Reserve Enhancement Program in Illinois and quantify its benefits.

Illinois Conservation Practices Tracking System & MANAGE - The Illinois Conservation Practices Tracking System is an interagency effort, including the Illinois Department of Natural

Resources, U.S. Department of Agriculture, Illinois Environmental Protection Agency, and the University of Illinois Cooperative Extension Service, to map the location of various conservation practices, such as Conservation Reserve Program, Conservation Reserve Enhancement Program, and Wetland Reserve Program contracts. As funding and staffing are available, data from additional counties and watersheds are being added to the system. The system enables partner agencies to effectively focus conservation actions. The Illinois Department of Natural Resources, the Illinois Nature Preserves Commission, and the U.S. Forest Service are currently developing the MANAGE system to assist field staff in monitoring the locations of stewardship activities (e.g., prescribed fires, invasive species control). Future plans call for modules with wildlife and fisheries applications.

Land-Water Interface - With 26,000 miles of streams and 644,000 acres of surface water (excluding lake Michigan), the land-water interface is essential for conservation in Illinois. Yet, the relationships among soils, land use practices, nutrients, drainage waters, erosion, wetlands, streams and other habitats are often poorly understood.

Forest

The extent of various forest types are confidently measured by land cover data. Statewide composition and condition information is being gathered by the Critical Trends Assessment Program, and the U.S. Forest Service monitors plots throughout Illinois and reports on forest condition every 10 years. Early successional forest species are highly represented in Species in Greatest Need of Conservation; but the extent and condition of these habitats is unknown. High-density mid-successional forest is perceived as most common, with young and open, mature oak forests thought to be becoming more scarce.

Open Woodland/Savanna/Barren

The extent of these open woodland habitats is best-estimated as “open woodland/partial canopy” category of land cover, though early successional forest and shrublands are also likely included. Many open woodland/savanna and shrub/successional species are among the

Species in Greatest Need of Conservation. The extent and condition of these habitats is largely unknown, though perceived as very poor due to destruction and lack of management.

Grassland

Grasslands are an important habitat for many species in Illinois, including many endangered and threatened vertebrate and invertebrate species. Land cover data was problematic because of the inability to distinguish between categories of grassland (prairies, golf courses, roadside vegetation, etc.). Although the Critical Trends Assessment Program documents grasslands are in poor condition, scientists must sample 8.6 grassland sites on average before one is found that meets minimum sampling criteria. Deriving better information about the extent and condition of grasslands on a statewide scale will require a multi-step approach. Key features contributing to the wildlife value of grasslands include floral diversity, nesting season disturbance, winter cover, patch width and juxtaposition relative to other habitats. Accuracy of satellite imagery in identifying grassland should be verified.

Shrub/successional

The extent of shrub/successional habitat is best-estimated as “open woodland/partial canopy” category of land cover (which also includes the open woodland habitats described above). Many shrub/successional species are among the Species in Greatest Need of Conservation. Composition and condition of shrub/successional habitat unknown, but perceived as poor due to invasive shrubs, destruction, and lack of management.

Wetland

Wetlands are an important habitat for most of the vertebrate species in Illinois, including many endangered and threatened species. As part of the U.S. Fish & Wildlife Service’s National Wetlands Inventory, an inventory of the wetlands of Illinois was completed utilizing mid-1980s photography, and is the sole source of statewide data. An updated inventory is essential to determine the extent of the resource and evaluating the effectiveness of wetland policies and programs. Advances in remote sensing technology, analysis software, and computing abilities will produce a more accurate and detailed inventory. Ephemeral wetlands

are difficult to identify because they may be dry for a large part of the growing season, but provide essential habitat for many Species in Greatest Need of Conservation (e.g., salamanders, frogs, shorebirds, fairy shrimp). Because of their small size, these wetlands are easily converted or drained. Any wetland inventory must ensure the extent and condition of this wetland type is quantified.

Several large-scale wetland restoration efforts are ongoing within the Illinois River valley (e.g., Conservation Reserve Enhancement Program, Emiquon Project, Hennepin & Hopper Lakes Project, Spunky Bottoms Project). Dr. Frank Bellrose produced >130 wetland maps of the Illinois River valley, each hand drawn with detailed vegetation types and zones, from 1939-1959. Although these recently-discovered maps do not cover all sites in all years, it is timely to convert these maps into Geographic Information System coverages, compare these “historic” conditions to contemporary wetland characteristics, and distribute these data as references for wetland restoration and evaluation efforts in Illinois and the upper Midwest. While large- and small-scale wetland restoration are under way, degradation of natural wetlands continues. Additional research is needed on the ecological aspects (such as quality invasive species, and contaminants) of both restored and high-quality sites.

Managed moist-soil areas are wetlands where water conditions, vegetation, and/or seed banks are manipulated to encourage growth of seed-producing vegetation (Low and Bellrose 1944, Fredrickson and Taylor 1982). Moist-soil management is employed throughout the U.S. to provide managed habitats for waterbirds that are rich in food resources, and is a common waterfowl habitat management practice in Illinois. Manipulating water levels and seed banks requires active management, and managers may not have the resources to evaluate the success of their management practices. The combined contribution of moist-soil sites managed by public agencies to foraging carrying capacity for waterfowl and other wildlife is not known.

Lake & Pond

Illinois Department of Natural Resources Fisheries biologists collect information on aquatic vegetation and water quality in conjunction with fish community sampling on the state's, lakes and ponds. These data are stored in the Fisheries Analysis System, maintained by the Illinois Natural History Survey. The system needs a comprehensive analysis, integration with other biological data sources, selected indicators of ecological integrity, and expansion to other taxa (invertebrates, phytoplankton, zooplankton). Inshore and offshore in southern Lake Michigan, water quality and habitat use/availability are also measured in conjunction with fish assemblage monitoring by the Illinois Department of Natural Resources, supported by Federal Aid (U.S. Fish & Wildlife Service) and the Great Lakes Fishery Commission. The program provides information on the status and trends of lake quality and fish ecological integrity, but could be improved with integration of other biological data sources and expanded effort.

Stream

Currently, conservation planning and implementation of stream habitat is hindered by the lack of a classification scheme for the diversity of stream types. An ecological classification of rivers in Illinois, Wisconsin, and Michigan is being developed to predict riverine site habitats and biological reference conditions from mapped landscape and local variables. These models will produce region-wide summaries of current ecological status, and coupled with a land transformation model, provide risk assessments for the river systems of the upper Midwest.

Habitat in Illinois' streams is characterized with the statewide Critical Trends Assessment Project. The Long-Term River Monitoring program also tracks aquatic vegetation and water quality in conjunction with fish and macroinvertebrate monitoring in the Illinois River (La Grange Reach) and Pool 26 of the Mississippi River. The Long-Term River Monitoring program provides status and trend data associated with operating the navigation system and ecosystem restoration efforts on the Mississippi and Illinois rivers. Field work is completed by the Illinois Natural History Survey's Illinois River Biological Station and Great Rivers Field Station, with support from the U.S. Army Corps of Engineers and the U.S. Geological Survey. Additional monitoring needs include enhanced floodplain assessments, integration with

Conservation Reserve Enhancement Program, Wildlife Habitat Incentives Program, Conservation Reserve Program and other large scale programs, indicators of ecological integrity, and expansion to other taxa (invertebrates, phytoplankton, zooplankton).

Small, wadable streams, often with rocky substrates, host several of the aquatic Species in Greatest Need of Conservation, but are not covered by the Department of Natural Resources' traditional stream basin surveys. Information on historic and current coolwater stream habitat in Illinois is rare (Pickering 1950, Rudey 1999). Additional monitoring for fishes, mussels, other macroinvertebrates, zoo- and phytoplankton, water quality, and habitat structure in these habitats is needed to track the status and trends of these resources, and assess the stresses caused by pollutants, sediments, invasive species, and altered hydrology. When unnecessary dams are identified and removed in Illinois (e.g., Fox River), monitoring the responses of river fish and mussel communities, habitat availability and returning normalized hydrograph will be important to evaluate resource recovery and conservation success. Results can then be used to predict the costs and benefits of dam removal in other systems. Lastly, sentinel monitoring at the Chicago Waterway will assess the effectiveness of the aquatic nuisance species barrier, designed to prevent biological invasions of the Great Lakes from the Illinois River, and vice versa. The U.S. Army Corps of Engineers, Illinois-Indiana Sea Grant and Great Lakes Fishery Commission can support this work.

Cave

Cave habitats are monitored only sporadically in Illinois, and largely in conjunction with biological monitoring. Water quality is measured periodically in select caves where Illinois cave amphipod surveys are conducted, and conditions are recorded during bat hibernacula surveys.

Primary

Glades, bluffs, cliffs, algific slopes and beaches that qualify as Illinois Natural Areas Inventory sites, as high-quality communities, threatened/endangered species habitat, and unique geological features, are monitored periodically as part of Illinois Natural Areas Inventory surveillance. No other formal monitoring of primary communities occurs.

Cultural

More information is necessary on many aspects of wildlife-agriculture interactions in Illinois. Waste grain is a particularly important source of energy for migratory, wintering and resident wildlife in the contemporary landscape of North America (Warner et al. 1989, Krapu et al. 2004). Efficiency of harvest has increased in recent decades, possibly reducing abundance of waste grain for wildlife (Krapu et al. 2004), while adoption of no-till and reduced-tillage methods may have offset this change. Additionally, genetically modified crop varieties are increasingly common in North America, but consequences to wildlife are largely unknown. Because much of Illinois' farmland is planted to grains annually, and myriad wildlife species use waste and natural plant seeds in harvested fields, current and precise estimates of waste grain abundance in the state are warranted. Crop damage, and wildlife control of agricultural pests, are certainly affected by the amount and relative positions of cropland and other habitats, but too poorly known to be effectively managed.

As developed areas expand in Illinois, the rural-urban interface and wildlife-human interactions are increasingly important. Strategies for conserving desirable species, managing deer and mesopredators (e.g., cats, raccoons), and minimizing human-wildlife conflicts need to be developed. Studying growth patterns and predicting future developments will help protect important habitats, viable populations, and valuable green infrastructure.