

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:

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

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.

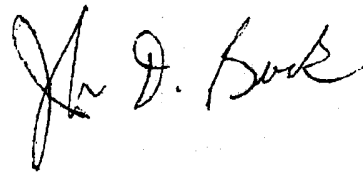
The Comprehensive Wildlife Conservation Plan is a way to make habitat management and land protection targeted at ecosystems as exciting and successful as the aforementioned restoration efforts. It will guide future conservation efforts by outlining specific areas where limited dollars can be targeted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

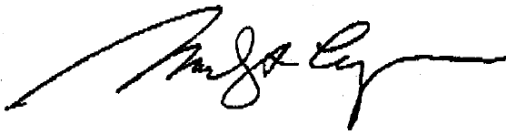
Every state is currently involved in this same wildlife conservation planning process. Grant programs are highly competitive, and additional federal revenues will depend on having an outstanding national conservation plan. This effort is not about regulating land use, and is not a new manual for protecting 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.



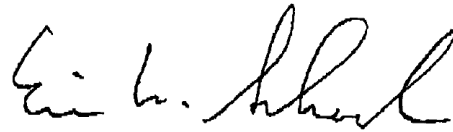
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Marilyn Campbell
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Eric Schenck
Regional Biologist
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11 July 2005

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 its 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 ongoing 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.

IV. NATURAL DIVISION ASSESSMENTS

The fifteen natural divisions of Illinois, defined by biological and geological characteristics (Schwegman 1973), are a useful scale to consider wildlife and habitat conservation. A map accompanies each section, showing the relative location of the natural division within Illinois, land cover features, municipalities, and county lines. The following assessments of each natural division include the following major headings:

Characteristics - a brief description of the natural division and its distinguishing features

Major Habitats & Challenges - identification of the broad habitat types within the natural division with statewide ecological significance, descriptions of the problems affecting those habitats, and a chart of current land use within the natural division

Opportunities - consideration of factors including current resource conditions, patterns of land ownership, and established partnerships that provide a platform for future conservation actions

Management Guidelines

Landscapes - priority strategies for conserving large areas of a habitat type, and habitat objectives stepped-down from statewide goals (summarized in Table 7)

Natural Communities - the natural communities present within the natural division that are priorities for restoration and management

Critical Species - Illinois' Species in Greatest Need of Conservation that need to be managed within the natural division, if they are to be effectively conserved in Illinois

Emphasis Game Species - game animals and sportfishes of management priority within the natural division

Non-game Indicator Species - non-game species that are indicative of a habitat type within a natural division, and could be useful for monitoring conservation effectiveness

Recreational Opportunities - noteworthy wildlife-related recreational opportunities within the natural division

Educational/Interpretive Resources - museums, trails, nature centers, demonstration areas and other places that promote learning about wildlife and habitat within the natural division

Natural Resource Commodities - natural products or opportunities with significant economic value within the natural division

Conservation Opportunity Areas - Locations within (or across) natural divisions with statewide significance to conserving Illinois' Species in Greatest Need of Conservation. Please see Sect. II, D - *Identifying Priorities, Problems & Actions* and Sect. III, E - *Priority Conservation Actions for Conserving Illinois Wildlife & Habitat Resources* for more information. Available information for each area varies: conservation actions are advanced within many Conservation Opportunity Areas, and proposed at others.

IV. A. The Coastal Plain Natural Division

Characteristics

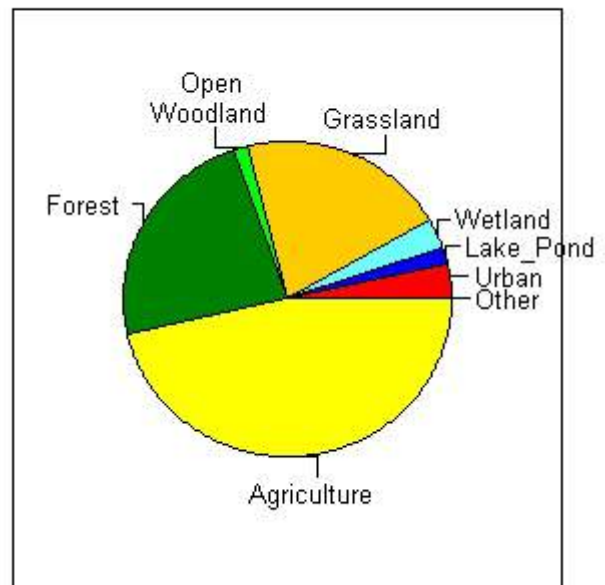
The Coastal Plain Natural Division of extreme southern Illinois is a region of swampy forested bottomlands and low clay and gravel hills that is the northernmost extension of the Gulf of Mexico Plain Province of North America. Baldcypress-tupelo swamps are a unique feature of the natural division, as 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.

Major Habitats & Challenges

Forests - Suppression of fire and subsequent alteration of fire-related species guilds and pre-disturbance natural character; alteration of basin hydrology and hydraulics as it relates to the natural flood regime (timing, depth and duration); controlling the spread of exotic and invasive species (especially Japanese honeysuckle, bush honeysuckle, autumn and Russian olive, garlic mustard, kudzu); and changes in woody species composition associated lack of forest management.

Open Woodland/Savanna/Barren - Reversing the effects of the suppression of natural disturbance, especially periodic burning, and controlling the spread of early successional woody species and the spread of woody and herbaceous invasive species (i.e., tall fescue, autumn olive).

Land Use of the Coastal Plain Natural Division



Wetlands - Protecting existing wetlands from drainage and clearing for conversion to agriculture or urban use; widespread implementation of Best Management Practices throughout the watershed to improve water quality entering existing wetlands; restoring and maintaining the flood regime responsible for the character and sustainability of individual wetlands; establishing wetland complexes intensively managed to provide habitat for migratory waterfowl and shorebirds.

Lakes and Ponds - Establishing and maintaining a flood regime that will restore and sustain the natural character and productivity of backwater areas (natural ponds, oxbows, sloughs) associated with major rivers and tributaries while minimizing conflicts with private landowners (agriculture, industry, private home/property damage); maintaining and improving the natural character and public values assigned/determined for aquatic resources.

Streams - Restoring and maintaining stream/river aquatic and terrestrial natural communities with minimal affects to private lands; eliminating stream bed and bank instability to improve water quality and aquatic habitat, and subsequently the health of receiving waters.

Primary Communities - Identifying and monitoring river sandbars utilized by Least Terns and protecting these sites from development and disturbance; monitoring known mussel beds and conducting additional monitoring to locate new beds (Ohio and Cache Rivers).

Opportunities

Cache River Joint Venture Partnership: Landscape-scale management and the restoration of ecological processes that will restore and sustain high quality aquatic and terrestrial natural communities is possible within land owned and managed by the Cache River Joint Venture Partnership (Illinois Department of Natural Resources, U.S. Fish and Wildlife Service, The Nature Conservancy, Ducks Unlimited).

Wetland Reserve Program, Wildlife Habitat Incentive Program, Best Management Practices: U.S. Department of Agriculture-Natural Resources Conservation Service programs can assist

greatly with improving aquatic and wetland resources and reducing forest fragmentation within the watershed by intensively working to implement these and similar programs on private land, especially land near large tracts of land already in public ownership (Cache River State Natural Area, Cypress Creek National Wildlife Refuge, Grassy Slough Preserve (The Nature Conservancy), Mermet Lake Conservation Area, Ft. Massac State Park, Horseshoe Lake Conservation Area). These programs have become significantly more attractive to private landowners subsequent to the increasing popularity and financial benefits associated with recreational use, especially waterfowl, whitetail deer, and wild turkey hunting.

Restoration of Giant Cane: Ecologists and historical data suggest that giant cane was once a dominant part of the landscape in the Coastal Plain, forming large dense monoculture stands often encompassing several hundred acres. Research has shown giant cane to provide significant water retention and filtration of overland flow. Restoration of giant cane within the riparian zone along rivers and tributaries could significantly improve water quality and provide habitat long absent from the floodplain environment.

Woodlands and Barrens of the Cretaceous Hills Section: With the U.S. Forest Service as a cooperating landowner in the Cretaceous Hills section, open woodlands, barrens, glades and other natural communities can be restored and managed on a large scale. Bachman's sparrows, extirpated in Illinois since about 1980, have been found nesting in western Kentucky, less than 100 miles from Illinois. Restoration of barren and glade habitat may facilitate natural recolonization of Illinois by Bachman's sparrows.

Management Guidelines

Landscapes

Forests - Net increase of 18,000 acres within the Coastal Plain Division; primary emphasis should be given to forested swamps (baldcypress-water tupelo) and floodplain forests within the Bottomlands Section. Massac and Pulaski counties contain the vast majority of the land within the Coastal Plain (384,681 acres), and this area was entirely forested prior to human disturbance. Today, these counties are among the lowest in forested acreage in the state

(Pulaski County-6,700 acres; Massac County-15,000 acres), with the vast majority of this converted to agricultural land (row crops and pasture). Particular attention should be given to the restoration of frequently flooded areas within the first terrace of river/tributary floodplains that have been cleared and are currently being farmed, especially corridors where reforestation can connect existing large forested blocks or other critical habitat. Management of existing forests should emphasize the restoration and sustainability of oak-hickory community types. Assessment of forest ecosystem health should be based on woody species guilds, but incorporate sub-canopy and herbaceous species composition as well.

Open Woodland/Barrens - A goal of increasing this natural community type by 3,730 acres within the Coastal Plain should emphasize open woodland and barrens habitat found within the Cretaceous Hills Section. This work may be accomplished best by identifying large forested tracts (>100 acres) where species composition suggests barrens and open woodland habitats were once present as a dominant component of the landscape, and where sufficient natural character remains to allow for restoration through intensive management (prescribed burning, timber stand improvement, and exotic/invasive species control).

Wetlands - The Bottomlands Section of the Coastal Plain Division includes bottomland hardwood forests, meander scars, oxbow lakes, sloughs, marshes, baldcypress-tupelo gum swamps, rivers and streams. These wetlands include aquatic habitat associated with each community type. A primary goal for protection of wetland habitat within this Ecoregion would include restoration, preservation and enhancement of an additional 20,000 acres of wetland habitat within the project boundary of the Cache River Joint Venture Partnership (Illinois Department of Natural Resources, U.S. Fish & Wildlife Service, The Nature Conservancy, Ducks Unlimited). A considerable part of the protection and enhancement will be accomplished with implementation of Best Management Practices on private land. Emphasis should be given to wetland restoration, water retention basins and stream bank/bed stabilization. Resource managers should target 20,000 acres for wetland restoration (including water retention basins) on private land within the Coastal Plain Division. Modification of existing impoundments to increase storage capacity should be included as part of this effort to reduce overland flow, water quality, and delivery of runoff to area rivers, streams and wetlands.

Lakes and Ponds - Intensive management/modification of lakes and ponds throughout the Coastal Plain Division offers perhaps the most significant opportunity for watershed improvements. They are very popular with private landowners, and recent innovations in design increase storage capacity to such an extent that they function hydrologically as a wetland, dramatically improving effluent water quality, reducing/slowing runoff, and in association with sufficient watershed coverage, reducing peak flows in tributary drainages, streams and rivers. Design and placement should emphasize these goals, with emphasis given to those watersheds containing high quality natural resources in public ownership or private land enrolled in land protection programs. These impoundments also provide valuable habitat for fish and wildlife, tremendous recreational and educational opportunities, and bring resource professionals and the general public together for a mutually beneficial cause.

Streams - Streams within the Bottomlands Section of the Coastal Plain Division were once sluggishly flowing systems meandering within broad flat floodplains. These floodplains were dominated by bottomland hardwood forests and baldcypress-tupelo gum swamps. Most of these waterways receive runoff from cropland and pasture containing excessive sediment, nitrogen and phosphate. Priority should be given to effluent water quality, particularly when receiving waters contain high quality natural communities or support uses valued by the public. Stream bank and bed stabilization should be implemented within stream/river systems where degradation is severe, especially where subsequent water quality and flooding issues threaten high quality natural communities, threatened/endangered or rare species or habitat important for migratory waterfowl, shorebirds or Neotropical migratory songbirds.

Natural Communities

Dry-mesic Acid Oak Upland Forest

Interior Highlands Oak Barrens

Backswamp/Slough Floodplain Forests

Midwestern Wet Flatwoods

Forested Acid Seeps - These acid seeps/springs are all found within the boundaries of Cretaceous Hills, on Shawnee National Forest and Illinois Department of Natural Resources property. The part owned by the Department of Natural Resources is a

designated Nature Preserve, and is managed to preserve and restore the forest community, with emphasis on the barrens and seep spring components.

Open Ponds and Emergent Marshes - This community type occurs infrequently throughout the floodplain of the Cache River. Occurrences are small (often less than 1 acre), and created and maintained by natural disturbance (scouring during flood flows, beaver, wind, lightning). Permanent water greater than 18" but less than 48" also supports this community type.

Thin Soil Oak Savannas/Barrens

Shaded Rock Outcrops

Canebrakes - Canebrakes occur frequently throughout these macrosites. Although most are small in size (<1 acre), historic data suggests there were extensive areas (>10 acres) of this distinctive community type. Because of the abundance of existing stands within large tracts of public land, the restoration potential of canebrakes is very good.

Canebrakes support diversity of dependent insect species, and provide habitat for the Swainson's warbler, and the canebrake rattlesnake (a subspecies of the timber rattlesnake).

Mesophytic Slope Forest

Critical Species

dusky salamander, Illinois chorus frog, northern crawfish frog, cerulean warbler, Swainson's warbler, Bachman's sparrow, Henslow's sparrow, Oxbow crayfish, southeastern myotis, gray bat, northern myotis, Rafinesque's big-eared bat, Indiana bat, river otter, green water snake, timber rattlesnake, hellbender, alligator snapping turtle, Price's potato bean (*Apios priceana*), cypress knee sedge (*Carex decomposita*), giant cane (*Arundinaria gigantea*), butternut (*Juglans cinerea*), willow oak (*Quercus phellos*), riverbank lichen (*Phaeophyscia leana*), heart-leaved plantain (*Plantago cordata*), ovate catchfly (*Silene ovata*), powdery thalia (*Thalia dealbata*)

Emphasis Game Species

Bottomlands Section: wood duck, mallard, Canada goose, whitetail deer, swamp rabbit, wild turkey, largemouth bass, white crappie, white bass, channel catfish

Cretaceous Hills Section: whitetail deer, wild turkey, bobwhite quail, gray squirrel

Non-game Indicator Species

Bottomlands Section: prothonotary warbler, Kentucky warbler, eastern wood pewee, Louisiana waterthrush, Acadian flycatcher, hooded warbler, summer tanager, yellow throated vireo, wood thrush, rusty blackbird, great blue heron, green heron

Cretaceous Hills Section: broad-winged hawk, chuck-will's-widow, worm-eating warbler, great-crested flycatcher, blue-winged warbler, prairie warbler

Recreational Opportunities

Hunting (whitetail deer, wild turkey, waterfowl, cottontail rabbit, bobwhite quail, squirrel, furbearer), wildlife viewing/bird watching, fishing, hiking, bicycle riding

Educational/Interpretive Resources

Cache River Henry Barkhausen Wetland Center, Fort Massac State Park, Mermet Lake Fish and Wildlife Area, Ohio River Recreation Area, Southern Illinois Spring Bird Count, Cypress Creek Christmas Bird Count

Natural Resource Commodities

Forest products, commercial fisheries, commercial hunting (waterfowl, eastern wild turkey, whitetail deer), row crop agriculture

Conservation Opportunity Areas

Cache River Joint Venture Partnership Project

Protected Lands - Cache River State Natural Area, Cypress Creek National Wildlife

Refuge, Grassy Slough Preserve, Cypress Pond State Natural Area, Heron Pond-Little Black Slough Natural Area

Priority Resources - Bottomland Hardwood forest, swamp forest, migratory waterfowl and shorebirds, Neotropical migratory songbirds

Conservation Philosophy - Restoration, preservation, and management of bottomland hardwood forests, swamp forests, and riparian aquatic habitat. Resource management will be guided by conditions that were present prior to human disturbance, and emphasis will be placed on restoration of ecological processes that will provide sustainability of all natural communities within the river continuum.

Wildlife Habitat Objectives - By 2020 increase land in public ownership within the project area to 60,000 acres; achieve partial reconnection of the Upper and Lower Segments of the Cache River by 2010; reduce peak flows in Big Creek by 25%

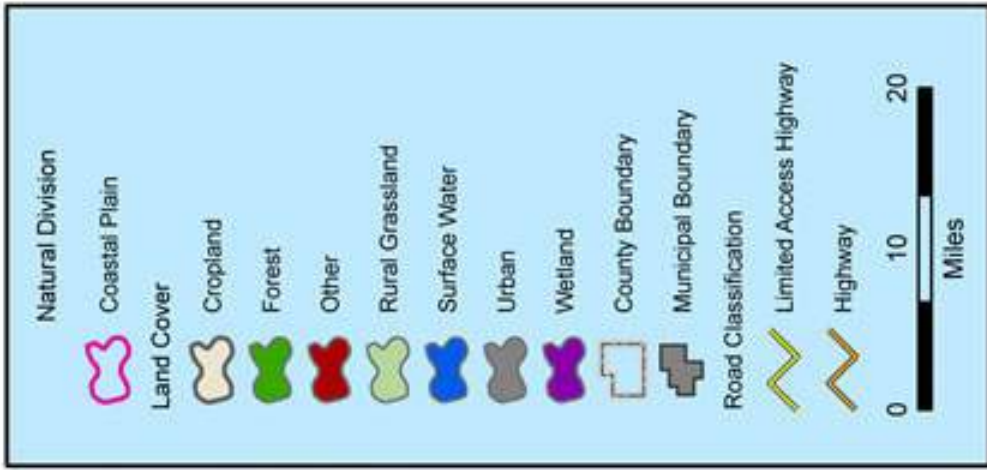
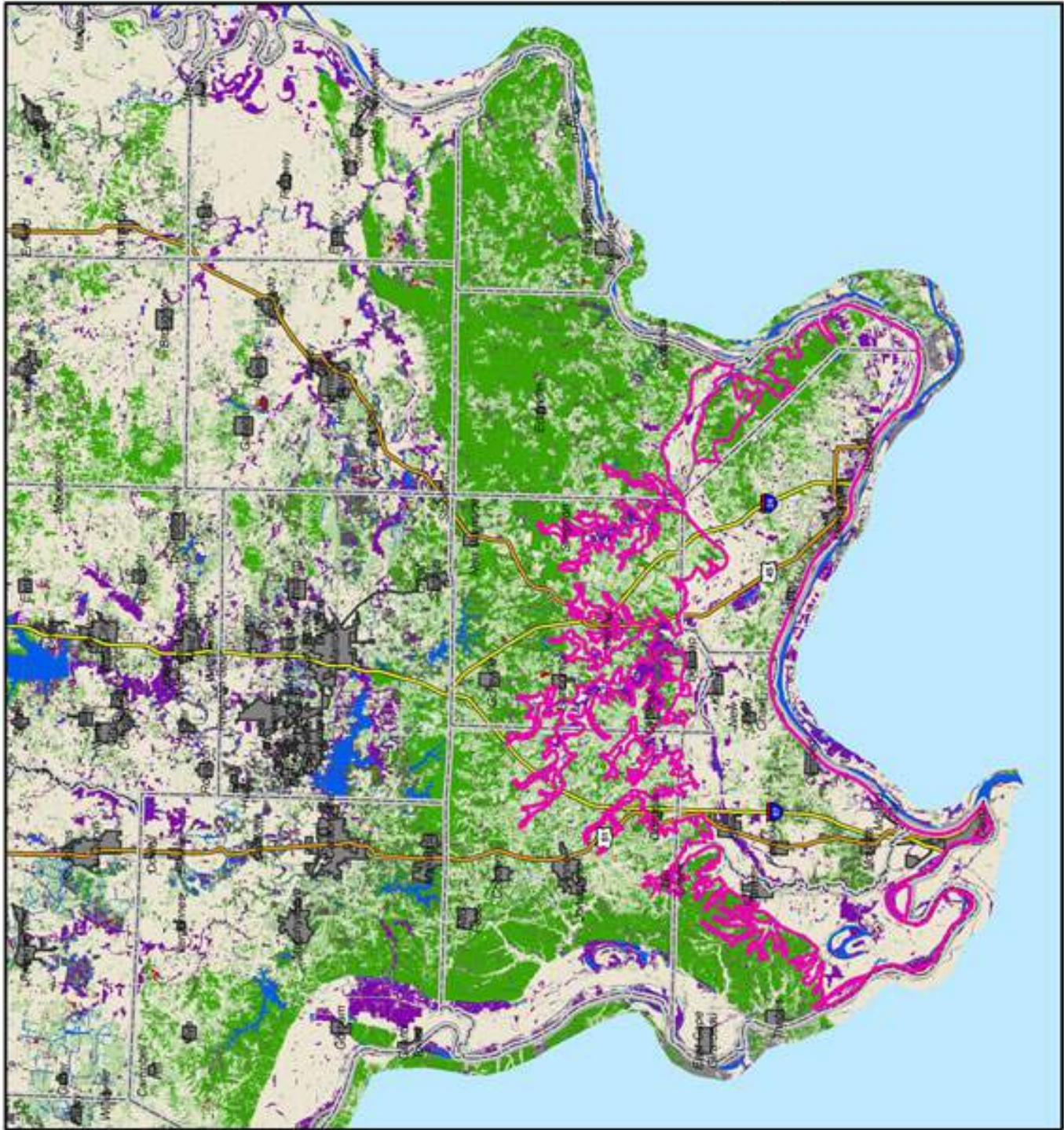
Key Actions - Land acquisition, partial reconnection of the Upper and Lower Segments of the Cache River, reforestation and wetland restoration

Partners - Illinois Department of Natural Resources, U.S. Fish & Wildlife Service, The Nature Conservancy, Ducks Unlimited, U.S. Department of Agriculture-Natural Resources Conservation Service and local Soil and Water Conservation Districts

Implementation Resources - C2000, State Wildlife Grants, Wildlife Habitat Incentives Program, Wetland Reserve Program, Natural Areas Acquisition Fund

Research, Monitoring and Evaluation - Southern Illinois University at Carbondale, Illinois Natural History Survey, Illinois State Water Survey, Little River Research, Inc.

Contributor: Mark Guetersloh



IV. B. The Grand Prairie Natural Division

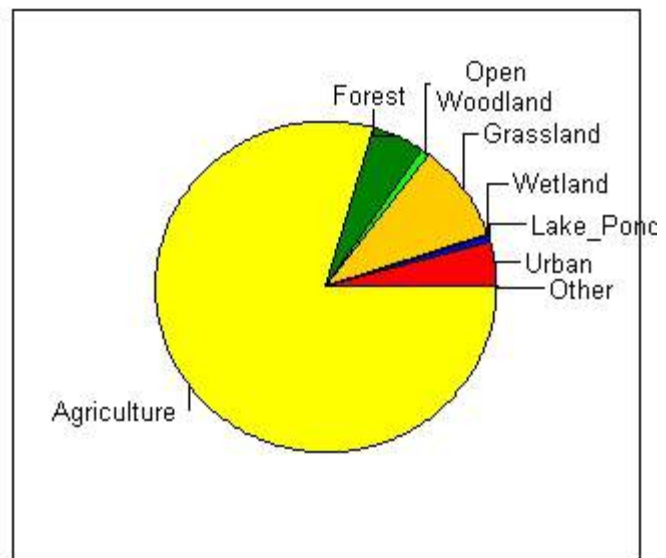
Characteristics

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.

Major Habitats & Challenges

Grasslands - Much of the area that was historically prairie is presently in row crops. Most of the prairie remnants are small and do not provide many of the functions of a real prairie. Many prairie restorations lack forbs or are choked by too much big bluestem or Indiangrass. Much of the area is relatively flat and does not qualify for farm programs which focus on highly erodible lands. The former prairie soils are very fertile. Even if sites do qualify for the Conservation Reserve Program, participation is usually low because there is little financial benefit for producers to take acres out of production. Other grassland habitat is also scarce, and typically dominated by tall fescue. Succession/lack of management, inadequate juxtaposing, fire suppression and recreational mowing are further challenges.

Land Cover of the Grand Prairie Natural Division



Forests - The forests in the Grand Prairie have suffered from lack of management or poor management. They are commonly formerly-pastured wood lots that have been “high graded” for valuable timber, and invaded by bush honeysuckle, multiflora rose, osage orange, garlic mustard and other exotic plants. Species composition is shifting to sugar maple and other mesophytic species due to fire suppression, lack of professional forestry assistance, and uneven-age timber management. The forests are highly fragmented, and deer browsing is problematic in many areas.

Open Woodland/Savanna - The little that remains of this habitat is being invaded by autumn olive and other exotics, and changing into forest in the absence of proper management.

Wetlands - Much of the historical wetlands have been drained and are presently farmed. The function of many of the existing wetlands are threatened by reed canary grass and other invasive species, sedimentation, and eutrophication. Ephemeral/vernal wetland types are poorly represented, but critical.

Streams - Many of the streams have been channelized and uplands tilled, causing a loss of natural function, in-stream erosion problems and pesticide run-off.

Lakes/Ponds - Nearly all backwater lakes have been eliminated; sedimentation and nutrient loading of impoundments is problematic.

Opportunities

The Grand Prairie Division was formerly dominated by tall-grass prairie ecosystems. Poor drainage created marshes and potholes. Forests bordered many riparian corridors, with sporadic groves on moraines and other glacial features. Today, the vast majority of the land within the Grand Prairie Division is under private ownership and devoted to row crops or development, with occasional habitat patches dotting the landscape. Wildlife habitat within the division is diminutive, highly fragmented and often poorly managed.

State and federal private lands programs, including the Conservation Reserve Program, Wetland Reserve Program, Environmental Quality Incentives Program, Landowner Incentives Program, and Vermilion County's North Fork Habitat Enhancement Program, have contributed to restoration of habitat and decreasing erosion and run-off into streams. These programs can continue to be utilized to achieve many of the Grand Prairie Division's habitat goals.

A number of excellent conservation partners are active in the natural division, including Pheasants Forever, National Wild Turkey Federation, White-Tails Unlimited, Soil and Water Conservation Districts, U.S. Department of Agriculture (Farm Service Agency, Natural Resources Conservation Service, U.S. Forest Service), Illinois Department of Natural Resources, C2000 partnerships, Grand Prairie Friends, Prairie Friends Network, Quail Unlimited, The Nature Conservancy, Parklands Foundation, Friends of Kankakee, The Conservation Foundation, and Ducks Unlimited.

Management Guidelines

Landscapes

The primary goal is to restore the rich mosaic of plant and wildlife that was typical of the Grand Prairie by development and management of grassland ecosystems capable of maintaining viable populations of grassland species, including both permanent and migrant residents; buffering streams and waterways with at least 50 feet of ecologically-beneficial habitat; and increasing early seral richness within our forests.

Grasslands - Grassland landscapes larger than 20,000 acres in the Grand Prairie Division should contain at least 60% grassland cover (over 90% in patches larger than 200 acres), less than 10% fescue and no more than 2% combined wooded and urban land covers. By 2025, restore and manage an additional 400,000 acres of grassland, with emphasis on focal areas with >1,000 acres of mosaic and contiguous grasslands; convert >4,000 acres of fescue-dominated roadsides to quality grassland habitat; improve the quality of Conservation Reserve Program grasslands on >4,000 acres. A system to estimate avian use of Pheasant Habitat

Areas is needed, and long-term evaluation of the Conservation Reserve Program must be refined.

Wetlands - Wetlands currently in agriculture should be buffered with upland habitat equal or greater than the wetland area. Bottomland wetland complexes should be buffered with bottomland habitat equal or greater than the wetland area; corridors connecting wetland complexes should be at least 50 m wide. Restored wetlands should be concentrated within focal areas. A net increase of at least 5,000 acres is needed to begin meeting wildlife objectives.

Streams - Restore 1,000 acres of backwater habitat. Buffer >1,000 miles of stream bank with no less than 50 m of habitat.

Lakes & Ponds - Establish aquatic vegetation on 10-20% of the littoral zone on all impoundments.

Open Woodland/Savanna - Managed savannas should contain at least 95% native species. An increase of 45,000 acres is needed to begin meeting wildlife objectives.

Forest - Upland forests will have a basal area of >35% for oak and hickory species combined, a basal area of <20% sugar maple, and fewer than 200 stems/ha of invasive shrubs. Bottomland forests should have a basal area of >20% early successional hard mast producing tree species and fewer than 200 stems/ha of invasive shrubs. Strive to reduce fragmentation. A net increase of 54,000 acres is needed to begin meeting wildlife objectives.

Natural communities

Coolwater streams	Sedge meadow	Bottomland forest
Sand savanna	Sand Prairie	Tall grass prairie
Wetland's	Seep's	Shrub Prairie
Fens	Upland forest	Hill prairie
Oak savanna		

Critical Species

Mussels: snuffbox, sheepnose, salamander mussel, slippershell mussel, purple wartyback, spike, black sandshell, kidneyshell, elktoe

Insects: regal fritillary, northern sedge grasshopper, Indian skipper, *Catocala amestris*, *C. praeclara*, *Gabara subnivosella*, *Oligia obtusa*, *Hyparpax aurora*, *Paraphlepsius electus*, *P. carolinus*, *P. maculosus*, *Scaphytopius abbreviatus*, bracken borer moth

Fishes: American eel, brown bullhead, western sand darter, eastern sand darter, largescale stoneroller, highfin carpsucker, brook stickleback, gravel chub, lake chubsucker, northern pike, bluntnose darter, harlequin darter, banded killifish, starhead topminnow, bigeye chub, northern brook lamprey, silver lamprey, American brook lamprey, redspotted sunfish, ribbon shiner, smallmouth bass, spotted bass, river redhorse, black redhorse, greater redhorse, bigeye shiner, ironcolor shiner, blacknose shiner, rosyface shiner, silverband shiner, weed shiner, slender madtom, pugnose minnow, yellow perch, trout-perch, southern redbelly dace, blacknose dace, sauger, central mudminnow

Amphibians: four-toed salamander, Illinois chorus frog

Reptiles: Blandings turtle, ornate box turtle, eastern massasauga, Kirtland's snake, western hognose snake, smooth green snake, lined snake

Birds: northern harrier, short eared owl, Henslow's sparrow, grasshopper sparrow, bobolink, LeConte's sparrow, Nelsons's sharp-tailed sparrow, stilt sandpiper, piping plover, black tern, marsh wren, yellow rail, prairie warbler, willow flycatcher, loggerhead shrike, black rail, American woodcock, short-billed dowitcher, red-headed woodpecker, savannah sparrow, dickcissel, field sparrow, greater yellowlegs, buff-breasted sandpiper, upland sandpiper, American bittern, Wilson's phalarope, king rail, red-shouldered hawk, brown creeper, least bittern, northern bobwhite, American golden plover, Smith's longspur

Mammals: American badger, gray bat, Indiana bat, Rafinesque's big-eared bat, red squirrel, Franklin's ground-squirrel

Emphasis Game Species

Fishes: northern pike, largemouth bass, smallmouth bass, spotted bass, warmouth, yellow bass, green sunfish, pumpkinseed, bluegill, longear sunfish, redear sunfish, rock bass, white crappie, black crappie, channel catfish, flathead catfish, black bullhead, yellow bullhead, brown bullhead, yellow perch, freshwater drum

Birds: ring-necked pheasant, wild turkey, mourning dove, American woodcock, Canada goose, wood duck, mallard

Mammals: white-tailed deer, eastern cottontail, fox squirrel, gray squirrel, coyote, raccoon, red fox, mink, beaver

Non-game Indicator Species

Open Woodland/Savanna - black rat snake, red-headed woodpecker, summer tanager, American robin, eastern kingbird, Baltimore oriole, white-footed mouse

Grasslands - prairie king snake, fox snake, common garter snake, bobolink, northern harrier, dickcissel, vesper sparrow, horned lark, eastern meadowlark, kestrel, song sparrow, American goldfinch, sedge wren, prairie vole

Forests - eastern box turtle, black rat snake, northern cardinal, black-capped chickadee, red-tailed hawk, wood thrush, tufted titmouse, Carolina wren, American redstart, Kentucky warbler, deer mouse

Wetlands - twelve spotted skimmer, chorus frog, spring peeper, painted turtle, northern water snake, great blue heron, river otter

Streams - sand shiner, bluntnosed minnow, spotfinned shiner, orange throated darter,

blackstriped topminnow, creek chub, green frog, spiny soft shell, northern water snake, spotted sandpiper, prothonotary warbler, river otter

Lakes/Ponds - crayfish, whirligig beetle, water boatman, twelve spotted skimmer, painted turtle, common musk turtle, great blue heron

Recreational Opportunities

Upland game (ring-necked pheasant) hunting, forest game (white-tailed deer, wild turkey) hunting, waterfowl hunting, fishing (walleye, smallmouth bass, bluegill), furbearer hunting and trapping, grassland bird viewing, Magnolia Morel Festival, Wildlife Prairie State Park, Rock Island Trail

Educational/Interpretive

The Illinois Natural History Survey, University of Illinois, Illinois State University, Illinois State Museum, Early American Museum, Henson Robinson Zoo, Miller Park Zoo, Scovill Zoo, Douglas Hart Nature Center, Sugar Grove Nature Center, Illinois Department of Natural Resources main offices, Kankakee River State Park, Wildlife Prairie State Park, Weldon Springs State Park, Illinois and Michigan Canal State Trail, Hennepin Canal Parkway State Trail, cemetery prairies

Natural Resource Commodities

Upland, forest and waterfowl hunting opportunities; fishing opportunities, furs, timber harvest, Illinois-ecotype prairie seeds

Conservation Opportunity Areas

Prairie & Grassland Restoration Areas (locations to be determined)

Protected lands - Establishment of 3 grassland Bird Conservation Areas (>3,000 acres of 'ecologically-patterned' grassland; see Fitzgerald et al. 2000) in the Grand Prairie Division will require restoration in areas where little habitat currently exists.

Management of areas of this size will need to accommodate the conservation of grassland Species in Greatest Need of Conservation and provide recreational opportunities, including ring-necked pheasant hunting. Pheasant Habitat Areas, patches of 80-640 acres (typically <120 acres) managed by the Illinois Department of Natural Resources for public hunting, are sometimes the only significant habitat patch on the landscape. These locations may be a starting point for influencing grassland habitat on a landscape scale. Additional incentives for landowners adjacent to Pheasant Habitat Areas's may promote larger contiguous grassland habitat on private lands, particularly in areas with concentrations of highly-erodible soils.

Goal - Establish and manage grassland landscapes, as described above, for the benefit of grassland Species in Greatest Need of Conservation and offering compatible, high-quality, wildlife-recreation opportunities

Key actions - identify locations with highest restoration potential; modify existing programs to encourage restoration of grassland on private lands

Partners - Illinois Department of Natural Resources, Pheasants Forever, U.S. Department of Agriculture (Natural Resources Conservation Service, Farm Service Agency), Grand Prairie Friends, C2000 Ecosystem Partnerships

Midewin - Des Plaines - Goose Lake Prairie Macrosite

Protected lands - Located in Will county, Midewin is the first tallgrass prairie to be established under federal control. Encompassing over 19,000 acres, it is the largest tallgrass prairie complex in the state, and is second only to Prairie Ridge State Natural

Area in the number of nesting area-sensitive grassland bird species. Goose Lake Prairie is the largest native tallgrass prairie remnant in Illinois. Des Plaines Conservation Area provides 2,000 acres of additional grassland habitat.

Key Actions - Restoration and management of tallgrass prairie vegetation are on-going; unnecessary legacy infrastructure (Midewin) and invasive woody vegetation are being removed. The surrounding landscape is vulnerable to exurban and suburban development because of its proximity to Chicago. Preserving open space would help ease the impact of land lost to development and increase an already ecologically important grassland ecosystem.

Partners - U.S. Forest Service, Illinois Department of Natural Resources, The Nature Conservancy

Kankakee Sands - Pembroke Savannas - Kankakee River - Mومence Wetlands Area

Protected Lands - Iroquois County State Fish & Wildlife Area, The Nature Conservancy properties

Objectives - Restore and manage an additional 10,000 acres of black oak sand savanna, sand prairie and sand flatwoods within the Kankakee Sands Section; restore and manage 2,000 acres in the Mومence Wetlands; restore in-stream habitat and natural process in the Kankakee River in Illinois and Indiana, especially issues of sand bed and sediment load

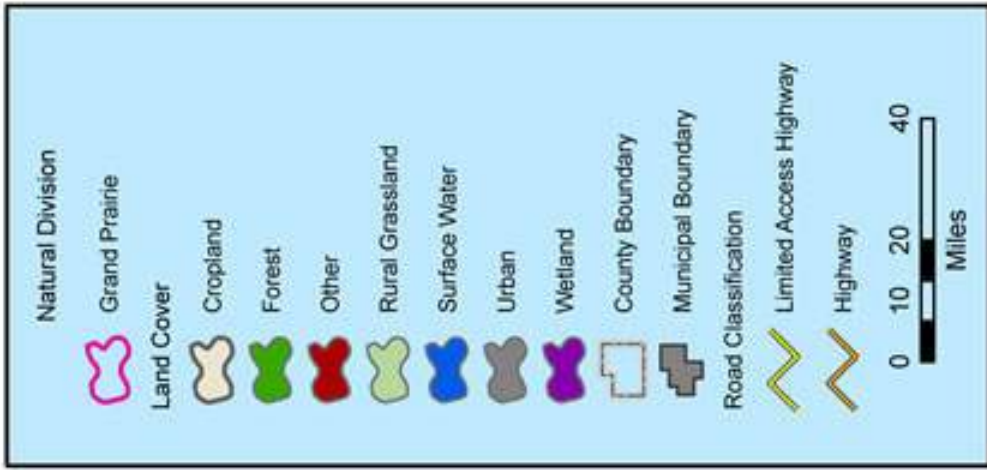
Key Actions - work across state boundaries to restore channelized streams, stabilize stream banks, manage drainage practices to moderate water flows, and develop minimum flow standards; protect and restore remnant savanna, sand prairie and wetland habitat

Partners - Illinois Department of Natural Resources, State of Indiana, The Nature Conservancy, Illinois Nature Preserves Commission, Northern Illinois Anglers Association

Green River

Lower Fox River

Contributors: Wade Louis, J. R. Black (Northern Illinois Anglers Association), Stan Etter, Tom Gargrave, Jay Hayek, Bob Massey, Dan Newhouse, Joe Rogus, Kim Roman, Eric Smith, Trent Thomas, and Mike Wefer



IV. C. The Illinois River and Mississippi River Sand Areas Natural Division

Characteristics

The Illinois River and Mississippi River Sand Areas Natural Division are several discrete patches of sand areas. The Illinois River Section is characterized by flat to gently rolling sand plains and sand dunes along the eastern side of the Illinois River. Oak-hickory forest, sand prairie, and marshes were the predominant vegetation groups prior to European settlement. The Mississippi Section encompasses sand areas and dunes in the bottomlands of the Mississippi River and the “perched dunes” atop the bluffs near Hanover. Scrub oak forest and dry sand prairie are the natural vegetation of this division. Several relict western amphibians and reptiles, such as western hognose snake, Illinois mud turtle, and Illinois chorus frog, are known only from these sand areas. Many plant species, including yucca and prickly pear cactus, are more typical of the shortgrass prairies to the west of Illinois.

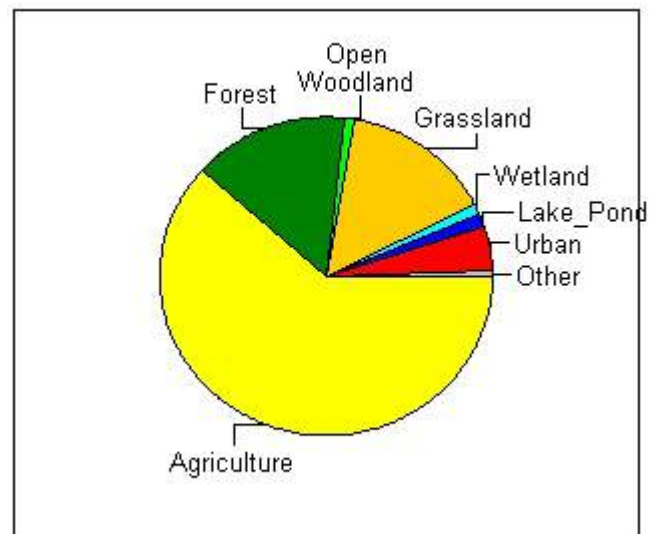
Major Habitats & Challenges

Forests - exurban development, lack of species diversity, white-tailed deer over-abundance

Open Woodland/Savanna - exurban development, lack of prescribed management (primarily fire), white-tailed deer over-abundance

Grasslands - exurban development, lack of prescribed management (primarily fire), white-tailed deer over-abundance

Land Cover of the Illinois River and Mississippi River Sand Areas



Wetlands - scarcity, sedimentation, low and decreasing vegetation diversity

Lakes and ponds - scarcity, sedimentation, low and decreasing vegetation diversity

Streams - sedimentation, channelization

Opportunities

The natural division has a high proportion of its land in forest and grassland cover. Much of the natural division is in public ownership, and state and federal farm programs (e.g. Conservation Reserve Program, Conservation Reserve Enhancement Program) can help achieve many of the habitat goals on private lands.

Management Guidelines

Landscapes:

Grasslands: Native and restored prairie (including CP-25 type establishment of rare and declining habitats in the Conservation Reserve Program) are to be protected from additional losses and managed to maintain and enhance floristic and structural quality. Management of grasslands with prescribed fire, soil disturbances, over-seeding, light grazing and other tools will enhance vegetation and structural diversity, and therefore wildlife value. A net increase of about 21,000 acres is needed to meet wildlife objectives.

Forest: Existing forest acreage must be protected by drawing attention to the extent and effects of increasing exurban development; attention to and consideration of zoning ordinances may be necessary to remedy the problems associated with loss of forest habitat and increased human-wildlife conflicts. Quality of forests will be managed and enhanced with timber stand improvement practices, the purposeful provision of varying stages of succession and an increase in tree species diversity where appropriate. A net increase of about 3,600 acres of forest and 7,500 acres of open woodland/savanna are needed to meet wildlife objectives.

Wetlands, Lakes and Ponds: By restoring upland, riparian and wetland habitats, sedimentation to wetlands, streams, lakes and ponds will be reduced. Wetland acreage on privately-owned properties can be increased through state and federal cost-share programs. A net increase of about 1,000 acres is needed to meet wildlife objectives.

Streams: Restore channelized segments (>5 miles) for the conservation of Species in Greatest Need of Conservation.

Natural Communities

Sand prairie, sand hill prairie, sand savanna, sand forest, ephemeral wetlands

Critical Species

Cobweb skipper, Arogos skipper, Ottoe skipper, regal fritillary, Illinois chorus frog, Illinois mud turtle, ornate box turtle, western hog-nosed snake, upland sandpiper, loggerhead shrike, common nighthawk, red-headed woodpecker, American badger

Emphasis Game Species

Migratory waterfowl, wood duck (nesting), northern bobwhite, wild turkey, ring-necked pheasant, American woodcock, mourning dove, American crow, white-tailed deer, fox squirrel, gray squirrel, eastern cottontail, raccoon, Virginia opossum, striped skunk, coyote, red fox, grey fox, beaver, muskrat

Non-game Indicator Species

Forest - eastern screech-owl, great horned owl, common nighthawk, chuck-will's-widow, downy woodpecker, eastern wood-pewee, black-capped chickadee, red-eyed vireo, Tennessee warbler, red crossbill, southern flying squirrel, white-footed mouse

Open Woodland/Savanna - bullsnake, red-tailed hawk, American kestrel, red-headed woodpecker, tufted titmouse, gray catbird, northern mockingbird, brown thrasher, yellow-breasted chat, orchard oriole, northern cardinal, big brown bat

Grassland - ornate box turtle, bullsnake, lark sparrow, dickcissel, American kestrel, killdeer, American tree sparrow (winter), western meadowlark, American goldfinch, plains pocket gopher

Wetland - Illinois chorus frog, spring peeper, great blue heron

Lakes & Ponds, Streams - great blue heron

Recreational Opportunities

Hunting, fishing, trapping, wildlife viewing, shed antler hunting, mushrooming, dog training, horseback riding, snowmobiling, camping and picnicking

Educational/ Interpretive

Chautauqua National Wildlife Refuge, Dickson Mounds Museum, Emiquon National Wildlife Refuge, Jake Wolf Memorial Fish Hatchery, Lincoln's New Salem Historic Site, Meredosia National Wildlife Refuge, Jim Edgar Panther Creek State Fish and Wildlife Area, Sanganois State Fish and Wildlife Area and Spring Lake State Fish and Wildlife Area.

Natural Resource Commodities

Forest products, hunting opportunities

Conservation Opportunity Areas

Mason County Sand Areas

Protected lands - 4,000 acres among Henry Allan Gleason State Natural Area, Sparks Pond State Natural Area, Rollo Prairie State Natural Area, Sand Prairie Scrub Oak State Natural Area, Long Branch Sand Prairie State Natural Area, Revis Springs Hill Prairie

State Natural Area, Matanzas Prairie State Natural Area, Barton Summer Timbers State Natural Area, and Clear Lake's open water

Priority Resources - sand prairie, sand savanna, ephemeral wetlands, sand-restricted wildlife, grassland and savanna Species in Greatest Need of Conservation

Lost Mound - Hanover Bluff - Mississippi Palisades

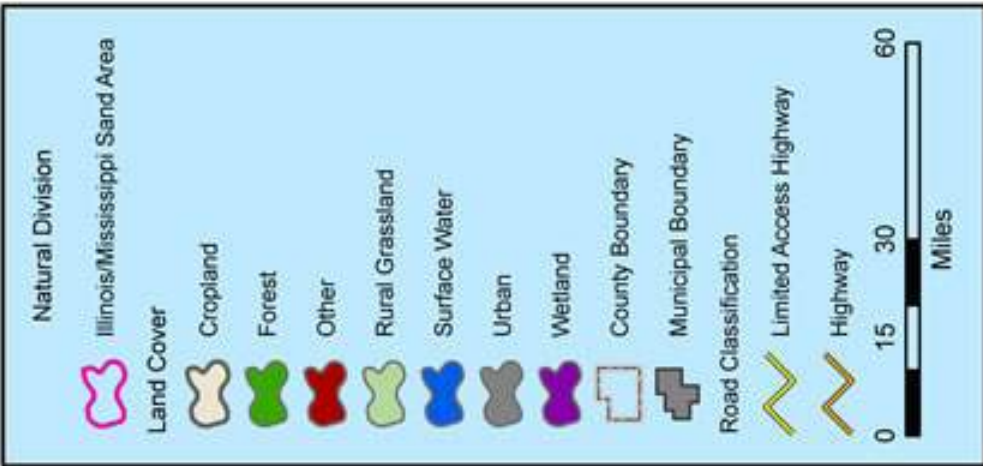
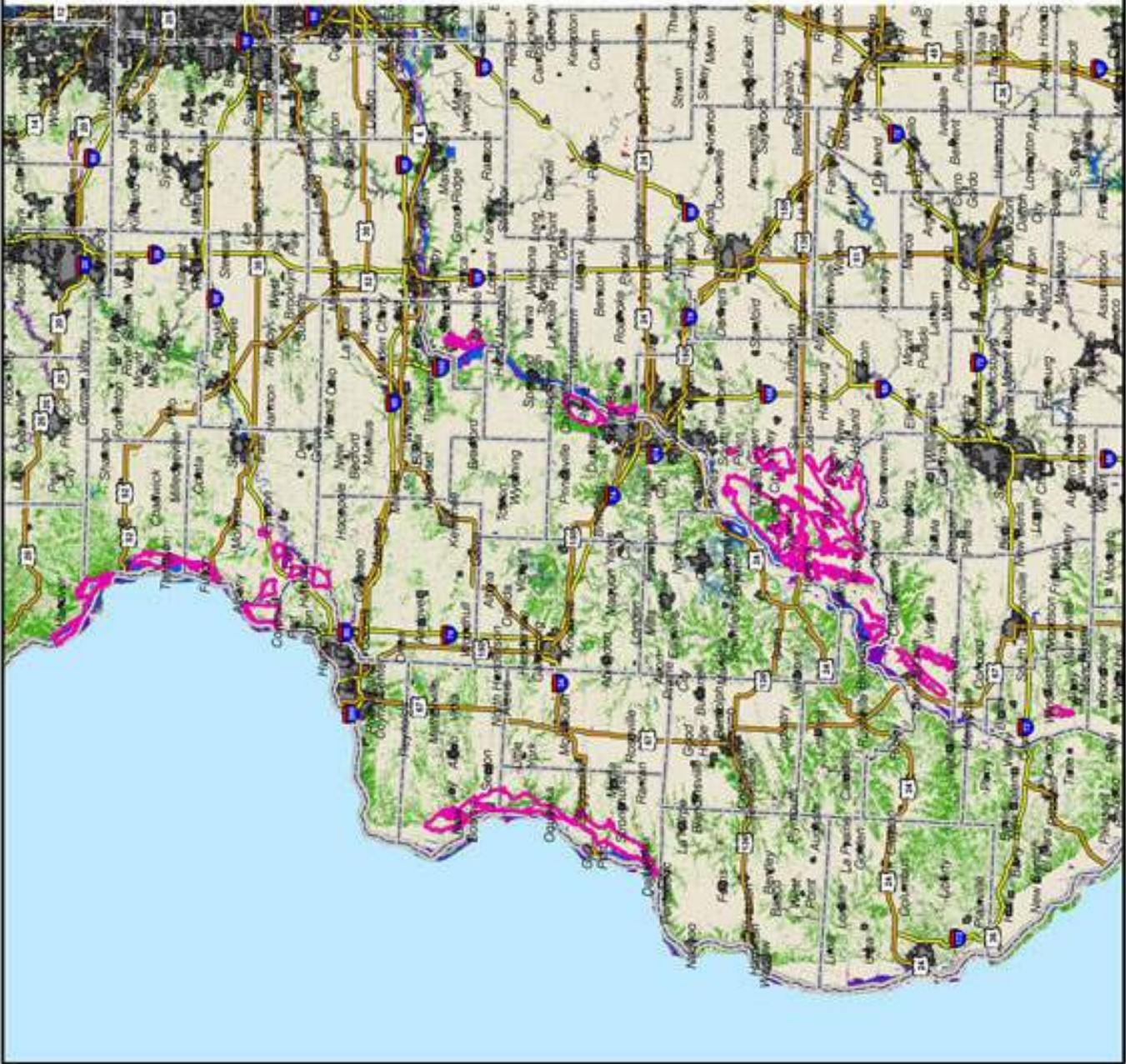
Protected Lands: Upper Mississippi River National Fish & Wildlife Refuge - Lost Mound unit, Hanover Bluff Nature Preserve, Falling Down Prairie Nature Preserve, Mississippi Palisades State Park

Conservation Philosophy: Restoration of the continuum of riverine (Mississippi River bottomlands), prairie (Lost Mound), and upland forest (Hanover Bluff, Mississippi Palisades) as an ecosystem landscape. At Lost Mound (within the Sands natural division), the objective is restoration of a sand prairie/sand savanna ecosystem capable of maintaining viable populations of grassland species, including both permanent residents and migratory species, with emphasis on declining grassland bird species and threatened and endangered species while allowing compatible recreational activities.

Partners: U.S. Fish & Wildlife Service, Illinois Department of Natural Resources, The Friends of the Depot, The Prairie Enthusiasts, The Nature Conservancy, Jo Daviess Natural Areas Guardians, Driftless Area Partnership, Natural Land Institute, Jo Daviess Conservation Foundation, Blufflands Alliance, National Wild Turkey Federation

* See also *Upper Mississippi River and Illinois River Bottomlands* and *Wisconsin Driftless* natural divisions

Contributor: Ed Anderson, Buck Cunningham



IV. D. The Lake Michigan Natural Division

Characteristics

Lake Michigan is a dynamic deepwater oligotrophic ecosystem that supports a diverse mix of native and non-native species. Although the watershed, wetlands, and tributaries that drain into the open waters are comprised of a wide variety of habitat types critical to supporting its diverse biological community this section will focus on the open water component of this system. Watershed, wetland, and tributaries issues will be addressed in the Northeastern Morainal Natural Division section.

Species diversity, as well as their abundance and distribution, are influenced by a combination of biotic and abiotic factors that define a variety of open water habitat types. Key abiotic factors are depth, temperature, currents, and substrate. Biotic activities, such as increased water clarity associated with zebra mussel filtering activity, also are critical components.

Nearshore areas support a diverse fish fauna in which yellow perch, rockbass and smallmouth bass are the more commonly found species in Illinois waters. Largemouth bass, rockbass, and yellow perch are commonly found within boat harbors. A predator-prey complex consisting of five salmonid species and primarily alewives populate the pelagic zone while bloater chubs, sculpin species, and burbot populate the deepwater benthic zone.

Challenges

Invasive species, substrate loss, and changes in current flow patterns are factors that affect open water habitat. Construction of revetments, groins, and landfills has significantly altered the Illinois shoreline resulting in an immeasurable loss of spawning and nursery habitat. Sea lampreys and alewives were significant factors leading to the demise of lake trout and other native species by the early 1960s. Zebra mussels and other invasive species are significantly

impacting the existing rehabilitated fishery while Asian carp are threatening to invade the Great Lakes through the Chicago Sanitary and Ship Canal system.

Opportunities

The Great Lakes state, federal, tribal, and provincial resource agencies have agreed to the Joint Strategic Plan for Management of the Great Lakes Fisheries. The Lake Michigan Committee coordinates fishery management activities for Lake Michigan. Fish Community Objectives have been agreed to by the Lake Michigan jurisdictional agencies. A reporting process for monitoring progress toward achieving these objectives also has been implemented.

Environmental Objectives are being developed to address environmental and habitat issues that are impeding progress toward achievement of the Fish Community Objectives. Critical pollutants are being addressed through the Lake Michigan Lakewide Management Plan. A Remedial Action Plan is addressing the only Area of Concern in Illinois waters of Lake Michigan.

Constituent groups, such as Salmon Unlimited, Lake Michigan Federation, and Trout Unlimited provide lobbying support for legislation and funding necessary for prevention of new introductions of aquatic nuisance species and their dispersal, and support lake and brook trout restoration in Lake Michigan.

The open water portion of lake Michigan in Illinois hosts significant numbers of wintering common goldeneye and long-tailed ducks, and loons, grebes, scaup, mergansers and other ducks during spring and fall migration.

Management Guidelines

Effective management of the Lake Michigan fishery requires that Illinois manage its fishery as an integral component of a whole lake management strategy. The long-term objectives for achieving a sustainable fishery are described in the Lake Michigan Fish

Community Objectives. Environmental Objectives are being developed to address the environmental and habitat issues that are impeding achievement of the Fish Community Objectives. Environmental issues in the Illinois waters are being addressed through the Waukegan Remedial Action Plan and the Lake Michigan Lakewide Management Plan.

Natural communities

Lake Michigan is a dynamic deepwater oligotrophic ecosystem. The present day fish community is a mix of native and nonnative species that comprise a heavily managed and unstable fishery. The historic fish community consisted of lake trout as the top predator preying upon whitefish, ciscoes, bloater chubs, sculpins, and yellow perch. By the early 1960s the historic fish community had collapsed from the combination of environmental abuse, unregulated harvest, and sea lamprey predation. The existing fishery consists of five salmonid predator species maintained by stocking and yellow perch, and a forage base primarily of alewives, rainbow smelt, and bloater chubs.

Critical species

Lake sturgeon, lake herring, re-establishment of self-sustaining lake trout populations is a critical objective, lesser scaup

Emphasis Game & Commercial Species

Nearshore sport fishery consisting primarily of yellow perch, rock bass, smallmouth bass and occasional brook trout; open water sport fishery consisting primarily of Chinook salmon, coho salmon, rainbow trout, brown trout, and lake trout; hunting for diving ducks. Only bloater chubs can be commercially fished in Illinois waters. Yellow perch were commercially fished until poor recruitment forced the 1996 closure of this fishery.

Nongame Indicator Species

Lake sturgeon, lake herring, emerald shiners, slimy sculpin, deepwater sculpin, common loon, horned grebe

Recreational Opportunities

The Illinois waters of Lake Michigan provide unique pedestrian and boat fishing opportunities for warm and cold water species. There is a spring and summer sport fishery for coho salmon, Chinook salmon, lake trout, rainbow trout and brown trout. Lower water temperatures near shore in early spring and late fall create trout and salmon fishing opportunities for shore fishermen. Yellow perch generally are caught throughout the year from shore, boats, and winter ice fishing. Smallmouth bass and largemouth bass are generally caught by boat fishermen in harbors and along nearshore structures. Shore fishermen also commonly catch several other species, such as rock bass, common carp, and blue gill.

Education/Interpretive

Chicago has several prominent museums. The Shedd Aquarium exhibits include species from the Great Lakes. The Department's Chicago Urban Fishing Program provides fishing clinics for teaching fishing to kids. The clinics are coordinated with the summer fishing programs sponsored by the Chicago Park District.

Natural Resource Commodities

Historically several fish species were commercially harvested by fishermen utilizing ports in Chicago and Waukegan. After the collapse of the lake trout fishery, two species (bloaters and yellow perch) were harvested commercially until 1996 when the commercial harvest of yellow perch was reduced to zero due to poor recruitment.

Key Actions

Achieve no net loss of the productive capacity of habitat supporting Lake Michigan's fish communities. High priority should be given to the restoration and enhancement of historic riverine spawning and nursery areas for anadromous species. Development of an accurate

habitat inventory system is necessary to achieve a no-net-loss of the productive capacity of habitat supporting Lake Michigan fish communities.

A geographic information system has been developed but more accurate substrate mapping with finer resolution is necessary to improve its effectiveness as a research and management tool.

Prevent Asian carp species from invading the Great Lakes by way of the Chicago Sanitary and Ship Canal system.

Development of effective ballast water discharge standards to prevent new aquatic nuisance species introductions and dispersal through ballast water discharge.

Prevention of new aquatic nuisance species introductions and dispersal through bait shops, pet shops, live food markets, and other potential pathways.

Suppress the sea lamprey within Lake Michigan to allow the achievement of other fish-community objectives.

Restore self-sustaining lake trout populations, and evaluate the feasibility of restoring native brook trout.

Research and monitoring programs must be augmented to provide the necessary information to progressively manage for a sustainable trout and salmon fishery that is primarily maintained through hatchery stockings.

Diporeia, a benthic crustacean, is a critical component in the Lake Michigan food web. Their abundance has declined substantially in Lake Michigan but the mechanism for this decline is poorly understood and needs to be addressed with ecological studies.

Identify the most important and traditional zones for migratory and wintering waterbirds, and reduce harassment by recreational watercraft.

Contributor: Tom Trudeau

IV. E. The Lower Mississippi River Bottomlands Natural Division

Characteristics

The Lower Mississippi River Bottomlands Natural Division, including the Mississippi River and its floodplain from Alton to the Thebes Gorge in southwestern Illinois, is glaciated bottomland country that used to be mostly forested with numerous marshes, wet prairies, and oxbow sloughs scattered throughout it. It historically was the wide Mississippi River bed before channelization, and is divided into a northern and southern section. The northern part of the division is also known as the American Bottoms, and it was here that the wet prairies and marshes occurred. The southern part of the division was more heavily forested. Glacial flood waters created this vast floodplain ecosystem. The soils in this natural division are finely textured, with both sandy (well-drained) and clay (poorly drained) areas, all developed from alluvium. 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).

Presettlement condition of this division was mostly forested, with historic wet prairies and marshes in the Northern Section. Many of the wet prairies were drained and converted into agricultural fields. These were replaced by more vast forest and bottomland swamp tree species typical of the coastal plain in the Southern Section. Aquatic habitats of this division are represented by oxbow lakes and sloughs, marshes, and springfed swamps. Some unique fish species are found only in the springfed swamps, and Gulf Coastal Plain reptiles and amphibians reach the northern-most edge of their range.

Major Habitats & Challenges

Forests - irregular and unnatural flood regimes invoked by levees created to protect farm ground; overuse from recreational such as off-road vehicles and all-terrain vehicles; land clearing and fragmentation; invasion and seed deposition by exotic plants such as garlic

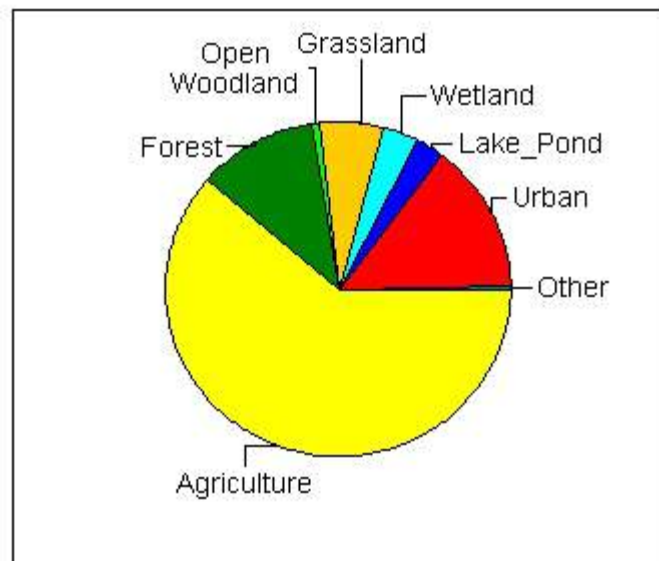
mustard and autumn olive; overgrazing by some livestock and abundant deer populations negatively affect forest composition and destroy rare plants.

Grasslands (wet prairies) - further destruction of wet prairies from draining for conversion to agricultural use; lack of fire to maintain fire-climax communities; invasion and seed deposition by exotic plants such as autumn olive and purple loosestrife; poor diversity and structure of cool-season grasslands

Wetlands (backwater sloughs and oxbows) - draining to promote farming of fertile floodplain soils; development of residential communities within the floodplain; sedimentation of small wetlands; invasion of shallow wetlands by native woody species such as willows

Streams - impaired water quality by pollution and herbicide runoff; degradation by sedimentation and development

Land Cover of the Lower Mississippi River Bottomlands Natural Division



Opportunities

This natural division has one of the larger amounts of floodplain habitat in the state. This corridor of river bottoms runs the Mississippi River bluffs from Madison to northern Alexander counties. There is a significant amount of this natural community type in public ownership (State of Illinois and U.S. Forest Service). Active management of portions of this floodplain have continued through acquisition by the U.S. Forest Service, enrollment in long term protection programs through the Illinois Nature Preserves Commission, and some prescribed burning in dry marshes by the Illinois Department of Natural Resources. Wetland enhancement and re-creation is occurring to serve as waterfowl hunting areas by private enterprises. Leased hunting is providing impetus to enhance forest stands for the benefit of

wildlife (i.e., deer and wild turkey). The Nature Conservancy's Upper Mississippi River Project works in close partnership with other organizations to conserve and restore the Mississippi River and its major tributaries by improving water quality, restoring healthy river flows, and reclaiming floodplains as natural habitat.

Management Guidelines

Landscapes

Forests - Increase forest cover by at least 10,800 acres. Inventory forested blocks at least 500 acres, and prioritize for addition on linkage with other blocks. Encourage sound management practices to promote healthy floodplain forests through landowner education and assistance, timber stand improvements, and exotics control (mechanical, chemical and fire). Controlling deer herds in bottomland forests needs to be addressed.

Grasslands - Increase grassland by at least 10,400 acres. In all remnant wet-mesic prairies, encourage sound management practices to maintain and increase their extent through prescribed burning, restoration with native cordgrass and stable water levels. Education of the public to the importance of wet prairies is necessary to gain support.

Wetlands - Increase wetlands by at least 4,000 acres. Recreating the historic meander scars and oxbow slough depressions may begin to restore wetlands on floodplain soils. Existing open wetlands need to be monitored and managed to prevent the encroachment of woody species such as willow. Establish buffer between wetlands and adjacent agricultural land to prevent herbicide runoff and sedimentation. Establishment of deeper and shallow wetlands is needed to increase amphibian breeding habitat, and help reduce harmful parasitic insect populations.

Streams - Encourage sound management practices to maintain and upgrade the quality of streams through landowner education and assistance, adjacent buffer and riparian corridors to filter herbicide runoff and avoid degradation by siltation and development, and discouraging destructive alteration by illegal off-road vehicle and all-terrain vehicle use.

Natural Communities

Floodplain forest, wet and mesic prairie, cypress-tupelo swamps, geological areas

Critical Species

Spring cavefish, bantam sunfish, Alabama shad, plains minnow, sturgeon chub, flathead chub, sicklefin chub, banded pygmy sunfish, Illinois chorus frog, eastern narrowmouth toad, bird-voiced treefrog, green treefrog, mole salamander, alligator snapping turtle, mud snake, western cottonmouth, Mississippi green water snake, timber rattlesnake, eastern massasauga, least bittern, pied-billed grebe, Mississippi kite, least tern, red-shouldered hawk, bald eagle, common moorhen, migratory shorebirds, eastern wood rat, Indiana bat, river bulrush, cattail, lotus, pickerelweed

Emphasis Game Species

White tailed deer, wild turkey, swamp rabbit, eastern cottontail, gray and fox squirrels, muskrat, beaver, raccoon, mink, Canada goose, blue-winged teal, wood duck, largemouth bass, black and white crappie, bluegill, red ear sunfish, spotted bass, and channel catfish

Non-game Indicator Species

Forests - bobcat, red and hoary bats, red-headed woodpecker, pileated woodpeckers, prothonotary warblers, summer and scarlet tanagers, spotted and marbled salamanders, eastern box turtles, skinks, western ribbon snake, speckled kingsnake

Wetland - herons and egrets, cricket frog, chorus frog, southern leopard frog, American toad, yellowbelly water snake, Graham's crayfish snake

Streams, springs - siren, cave and longtail salamanders

Recreational Opportunities

Waterfowl and bottomland forest game hunting, trapping, fishing, hiking, wildlife observation, biking, and limited equestrian use.

Educational/Interpretive

The La Rue Swamp is a registered National Natural Landmark and also a federal Research Natural Area. Portions of the southern section are U.S. Forest Service, with some distinction between National Natural Landmarks and Research Natural Areas. State sites include Poag Chorus Frog Site, Horseshoe Lake State Park (Madison County), Frank Holten State Park, Kidd Lake Marsh Natural Area, Fort de Chartres Historic Site, Lovet's Pond Nature Preserve, and Union County Conservation Area.

Natural Resource Commodities

Forest products, commercial fisheries, hunting reserves/clubs, waterfowl clubs, nature-based tourism (scenic roadways, birdwatching, backpacking/hiking, and nature observation/recording)

Conservation Opportunity Area

LaRue - Pine Hills - Western Shawnee - Trail of Tears

Protected lands - Pine Hills Ecological Area, LaRue Ecological Area, Ozark Hills Nature Preserve, Shawnee National Forest (including Oakwood Bottoms), Trail of Tears State Forest

Conservation philosophy - Maintain connectivity among Ozark, Shawnee Hills and Lower Mississippi River Bottomlands Natural Divisions with riverine, swamp, bottomland forest, bluff, and upland forest, glade and barrens communities. Protect and proactively manage for the unique flora and fauna native to these ecosystems. Use sound management decisions, with historical conditions as a guide.

Priority resources (LaRue Swamp) - swamp, sloughs of the Big Muddy River, high diversity of reptiles and amphibians

Objectives - enroll unprotected critical habitats for endangered/threatened species into long term protection plans; generate funding to increase biologist positions to help with personnel needed to proactively manage these communities.

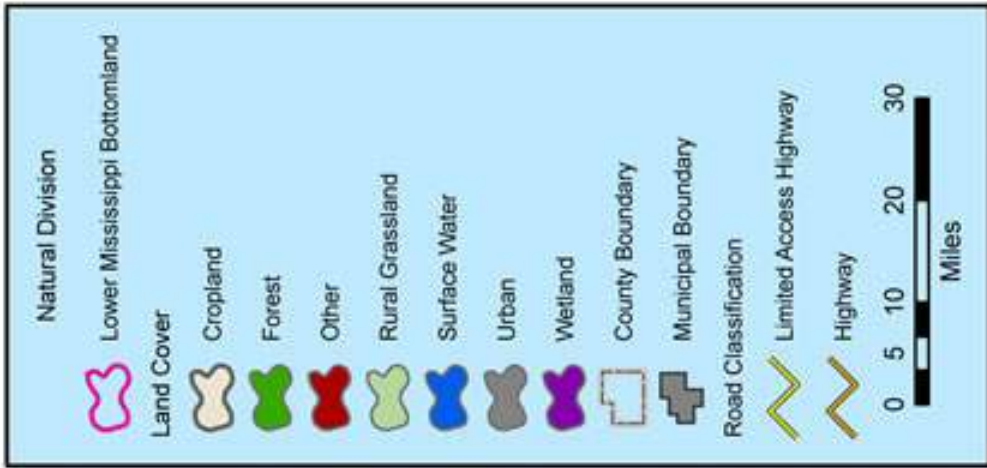
Priority actions - use prescribed fire to manage fire climax communities of glades, barrens, and upland forests; permanent protection of land parcels with high quality community types; reforestation to create larger patches

Partners - U.S. Forest Service, Illinois Department of Natural Resources, The Nature Conservancy

Research, monitoring & evaluation - research and monitoring can be conducted by Illinois Department of Natural Resources, Southern Illinois University (Carbondale and Edwardsville campuses), Southwest Illinois College, and the Illinois Natural History Survey

* See also *Ozark* and *Shawnee Hills* natural divisions

Contributors: Scott Ballard, Brian Mahan



IV. F. The Middle Mississippi Border Natural Division

Characteristics

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 predominate 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.

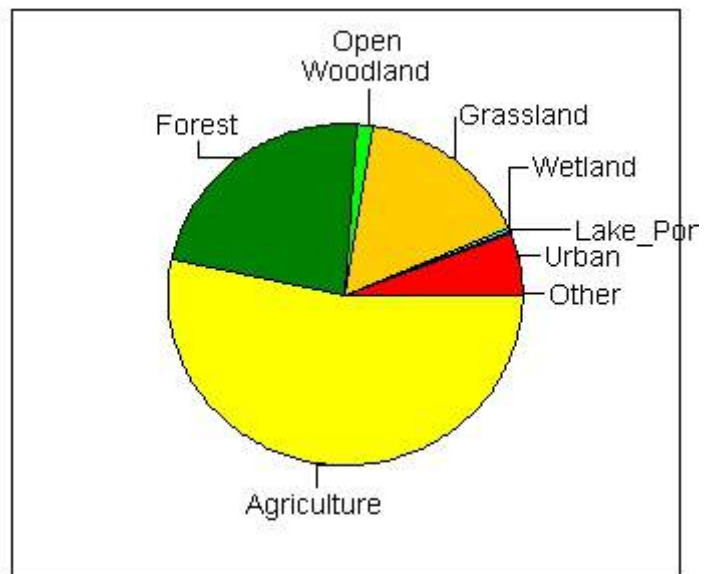
Major Habitats & Challenges

Forests - invasive exotic plants (bush honeysuckle), increase of less desirable species (black locust, maple, sassafras), deer browsing, lack of management and poor forestry practices, soil erosion as streams traverse bluff lines and subsequent sedimentation of the river bottomlands are problematic

Open Woodland/Savanna/Barren - invasion by exotic species, lack of management

Grassland - dominance by fescue and other exotic plants, succession to forests, lack of fire/management; conversion to cropland

Land Cover of the Middle Mississippi Border Natural Division



Primary Communities (bluffs) - lack of knowledge about these communities

Lakes and Ponds - Drainage alteration and intensive agricultural production have resulted in excessive erosion of soils of the upland portions of the Middle Mississippi Border that diminish water quality and depth of ponds and lakes due to sedimentation.

Streams - Peak flood volumes have increased and base flows decreased from historic levels due to drainage alteration. Drainage alteration exacerbates the secondary problems of high turbidity and siltation. In some areas, rural subdivision development may lead to higher nutrient loads in streams receiving septic runoff.

Opportunities

The Middle Mississippi Border Division's Driftless Section has a high proportion of its land in forest and grassland cover. Due to this area's highly erodible crop land, participation in the Conservation Reserve Program is high. The Conservation Reserve Program and other state and federal incentives programs can help achieve habitat objectives and address issues such as altered drainage on private lands. Cost-share for timber stand improvement is available through programs including Illinois Forestry Development Act, and Environmental Quality Incentives Program, and improve wildlife habitat on private forests. Hill prairie management is being addressed through the Highway 96 Hill Prairie Complex Plan, as well as a statewide program (in development). The Nature Conservancy's Upper Mississippi River Project works in close partnership with other organizations to conserve and restore the Mississippi River and its major tributaries by improving water quality, restoring healthy river flows, and reclaiming floodplains as natural habitat.

Management Guidelines

Landscapes

Forests - Increase forest cover by at least 21,600 acres; forested blocks of at least 500 acres should be inventoried and prioritized for addition or linking to other forests blocks.

Encourage sound management practices to promote healthy upland forests through landowner education/assistance, prescribed burning, timber stand improvements, and exotics control (mechanical, chemical, or fire). Forests should grade into open woodland or savanna habitats on adjacent uplands.

Open Woodland/Savanna/Barrens - Increase open woodland, savanna, & barrens by at least 7,500 acres. Pro-actively manage existing habitat that is not already in a management agreement or long term protection program. Encourage sound management practices to maintain and increase the extent of natural savannas and barrens through landowner education and assistance, prescribed burning, selective woody encroachment removal and exotics control (mechanical, chemical, or fire). Savanna or open woodland habitats should be encouraged in isolated woodland blocks under 15 acres in size.

Grasslands - Increase grassland habitat by 31,000 acres. Encourage sound management practices to maintain and increase the extent of hill prairies and other grasslands through landowner education and assistance, prescribed burning, selective woody encroachment removal and exotics control (mechanical, chemical, or fire).

Streams - Encourage sound management practices to maintain and upgrade the quality of streams through landowner education and assistance, adjacent buffer and riparian corridors to filter herbicide runoff, and correcting degradation caused by sedimentation and development.

Natural communities

Hill prairies, limestone cliffs/bluffs

Critical species

Brassy minnow, slender madtom, banded sculpin, dark-sided salamander, western worm snake, timber rattlesnake, brown creeper, northern harrier (winter), short-eared owl (winter), bobcat

Emphasis Game Species

Channel catfish, flathead catfish, smallmouth bass, largemouth bass, bluegill, wild turkey, white-tailed deer, fox and gray squirrel, raccoon, red and gray fox, coyote

Nongame Indicator Species

Forest - eastern box turtle, great horned owl, eastern screech-owl, black-capped chickadee, white-breasted nuthatch, white-footed mice

Open Woodland/Savanna - copperhead, great horned owl, eastern screech-owl, blue jay, black-capped chickadee, white-breasted nuthatch, white-footed mice

Bluffs - copperhead, turkey vulture

Streams - creek chub, southern redbelly dace, shorthead redhorse, fantail darter, orangethroat darter, slenderhead darter

Recreational Opportunities

Deer and turkey hunting, trapping, catfish fishing, mushroom hunting, fall driving tours (e.g. Pere Marquette State park), winter eagle watching

Educational/Interpretive

Pere Marquette State Park (Fishing Fair, Eagle Days), Great Rivers Museum at Lock & Dam 26, Lewis and Clark Museum, Kampsville Archaeological Museum, McCulley Heritage Project

Natural Resource Commodities

Timber, trapping, ginseng and other marketable roots, hunting (especially white-tailed deer and turkey), commercial fishing

Conservation Opportunity Area

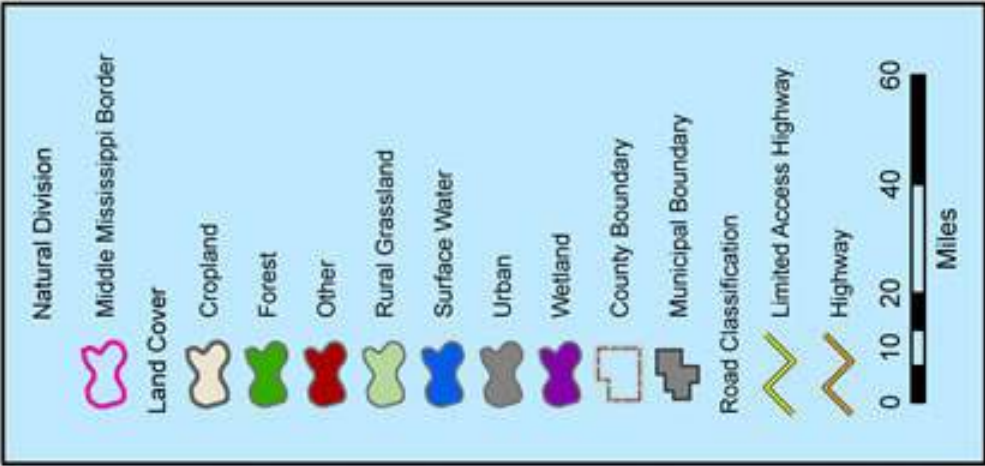
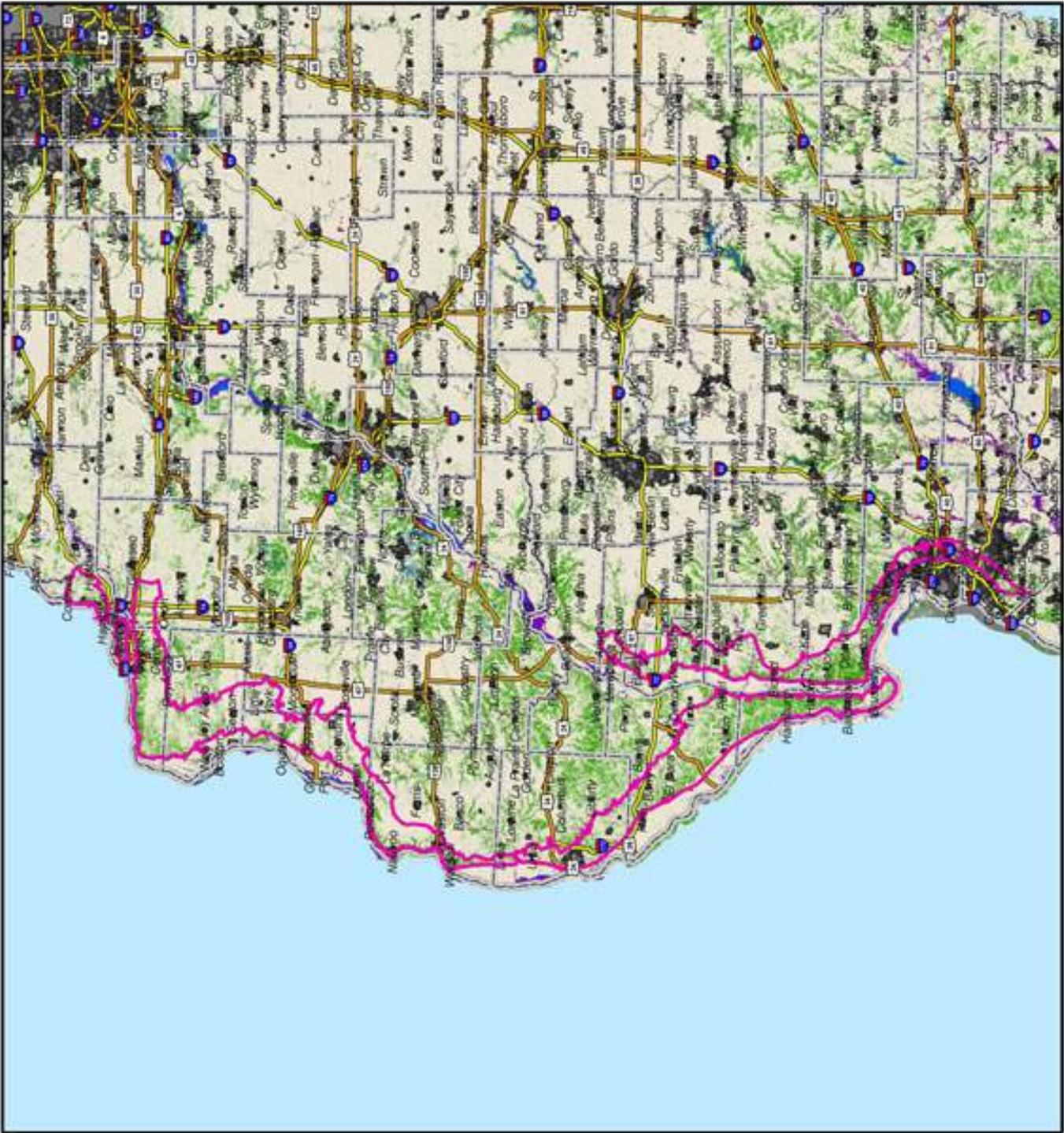
Pere Marquette State Park

Protected Lands - 8,000-acre Pere Marquette State Park

Priority Resources - large forested area, hill prairies, major rivers, bald eagles

Key Actions - develop a plan to deal with the numerous exotic plant species

Contributors: Doug Carney, Dean Corgiat, Jon Handel



IV. G. The Northeastern Morainal Natural Division

Characteristics

The Northeastern Morainal Natural Division contains a landscape of the most recently glaciated portion of Illinois within the counties of Boone, DeKalb, DuPage, Kane, Lake, McHenry Will, and Winnebago. Four distinct Sections within in the Division are recognized due to variations in topography, soil, glacial activity, flora and fauna. Drainage is poorly developed in some areas, thus abundant marshes, natural lakes, and bogs are distinctive features. Other areas have well-drained glacial outwash soils with seeps, fens, and springs. The Chicago lake plain and ancient beach ridge, bluff and panne communities provide unique critical habitat found only in the Northeastern Morainal Natural Division in Illinois. Higher gradient streams flow over gravel, cobble, and bedrock, providing good substrate for habitat and more stable stream bed characteristics compared to than many 'older' regions of Illinois with loess-dominated soils. Stable, rocky substrate, combined with significant ground water flow in some areas provides unique coolwater conditions for excellent gamefish populations and diverse non-game communities.

With such diverse wetlands, prairie, forest, savanna, lakes, and streams, the Northeastern Morainal Natural Division hosts the greatest biodiversity in Illinois. Along with the largest human population, northeastern Illinois also has the most extensive acreage of protected natural areas, which offer excellent active and passive recreational opportunities. Like most areas of the State, natural land cover has been extensively altered, although urbanization is considerably more extensive than elsewhere and expansion of development continues to be a major stressor.

Major Habitats & Challenges

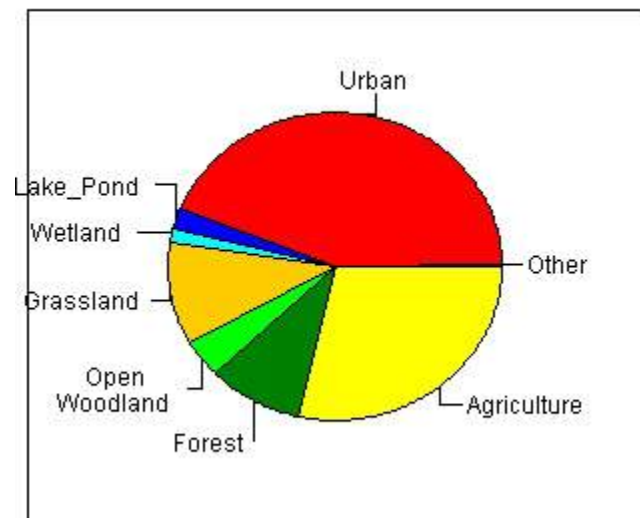
Forest - Including open woodlands and savannas, there are currently less than 270,000 acres of forest in the natural division, from a historical 765,000 acres. Fragmentation/edge effects

from developments, too little oak regeneration due to lack of fire and other factors, lack of other timber management and improvements, sugar maple infestation, buckthorn, other woody exotics, exotic insect pests (European ash borer, gypsy moth, Dutch elm disease), excessive deer browse, other nuisance animals such as feral cats, raccoons, cowbirds, drainage diversion and flood water

Open Woodland/Savanna - fragmentation, lack of fire, past over-grazing, buckthorn and other woody exotic invasion, no seed bank, lack of mature, cavity-producing timber, excessive deer browse

Grassland - Less than 245,000 acres remain. Fragmentation, dominance by exotic and invasive species, woody species invasion or natural succession to forest, nuisance animals including feral and domesticated cats

Land Cover of the Northeastern Morainel Natural Division



Wetland - Historically, more than 568,000 acres occurred, but less than 72,000 acres at present. Drainage issues including de-watering, impounding water too long, urban run-off, increased salinity, nutrient overload, filling, sedimentation, exotic species including reed canary grass, phragmites, purple loosestrife, carp and mute swans, and nuisance native animals such as beaver and Canada goose

Lakes and Ponds - Lake County has 10,000 acres of large glacial lakes including Fox Chain, Loon, Deep, Diamond, Bangs, Lake Zurich, Timber, Turner, Little Silver, Long, and others. Sediment and shoreline erosion from heavy boating, invasive exotics (e.g., curlyleaf pondweed, water milfoil, zebra mussel), increased turbidity from agricultural and urban runoff and pollutants, loss of vegetative habitat due to excessive removal treatments of submersed aquatic vegetation, municipal wastewater discharge, road salt for de-icing, storm-water discharge and impermeable surfaces severely impacting water quality, nutrient input and eutrophication,

isolation from wetland habitat by berms and spillways, dams, and shoreline development (i.e., riparian vegetation removal and seawall construction)

Streams - urbanization may be the most critical challenge to stream communities: increased point and non point sources pollution causing exacerbated nutrient levels, increased stream flow from higher imperious surface coverage, elevated water temperatures, increased demand for surface water, and dams

Beach, Dune, Panne - ongoing battle with accelerated shoreline degradation and lack of sand nourishment, invasive and exotic species, hydrological alterations, nuisance beaver

Challenges for All Community Types - Urbanization has numerous impacts, some irreversible, on all habitat types in the Northeastern Morainal Natural Division: altered hydrology, impervious surface, land clearing, filling; light, noise and air pollution, dams, runoff, siltation, nuisance-invasive plant and animal species, and others.

Opportunities

The Northeastern Morainal Natural Division has many sizable, potentially good quality habitats protected by public and private landowners. Landscape-scale management is facilitated by seven Forest Preserve Districts, two Conservation Districts, and the Illinois Department of Natural Resources. These landowners own over 183,900 acres of open space and fish and wildlife habitat. Three federal facilities, Fermilab, Argonne, and Fort Sheridan, contain an additional 8,500 acres of significant habitat. Much of the public land is concentrated around stream corridors, wetland, and lakes. Over 20,500 acres of public and private land within in the natural division are managed as Illinois Nature Preserves or Land and Water Reserves. Many partnerships with a multitude of public and private conservation organizations and institutions exist in the Northeastern Morainal Natural Division. Restoration and management goals for all major habitat types are being targeted by these partners.

Funding used by partners for terrestrial and aquatic habitat protection, acquisition and restoration include federal (e.g., State Wildlife Grant Program, U.S. Army Corps of Engineers Material Services Fines and mitigation requirements, various U.S. Fish & Wildlife Service funds), state (e.g., OpenLand Trust, C-2000, Illinois Environmental Protection Agency 319 Nonpoint Source Pollution fund, Clean Energy Foundation) and local (Open Space Referendum) sources. Private resources come from organizations including The Nature Conservancy, Pheasants Forever, Ducks Unlimited, National Wild Turkey Federation, Smallmouth Bass Alliance, Illinois Muskie Alliance, Walleye Unlimited, and BASS.

The New Invaders Watch is a partnership of government, non-profit, and volunteer organizations dedicated to the early detection and control of invasive plant and insect species in the Chicago Wilderness region. Target species are known to be invasive in the Midwest or regions of similar climate. Trained volunteers and professionals are coordinated to locate and voucher target species, provide an on-line system for reporting new populations, verifying their identification, notifying land managers, and tracking responses. The on-line toolbox includes known species distributions, current management techniques, identification and training materials, and reports of new invasive species locations found by other programs in the region.

Management Guidelines

Landscapes

Restoration and management of large, contiguous tracts of land will become more difficult as urbanization continues. New landscape-scaled projects are still possible in Boone, McHenry, Lake, Kane and DeKalb counties. Existing large areas throughout the natural division will benefit from on-going and planned restoration and management.

Forests: Increase by 8,000 acres. Restore and manage 20 sites >500 acres, 4-5 sites 800-1000 acres, and 100% of all remaining flatwoods.

Savannas: Increase by 12,000 acres. Restore and manage 15-20 existing sites to >200 acres and 10 sites to >500 acres.

Grasslands: Increase by 20,000 acres. Restore and manage 10-12 sites with >65% grass cover and >500 acres. Grassland complexes >3,000 acres should maintain at least 65% grassland cover. Restore and manage 100% of remaining dolomite and gravel prairie types.

Wetlands: Increase by 1,500 acres. Restore and manage 15 sites of >1,000-acre complexes with several 50- to 100-acre wetlands community types including fens, panne, seeps/springs, and sedge meadow.

Glacial Lakes: Most glacial lakes are not protected, owned by an organization other than the State, Nature Preserve, or County. Many glacial lakes have homeowners associations making management decisions because of Illinois Water Law. Citizens organizations should be encouraged to appropriately manage these lakes with attention to rare fishes, migratory birds, and improved water quality, with support from state and county agencies.

Beach & Lakeshore: The Northeastern Morainal Natural Divisions - Lake Michigan interface is heavily developed, but has significant natural communities and importance to wildlife including shorebirds, gulls and terns. Partnerships among partners and corporate and governmental landowners (including the U.S. Department of the Navy, U.S. Fish & Wildlife Service and Illinois Department of Natural Resources) may be expanded.

Natural communities

Beach, dune, swale, panne, sand and other savannas, sand prairie, fen, forested fen, cattail marsh, cool water streams, gravel prairies, bog, graminoid fen, calcareous floating mat, seeps/springs, dolomite prairie, sedge meadow, glacial lakes, northern and sand flatwoods, vernal ponds

Critical Species

Insects: hoary elfin, swamp metalmark, Karner blue, elfin skimmer dragonfly, Hine's emerald dragonfly, silver-boarded fritillary, silvery checkerspot

Mussels: creek heelspitter rainbow, black sandshell, salamander mussel, slippershell, spike, and purple wartyback

Fish: Iowa darter, banded killifish, pugnose shiner, blacknose shiner, blackchin shiner, starhead topminnow, longnose sucker, lake sturgeon, lake chubsucker (indicator species), bowfin, brook trout (extirpated)

Amphibians: blue-spotted salamander, plains leopard frog, smooth green snake, Blanchard's cricket frog (Illinois Beach), wood frog

Reptiles: Kirtland's snake, eastern massasauga, bull snake, western ribbon snake, spotted turtle, Blanding's turtle

Birds: Henslow's sparrow, bobolink, upland sandpiper, loggerhead shrike, American bittern, least bittern, Swainson's hawk, black-crowned night-heron, piping plover, black tern, northern harrier, yellow rail, black rail, common moorhen, sandhill crane, Wilson's phalarope, Forster's tern, common tern, greater yellowlegs, black-billed cuckoo, northern flicker, red-headed woodpecker, yellow-headed blackbird

Mammals: Franklin's ground-squirrel

Emphasis Game Species

White-tailed deer, gray and fox squirrel, eastern cottontail, beaver, wild turkey, resident and migratory waterfowl (especially Canada goose, mallard, wood duck), smallmouth bass, walleye, northern pike, muskellunge (native to Fox Chain system), yellow perch, flathead catfish, brown trout (reproducing in some streams)

Nongame Indicator Species

Forest - spotted salamander, wood frog, spring peeper, tiger salamander, barred owl, wood thrush, hairy woodpecker, gray squirrel, little brown bat

Open Woodland/Savanna - wood frog, six-lined racerunner, Cooper's hawk, red-headed woodpecker, eastern kingbird, Baltimore oriole, eastern bluebird, red bat, flying squirrel, fox squirrel, white-footed mouse

Grasslands - Plains garter snake, smooth green snake, bobolink, eastern meadowlark, Henslow's sparrow, meadow vole

Wetlands - marsh wren, northern leopard frog, common snapping turtle, sandhill crane, sora, yellow-headed blackbird, king rail, Virginia rail, pied-billed grebe, great egret, great blue heron, muskrat, meadow jumping mouse

Glacial Lakes - lake chubsucker, grass pickerel, warmouth, bowfin, blackstripe topminnow

Streams - American brook lamprey, American eel, stoneroller, suckermouth minnow, brassy minnow, creek chubsucker, lake chubsucker, freckled madtom, trout-perch, starhead topminnow, bluntnose darter, least darter, southern redbelly dace, speckled chub, pugnose minnow, slender madtom, mottled sculpin, rainbow darter

Beach & Panne/Dune - plant-host specific insect species, Olympia marblewing, Blanchard's cricket frog, eastern tiger salamander, meadow vole, meadow jumping mouse, least weasel, migratory shorebirds and raptors

Recreational Opportunities

Opportunities for recreation are outstanding due to the extensive acreage of publicly owned lands and the numerous programs offered by State, Regional, County and municipal Forest Preserve and Park District, including: birdwatching, guided nature hikes, canoe outings, river clean ups, stewardship opportunities, other passive wildlife and plant observations, “citizen scientists” data collection and restoration opportunities, biking, cross country skiing, canoeing, kayaking, and nature photography. Although hunting is limited in many areas, waterfowl hunting, trapping and deer hunting is excellent in some counties.

Angling opportunities are outstanding, with Lake Michigan, Chain-O-Lakes, other State Lakes, and the numerous Park and Forest Preserve District waters. One particularly good opportunity is larger river angling for smallmouth bass, walleye, sauger, channel catfish, flathead catfish, and white bass. Due to extensive public holdings and easy access along the major rivers wading and bank fishing opportunities are excellent.

Educational/Interpretive

Illinois Department of Natural Resources: Volo Bog, Illinois Beach State Park, Tri-County State Park, Chicago Urban fishing program

Forest Preserve Districts and County Conservation Districts: Cook, DuPage, Lake, Kane, Will, McHenry, Boone, DeKalb, and Winnebago Counties all have interpretive facilities, various special events (National Public Lands Day), volunteer programs, and some have wildlife rehabilitation centers.

Museums, Zoos, Botanical Gardens, Universities: Field Museum of Natural History, Chicago Academy of Science, Shed Aquarium, Brookfield Zoo, Lincoln Park Zoo, Chicago Botanic Garden, Morton Arboretum (research, special events, volunteer opportunities)

City of Chicago and a multitude of Park Districts sponsor major events and provide urban volunteer projects in environmental stewardship.

Natural Resource Commodities

Guided waterfowl hunting, especially for Canada geese

Conservation Opportunity Areas

Crow's Foot Marsh - Coon Creek - Kishwaukee River

In 2002, The Boone County and the McHenry County Conservation Districts formed a partnership with the Illinois Department of Natural Resources to develop a conservation initiative aimed at preserving and enhancing habitat along the high quality Kishwaukee River and its' tributary, Coon Creek. Initial effort is focused on conservation of open space – farms, wildlife habitat, and water resources – through easements, incentive based programs or acquisition with willing participants or sellers. The feasibility study looked at a total area of about 16,500 acres. The study area includes portions of both the Kishwaukee River watershed and the Coon Creek watershed. The Kishwaukee River watershed has been identified as a "Unique Aquatic Resource" or class "A" stream. This area includes habitat for at least four state threatened species of birds and six endangered species of birds.

Funding: Illinois Clean Energy Community Foundation, Open Land Trust, Boone and McHenry County Conservation District, Natural Resources Conservation Service

Illinois Beach - Chiwaukee Prairie

The Chiwaukee Prairie Preservation Fund established a 40-year partnership to preserve and restore Chiwaukee Prairie in southeast Wisconsin. Partners include the Village of Pleasant Prairie, University of Wisconsin-Parkside, The Nature Conservancy - Wisconsin

and the Wisconsin Department of Natural Resources. Potential exists for a larger agreement to manage critical beach, dune, swale habitat across state lines with Illinois Department of Natural Resources at Illinois Beach State Park and Lake County Forest Preserve District at Spring Bluff and Lyons Woods Nature Preserves. The District Restoration Ecologist has initiated contact with the Wisconsin partners. Reintroductions of rare insects and management of federally endangered species exist.

Lake-McHenry County Wetland Complex

Protected lands - Redwing Slough, Black Crown-Marsh, Chain O' Lakes, Moraine Hills, Volo Bog, Marl Flat, Sun Lake, Nippersink, Grant Woods, Gavin Bog & Prairie, Wauconda Bog Nature Preserve, Broberg Marsh, Airstrip Marsh, Schreiber Lake Bog, Bangs Lake, Fairfield Road South Marsh, Fourth Lake Nature Preserve, Rollins Savanna and McDonald Woods Marsh

Priority resources - several rare wetland types including fens and bogs, rare wetland and grassland species—some not found elsewhere in Illinois; several hundred recently-protected acres are slated for wetland, prairie and savanna restoration

Partners - Illinois Department of Natural Resources, Forest Preserve District of Lake County, McHenry County Conservation District

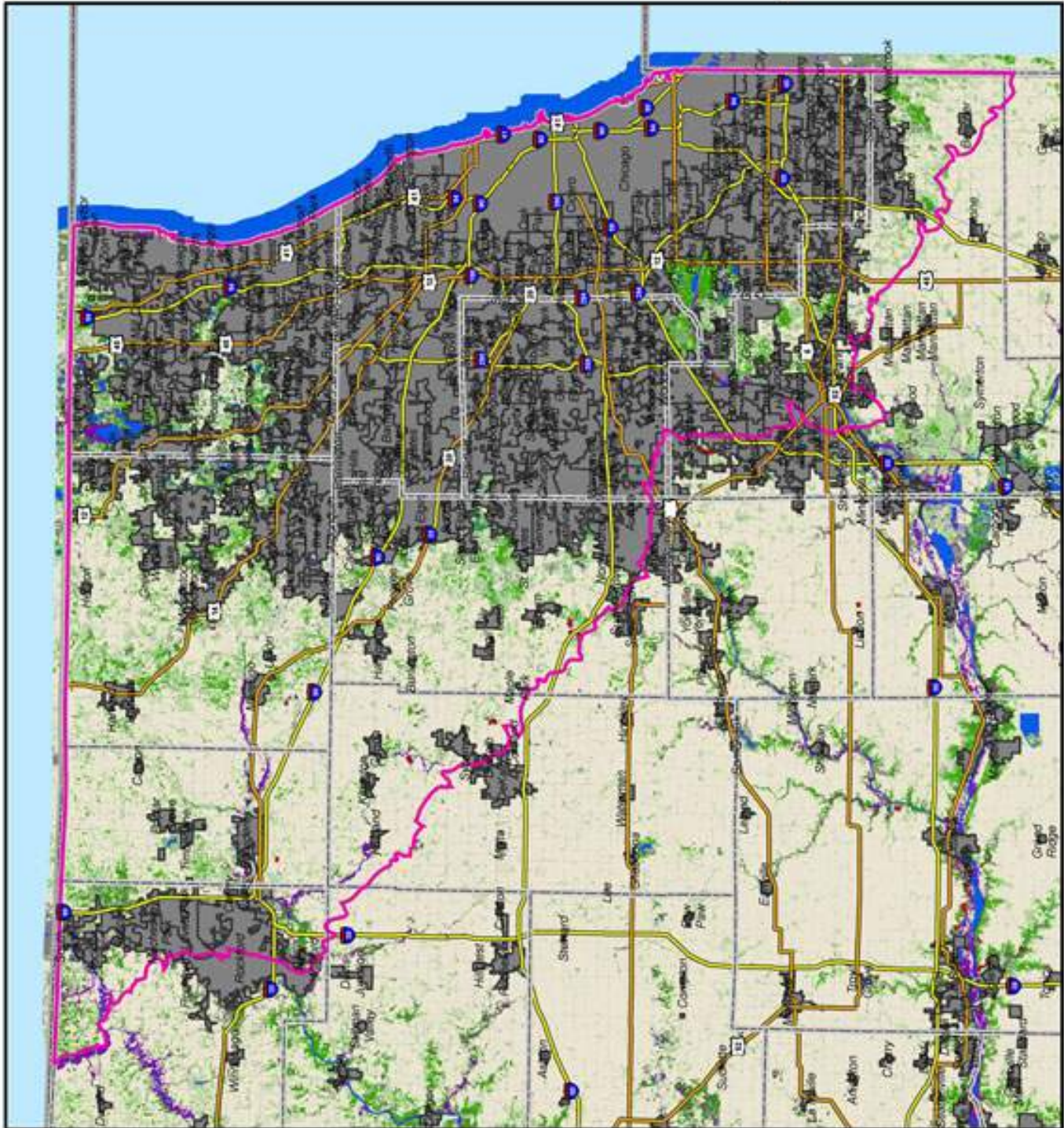
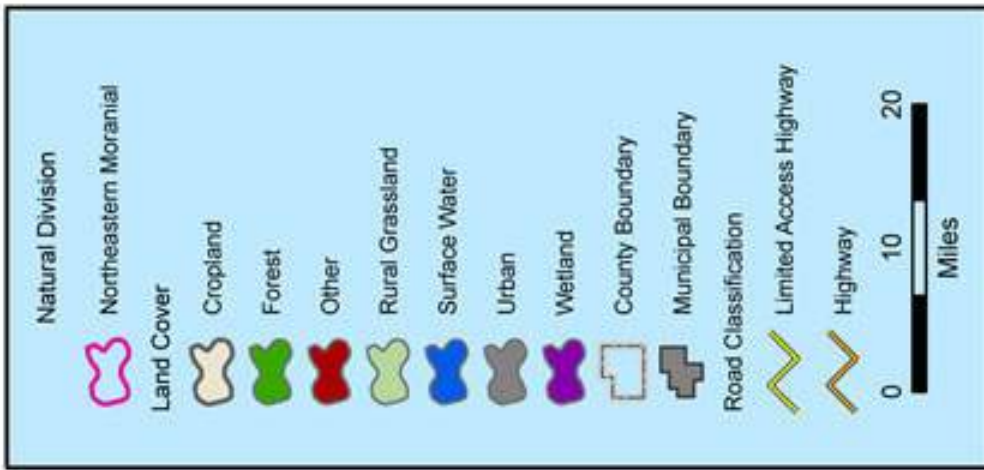
Upper Des Plaines River Corridor

Protected lands: Van Patten Woods, Wadsworth Savanna Nature Preserve, Wetlands Demonstration Site, Gurnee Woods

Priority resources - Des Plaines River, wetland, sedge meadow, and savanna habitat; several threatened/endangered species, migratory birds

Conservation opportunities - Large areas are available for wetland, savanna, sedge meadow and floodplain forest restoration occur within this complex.

Contributors: Maggie Cole, Jim Anderson (Lake County Forest Preserve District), Ed Collins (McHenry County Conservation District), Roy Domazlicky, Tom Gargrave, Frank Jakubizek, Dan Kane (Boone County Conservation District), Dan Kirk, Dan Ludwig, Chris Mulvaney (Chicago Wilderness), Erik Neidy (Forest Preserve District of DuPage County), Deb Nelson, Steve Pescitelli, David Robson (Will County Forest Preserve District), Kim Roman, Vic Santucci, Wayne Vanderploug (Forest Preserve District of Cook County)



IV. H. The Ozark Natural Division

Characteristics

The Ozark Natural Division, the part of the Ozark uplift that extends into extreme southwestern Illinois, is partially unglaciated and partially glaciated hill country that is mostly forested with many hill prairies interspersed amongst them. It is divided into three sections: Northern, Central, and Southern. The northern part of the division has an underlay of pure limestone, which is replaced in the southern part with cherty limestone that is more resistant to erosion. Underlying the central part of the division is sandstone. There are bedrock outcrops in all three sections of the division, and cave/sinkhole features are more numerous in the limestone portion of the north and less in the south. Glaciation occurred in the Central and part of the Northern sections, but none in the Southern. Topography of this division comprises a mature dissected plateau with steep bluffs along the Mississippi River, with ravines and stream canyons throughout. Deep loess soils in the Northern and Central sections make up much of the hill prairie and rock outcrop areas along the river bluffs and interior ravines. Much of the soils in the Southern Section are acidic.

Presettlement condition of this division was mostly forested, with loess hill prairie openings in the Northern Section along the river bluffs. The Ozark Division contains several Ozarkian, southern, and southwestern plant and animal species that are rare or absent elsewhere in the state, such as plains scorpion, spring cavefish, eastern narrow-mouthed toad, coachwhip, and northern flat-headed snake. Aquatic habitats of this division are few, but are represented by sinkhole ponds, springs, and creeks.

Major Habitats & Challenges

Forests - oak and hickory regeneration, overuse from recreational such as off-road vehicles and all-terrain vehicles, land clearing and fragmentation for suburban and exurban development, seed deposition and invasion by woody exotic plants such as bush honeysuckle and autumn

olive, lack of fire to scarify hardwood nuts and prevent invasion of sugar maple, and overgrazing by some livestock and abundant deer populations which negatively affect forest composition and destroy rare plants

Open Woodlands/Savannas/Barrens -

uncontrolled invasion of woody species, closing the grassy openings; lack of fire to maintain barrens communities; overuse from recreational such as Off-road vehicles and all-terrain vehicles can severely erode the shallow soils; invasion and seed deposition by woody exotic plants such as autumn olive

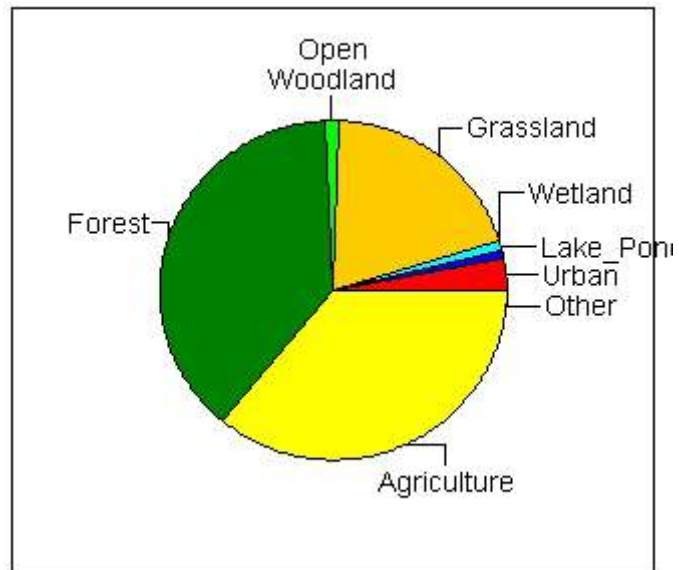
Grasslands (hill prairies) - invasion by native woody species (red cedar, smooth sumac, and gray dogwood), closing hill prairie

openings and sterilizing underlying grass seedbanks; lack of fire to maintain fire-climax communities; invasion and seed deposition by exotic plants such as autumn olive and sweet clover

Lake & Ponds (sinkholes) - sinkhole ponds in the Ozark Division feed the numerous cave systems with groundwater; intentional filling, use as garbage dumps, and inadequate buffers between sinkholes and agricultural fields reduce this habitat, contribute to sedimentation, and contaminate groundwaters

Streams - springs and creeks in the Ozark Division are stressed by impaired water quality (pollution & herbicide runoff), sedimentation, development, and destructive alteration by illegal off-road vehicle and all-terrain vehicle use

Land Cover of the Ozark Natural Division



Caves - sinkhole dumping and groundwater contamination (see above), disturbance to sensitive fauna such as bats during hibernation months, vandalism to underground structures such as stalagmites and stalagmites, reduction of natural quality by graffiti, garbage and trash left behind by visitors, and quarry/mining operations

Primary communities (cliffs, bluffs, glades) - mining/quarry operations along the Mississippi River limestone bluffs, development of cliff top areas into residential areas (driven by proximity to St. Louis metro area), lack of fire to maintain glades communities, encroachment of native woody species such as red cedar, and invasion and seed deposition by exotic plants such as sweet clovers and cool-season grasses

Opportunities

This natural division has a large amount of loess hill prairies in a long corridor along the Mississippi River bluffs from southern St. Clair to northern Randolph counties, sporadically in Jackson and Union counties. There already has been a significant amount of this fragile natural community type enrolled in protection programs through the Illinois Nature Preserves Commission field preservation specialist within that corridor, both with private, public, and corporate landowners. Active management of these hill prairies by Illinois Nature Preserves Commission and Illinois Department of Natural Resources staff has been received well by local landowners, who have shown interest in preserving this natural community on private land.

This division boasts the largest amount of karst topography in the state. Much public awareness has occurred in protecting cave ecosystems both above ground and below. Many amateur speleological groups have offered to map several of the cave systems free of charge to the state. There has been a willingness of landowners to protect the karst communities by enrolling their land in protection programs offered by the Illinois Nature Preserves Commission and Illinois Department of Natural Resources. Local offices of the Natural Resources Conservation Service and Soil & Water Service have assisted in educating landowners of the need for buffers between cropland and sinkhole ponds.

Large areas of dry upland and mesic upland forest exist atop the Mississippi River bluffs and along the backside of the loess hill prairies, limestone ledges, and glades/barrens within the Ozark Division. Illinois Nature Preserves Commission and Illinois Department of Natural Resources staff are working to reduce fragmentation, and surrounding private forest is being included in large management areas to facilitate management with prescribed fire.

Various state and federal programs assist landowners in protecting caves (sinkholes) from sedimentation and pollution, improving timber stands, retiring environmentally-sensitive croplands, and restoring and managing grasslands. Lease-hunting may prevent or delay residential development, but complicates access issues.

Management Guidelines

Landscapes

Forests - Increase forest cover by at least 10,800 acres. Forested blocks of at least 500 acres should be inventoried and prioritized for addition or linking to other forests blocks. Encourage sound management practices to promote healthy upland forests through landowner education/assistance, prescribed burning, timber stand improvements, and exotics control (mechanical, chemical, or fire). Controlling deer herds in upland forests is an issue to address.

Open Woodland/Savanna/Barrens - Increase open woodland, savanna, & barrens by at least 7,500 acres. Pro-actively manage existing habitat that is not already in a management agreement or long term protection program – several blufftop glades and barrens could be targeted. Encourage sound management practices to maintain and increase the extent of natural savannas and barrens through landowner education and assistance, prescribed burning, selective woody encroachment removal and exotics control (mechanical, chemical, or fire). Law enforcement assistance should be given to landowners who wish to curb illegal all-terrain/off-road vehicle use in these shallow soil areas.

Grasslands - Encourage sound management practices to maintain and increase the extent of hill prairies to historic boundaries through landowner education and assistance,

prescribed burning, selective woody encroachment removal and exotics control (mechanical, chemical, or fire). As with savannas and barrens, illegal all-terrain/off-road vehicle use in these shallow soil, steep aspect areas should be discouraged, and law enforcement assistance given to landowners who wish to have it.

Lakes & Ponds - Pro-actively manage sinkhole ponds exists that are not already in a management agreement or long term protection program. Encourage sound management sinkhole practices with landowners thorough education and assistance, creating buffer areas around the edge of sinkhole ponds with respect to herbicide application and soil disturbance, and discouraging trash dumping in these ponds. Restore amphibian breeding ponds in these sinkholes to reduce harmful parasitic insect populations.

Streams - Encourage sound management practices to maintain and upgrade the quality of streams through landowner education and assistance, adjacent buffer and riparian corridors to filter herbicide runoff, correcting degradation caused by sedimentation, development, and illegal off-road/all-terrain vehicles.

Caves - Encourage sound management practices to maintain and reduce degradation of cave systems through landowner education and incentives, promotion of cave gates with enrollment into a long term protection program to minimize disturbance to these fragile ecosystems – while also protecting sensitive cave fauna and reducing vandalism to subterranean cave features. Create mapping efforts with local speleological societies for unmapped caves. Work with quarrying companies to enroll their property in long term protection plans and publicly promote their stewardship efforts. Protect recharge areas for caves that provide habitat for Illinois cave amphipod and other listed troglobytic species.

Primary Communities - Encourage sound management practices to maintain these extremely sensitive natural areas through landowner education and assistance, enrollment of qualifying properties into long term protection plans, prescribed burning, selective woody encroachment removal and exotics control (mechanical, chemical, or fire). As with savannas, barrens, grasslands, and streams, illegal all-terrain/off-road vehicle use in these shallow soil,

steep aspect areas should be discouraged and law enforcement assistance given to landowners who wish to have it. Equestrian use of these areas should also be discouraged to avoid more erosion. As with caves, work with quarrying companies to enroll their property in long term protection plans and publicly promote their stewardship efforts.

Natural Communities

Dry upland forest, mesic upland forest, floodplain forest, loess hill prairie, sinkhole ponds, terrestrial and subterranean caves, bluffs, cliffs, limestone glades, and sandstone glades

Critical Species

Illinois cave amphipod, plains scorpion, spring cavefish, northern blacktail shiner, eastern narrowmouth toad, eastern coachwhip, Great Plains rat snake, flathead snake, scarlet snake, timber rattlesnake, hooded warbler, ovenbird, worm-eating warbler, and Indiana bat. Distinctive plant species include reticulate-seeded spurge, stiff bedstraw, Missouri black-eyed susan, small heliotrope, Harvey's buttercup, large-flowered rock-pink, Bradley's spleenwort fern, black spleenwort, shortleaf pine, azalea, and big-leaf snowbell-bush.

Emphasis Game Species

White tailed deer, wild turkey, eastern cottontail, northern bobwhite, gray and fox squirrels, raccoon, mourning doves, largemouth bass, black and white crappie, bluegill, redear sunfish, spotted bass, and channel catfish

Non-game Indicator Species

Forest - bobcat, red bat, woodpeckers, Carolina chickadee, Carolina wren, eastern box turtle, spring peeper, chorus frog, gray tree frog, spotted and smallmouth salamanders, copperhead

Open Woodland/Savanna/Barrens - fence lizard, skinks, eastern hognose, copperhead, ringneck, and red milk snakes

Grassland - loggerhead shrike, American and Fowler's toads

Caves - cave and longtail salamanders, pickerel frog, cave amphipods, bats

Recreational Opportunities

Upland and forest game hunting, trapping, fishing, hiking, wildlife observation, biking, caving, scenic roadways, and limited equestrian use. With the extensive bluff line tops raising some 350 feet above the adjacent floodplain, the division offers dramatic vistas of the Mississippi River bottoms.

Educational/Interpretive

The Fults Nature Preserve is a registered National Natural Landmark. Portions of the southern section are U.S. Forest Service property, with some distinction between National Natural Landmarks and Research Natural Areas. State sites include Fults Nature Preserve, Fogelpole Cave, Illinois Caverns, Randolph County Conservation Area, and Piney Creek Ravine Nature Preserve. Ft. Kaskaskia Historic Site, on the bluffs, hosts special events.

Natural Resource Commodities

Forest products, hunting opportunities, and nature-based tourism

Conservation Opportunity Areas

Hill Prairie Corridor

Protected lands - Fults Hill Prairie Nature Preserve, Pine Hills Annex Hill Prairie, Piney Creek Ravine Nature Preserve, several privately-owned land & water reserves, nature preserves, and natural heritage landmarks

Priority resources - hill prairies and associated species

Conservation philosophy - restore, maintain and protect the fragmented hill prairies that exist on these areas to prevent their closing in by woody encroachment; protect and proactively manage for the unique flora and fauna native to these blufftop ecosystems; use sound management decisions guided by historical conditions

Objectives - expand boundaries of hill prairies to historical extent; enroll unprotected hill prairies and critical habitats for endangered/threatened species into long term protection plans; generate funding for biologist positions to provide personnel needed to proactively manage these blufftop communities

Priority actions - use prescribed burning to manage the fire climax communities of hill prairies, glades, barrens, and upland forests; permanent protection of available parcels of high quality community types; create connection of the hill prairies system along the Mississippi River bluffs from Dupo to Prairie du Rocher

Partners - Illinois Department of Natural Resources, blufftop protection groups

Conservation resources - C2000 grants, Wildlife Preservation Fund, Wildlife Habitat Incentives Program, Natural Areas Acquisition Fund

Research, monitoring & evaluation - research and management can be conducted by Illinois Department of Natural Resources, Southern Illinois University (Carbondale and Edwardsville campuses), Southwest Illinois College, and the Illinois Natural History Survey

Sinkhole Plain

Protected lands - Fogelpole Cave Nature Preserve, Illinois Caverns State Natural Area

Priority resources - sinkhole ponds, caves

Conservation philosophy - maintain and protect in perpetuity the karst topography and underlying subterranean ecosystems; protect and proactively manage for the unique flora and fauna native to these cave ecosystems; use sound management decisions guided by historical conditions

Objectives - enroll unprotected cave systems and critical habitats for endangered/threatened species into long term protection plans; generate funding for biologist positions to provide personnel needed to proactively manage these communities

Priority actions - establish buffers around sinkholes and critical groundwater recharge areas to protect water quality; increase education and technical assistance for protection of sinkhole and cave habitat

Partners - Sinkhole Plain Ecosystem Partnership (defunct), karst working groups, Natural Resources Conservation Service

Conservation resources - C2000 grants, Wildlife Preservation Fund, Wildlife Habitat Incentives Program, Natural Areas Acquisition Fund

Research, monitoring & evaluation - research and management can be conducted by Illinois Department of Natural Resources, Southern Illinois University (Carbondale and Edwardsville campuses), Southwest Illinois College, and the Illinois Natural History Survey

LaRue - Pine Hills - Western Shawnee - Trail of Tears

Protected lands - Pine Hills Ecological Area/Research Natural Area, LaRue Ecological Area/Research Natural Area, Ozark Hills Nature Preserve

Conservation philosophy - Maintain connectivity among Ozark, Shawnee Hills and Lower Mississippi River Bottomlands Natural Divisions with riverine, swamp, bottomland

forest, bluff, and upland forest, glade and barrens communities; protect and proactively manage for the unique flora and fauna native to these ecosystems; use sound management decisions guided by historical conditions

Priority Resources (Pine Hills, Shawnee) - glades, barrens, large forest tracts, Neotropical migratory birds

Objectives - restoration and management of a forest >50,000 acres; enroll unprotected critical habitats for endangered/threatened species into long term protection plans; proactively manage natural communities

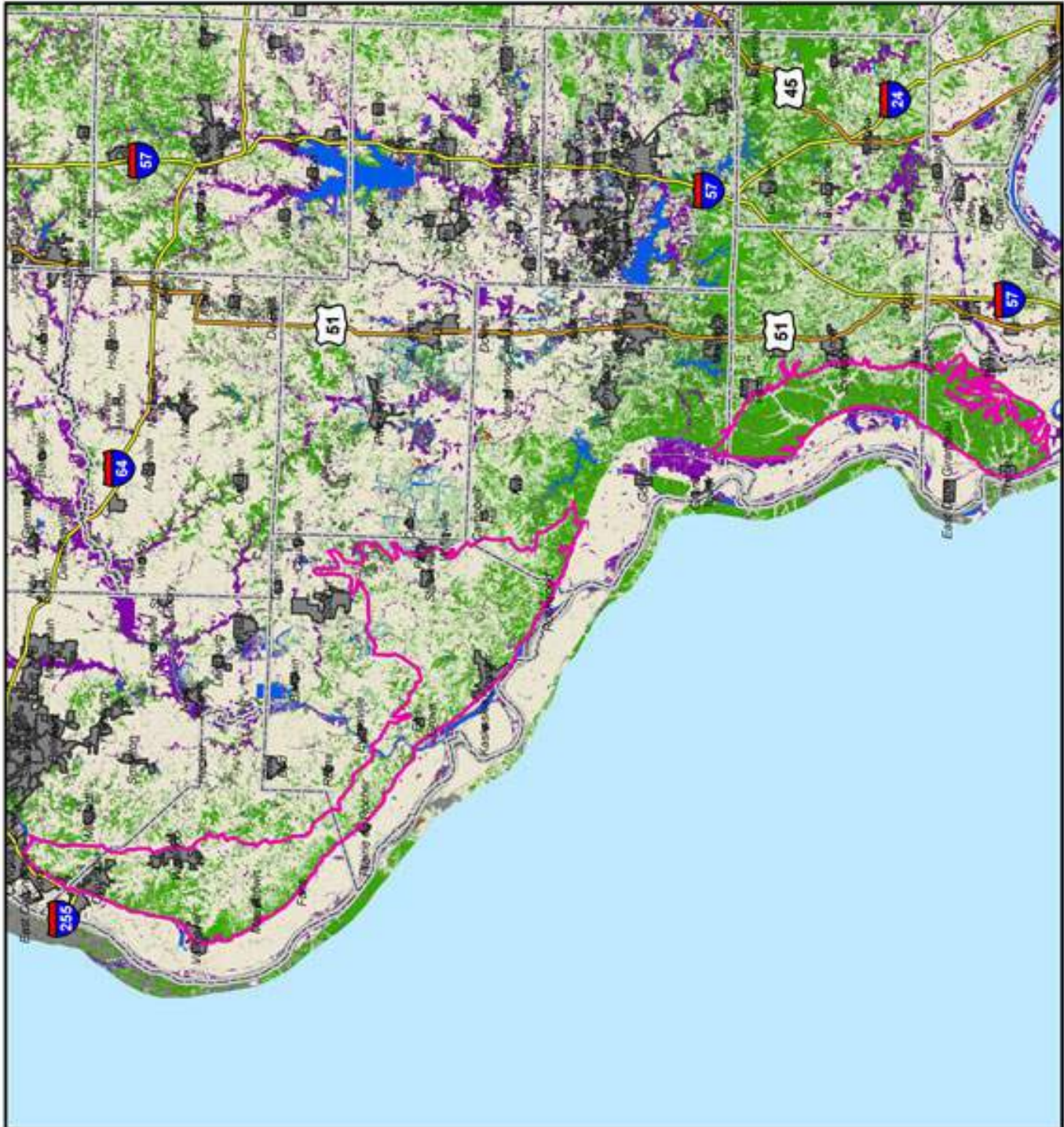
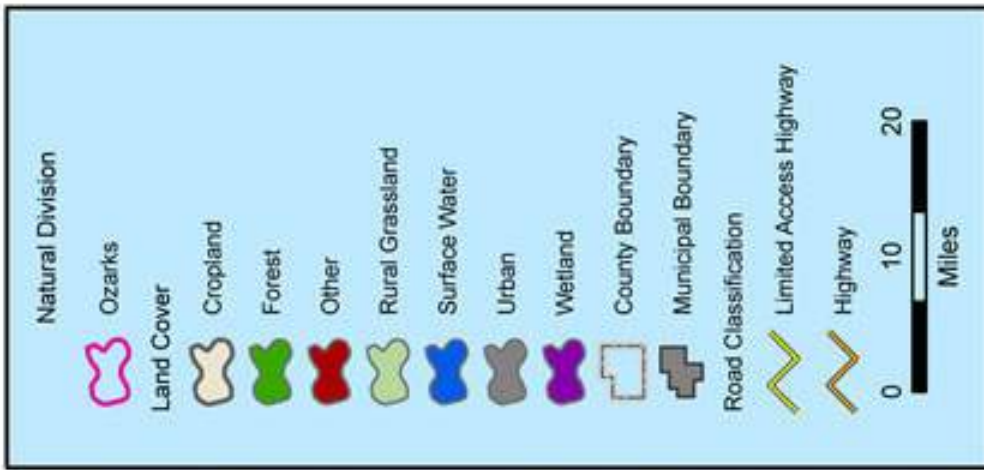
Priority actions - use prescribed fire to manage fire climax communities of glades, barrens, and upland forests; permanent protection of high quality community types; reforestation to create larger patches

Partners - Illinois Department of Natural Resources, U.S. Forest Service, The Nature Conservancy

Research, monitoring & evaluation - research and management can be conducted by Illinois Department of Natural Resources, Southern Illinois University (Carbondale and Edwardsville campuses), Southwest Illinois College, and the Illinois Natural History Survey

* See also *Lower Mississippi River Bottomlands* and *Shawnee Hills* natural divisions

Contributors: Scott Ballard, Brian Mahan



IV. I. The Rock River Hill Country Natural Division

Characteristics

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.

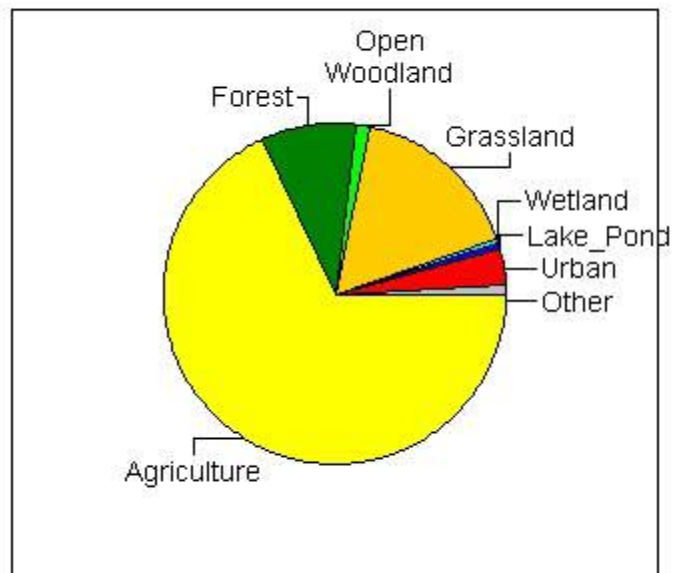
Major Habitats & Challenges

Forests – fragmentation (patches small and isolated), invasion by exotic species, excessive deer browse, housing development, clearing of riparian forest

Open Woodland/Savanna – improper grazing, lack of fire, housing developments

Grasslands – fragmentation, conversion to agricultural production, dominated by exotic species, loss of small dairy farms is reducing hay and pasture land use

Land Cover of the Rock River Hill Country Natural Division



Wetlands – Most wetlands are found along Pecatonica River and most are farmed. groundwater alteration from commercial development, diversion of streams/runoff from wetlands

Lakes & Ponds – Most are human-made and suffer from sedimentation and the impacts of runoff.

Streams - increase in pollutants (sediment, nutrient, thermal, bacterial) causing loss of biodiversity, channelization, clearing of riparian vegetation

Caves - accelerated flow of runoff

Primary Communities - housing developments, quarries

Opportunities

The natural division is served by the Sugar-Pecatonica Ecosystem Partnership of the C2000 Program. Efforts to protect bottomland forests along the Pecatonica River can be expanded, and donations of conservation easements on private forest lands should be promoted. Cooperation with the Illinois Department of Transportation will restore habitat on the U.S. Highway 20 by-pass right-of-way.

Grassland is the most prevalent habitat in the division, much of it in the Conservation Reserve Program. Dominated by smooth brome, improved management and composition is needed to provide quality wildlife habitat. The Prairie Preservation Society of Ogle County works to protect natural areas and remnant prairies. Restoration of degraded open woodland and savanna has high potential with proper use of grazing, prescribed fire and removal of invasive plants.

Management Guidelines

Landscapes

Forest - Increase by about 14,400 acres. Forested blocks of at least 500 acres should be inventoried and prioritized for addition or linking to other forests blocks. Expand and improve bottomland forest habitat. Encourage sound management practices to promote healthy upland forests through landowner education/assistance, prescribed burning, timber stand improvements, and exotics control (mechanical, chemical, or fire). Forests should grade into open woodland or savanna habitats on adjacent uplands.

Open Woodland/Savanna/Barrens - Increase by about 15,000 acres. Pro-actively manage existing habitat and restore degraded habitats with prescribed fire, proper grazing, and exotic species control (mechanical, chemical, or fire). Savanna or open woodland habitats should be encouraged in isolated woodlots under 15 acres in size.

Grassland - Increase by about 52,000 acres. Manage rural grasslands for diverse structure and composition with prescribed fire, proper grazing, soil disturbance, and invasives control (mechanical, chemical, or fire) to support native species. Establish grassy buffers and terraces to reduce agricultural runoff and erosion from construction sites into waterways.

Wetland - Increase by 1,500 acres. Establish buffer between wetlands and adjacent agricultural land to prevent herbicide runoff and sedimentation.

Natural Communities

Dolomite prairie, groundwater fed wetlands (fens), white pine groves, dolomite cliff communities (Pine Creek)

Critical Species

Brook trout, timber rattlesnake, red-shouldered hawk, bald eagle, sandhill crane, red-headed woodpecker, cerulean warbler, sedge wren, American redstart, Bell's vireo, Blanding's turtle, northern harrier, short-eared owl, Franklin's ground-squirrel, river otter, endangered prairie species limited to dolomite prairie, redroot, star flower

Emphasis Game Species

Walleye (Rock River), brown trout (cold-water streams), northern bobwhite, white-tailed deer, wild turkey

Non-game Indicator Species

Forest - red-eye vireo, scarlet tanager

Open Woodland/Savanna - tufted titmouse, great crested flycatcher, red-headed woodpecker, Cooper's hawk

Grassland - western meadowlark

Wetland - willow flycatcher

Streams - spotted sandpiper, mussels

Recreational Opportunities

Hunting (forest game, upland game, furbearers), trapping, fishing (including native and naturalized trout), hiking, wildlife viewing

Educational / Interpretive

Burpee Natural History Museum, Camp Benson, Boy/Girl Scout Camps, Park District & Forest Preserve District sites, Jane Addams Land Foundation/Parkland Trail, Audubon Societies, Prairie Preservation Society of Ogle County, Sand Bluff Bird Observatory, Wildflower Walkabouts, numerous nature centers

Natural Resource Commodities

Forest products, hunting/fishing opportunities, nature-based tourism

Conservation Opportunity Areas

Sugar-Pecatonica River

Protected lands - Winnebago County forest preserves, Rock Cut State Park

Priority resources - high quality stream, wetlands

Partners - Winnebago County Forest Preserve District, Sugar-Pecatonica Ecosystem Partnership, The Natural Land Institute, Illinois Department of Natural Resources

Nachusa-Franklin Creek-Castle Rock-Lowden Miller

Protected lands - Nachusa Grassland, Franklin Creek Natural Area, Castle Rock State Park, Lowden-Miller State Forest, White Pines Forest

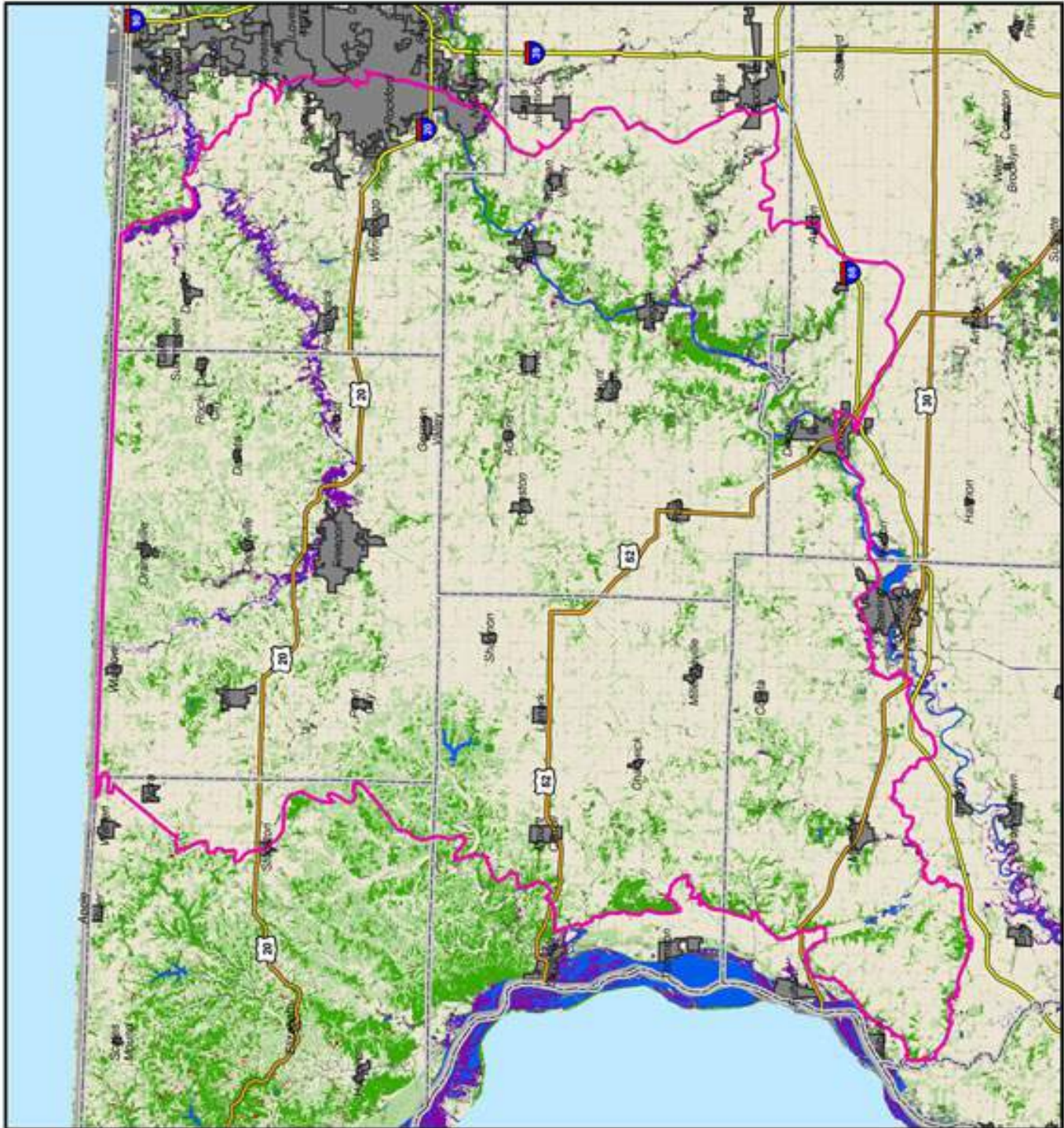
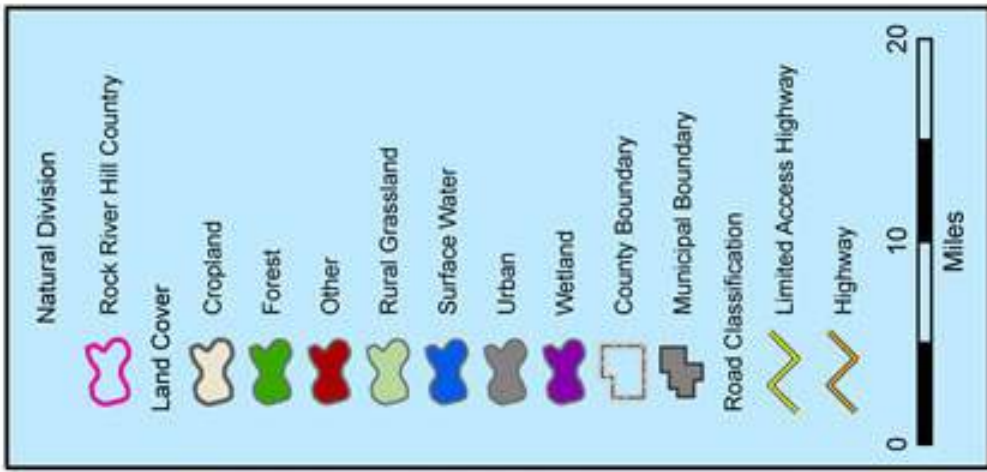
Priority resources - Nachusa Grasslands, over 2,500 acres of prairie remnants and restorations, is one of the largest remaining prairie landscapes in Illinois. The forested area along the Rock River at Castle Rock and Lowden Miller is the largest forest in the region, and hosts a highly diverse nesting community of Neotropical migratory birds.

Partners - The Nature Conservancy, Illinois Department of Natural Resources

Rock River

Priority resources - high quality stream

Contributors: Rick Lawrence, Jerry Paulsen



IV. J. Regional Assessment of the Shawnee Hills Natural Division

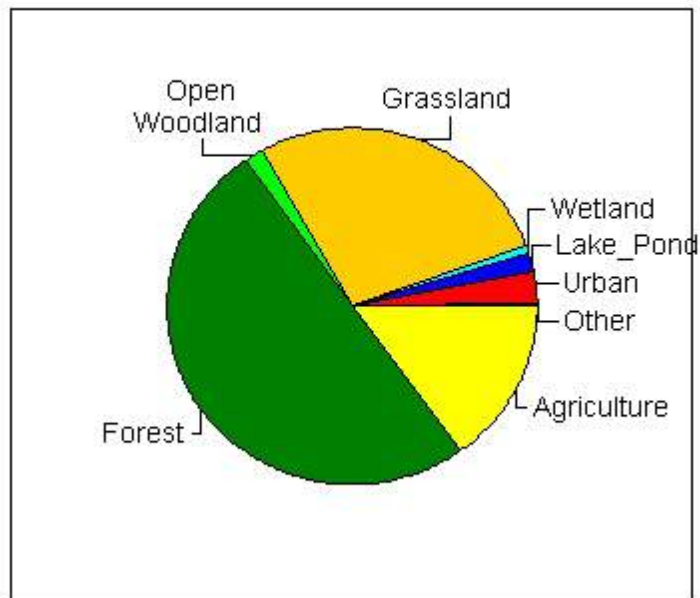
Characteristics

The Shawnee Hills Natural Division in the southern tip of Illinois is unglaciated hill country characterized by ridged uplands with many cliffs and deeply dissected valleys. Cuesta Ridge of the northern Shawnee Hills extends from the Mississippi River to the Ohio. The steep south facing escarpment is nearly in the middle of the division and separates the land to the north known as the Greater Shawnee Hills and the hills to the south which average 200 feet lower, known as the Lesser Shawnee Hills. Cave and sinkholes are locally common in the division. Presettlement vegetation was mostly forest with some prairie vegetation contained in glades and barrens. At present this natural division is the most heavily forested in the state and hosts some of the most outstanding biodiversity.

Major Habitats & Challenges

Forests - lack of oak regeneration; oak decline; potential infestation of European gypsy moth; overuse from recreation; land clearing and fragmentation for exurban development; invasion by *Microstegium viminium* could affect regeneration; other exotic plants (including Japanese and bush honeysuckle); lack of fire management leading to composition change; poorly planned logging continues to be a threat to healthy forests; overgrazing by livestock and abundant deer populations are affecting forest composition and destroying rare plants in some localities

Land Cover of the Shawnee Hills Natural Division



Open Woodland/Savanna/Barrens - lack of fire management leading to invasion by mesophytic species of trees and shrubs

Grasslands - no large, contiguous natural grasslands exist; lack of diversity of species, succession and exotic plants (autumn olive, fescue, sericea lespedeza) are threats to Conservation Reserve Program and U.S. Forest Service-managed grasslands

Lakes and Ponds - bank erosion; sedimentation; possible future exotics problem (e.g., curly leaved pond weed)

Streams - inadequate riparian buffers in some areas; exurban development; sedimentation; pollution (mainly non-point agricultural)

Caves - sinkhole dumping and ground water contamination; inappropriate, repetitive disturbance during visitation, along with vandalism; quarry and mining operations

Primary Communities - increases in recreational climbing threatens cliff habitats by creating bolted routes which are used repetitively, destroying plants on the cliff face; glades are shading in due to encroachment of more mesophytic woody plants such as eastern red cedar, in some locations exotic species are a major threat such as sweet clover; sandstone glades are often used as trail corridors for equestrians due to the scenic nature of their placement on the landscape

Opportunities

This natural division has the largest concentration of forested habitat and the most extensive area of upland oak-hickory forest in the state. It also has over 180,000 acres of public land with many large tracts. Opportunities exist for the creation of larger, more contiguous forest blocks of habitat which would be more suitable for recruitment of Neotropical migratory songbirds. Landscape scale management becomes a viable goal given the significant land base and the ability for land management agencies to pool resources and form

partnerships. Many acres of public land are already in large tracts which could with relatively few additions be linked to form macrosites. Ecosystem Partnerships cover most of the division which could help facilitate greater cooperation and involvement by private landowners in landscape scale management. There is already a high level of interest and participation in Illinois Department of Natural Resources and U.S. Department of Agriculture conservation programs among private landowners.

A 1997 study indicated suitable habitat was available for reintroducing elk to the Shawnee Hills, though private property damage was likely (Buhnerkempe and Higgins 1997). Bachman's sparrows, extirpated in Illinois since about 1980, have been found nesting in western Kentucky, less than 100 miles from Illinois. Restoration of barren and glade habitat may facilitate natural recolonization of Illinois by Bachman's sparrows, as may climate change (Matthews et al. 2004).

Management Guidelines

Landscapes

Forest - Promote the use of forest stand improvement, prescribed burning and sound harvesting practices to increase oak regeneration and native plant diversity in upland oak-hickory forests. Increase cooperation and coordination of management activities across ownership boundaries to facilitate landscape level management. Increase forest cover by at least 22,000 acres. Forested blocks of at least 500 acres should be inventoried and prioritized for addition or linkage to other forest blocks. Restore and manage two contiguous forest blocks of greater than 50,000 acres each. Forest landscapes larger than 50,000 acres should contain at least 80% forest land cover and less than 5% cropland cover. Forests should grade into open woodland habitats on adjacent uplands.

Open Woodland/Savanna/Barren - Encourage management practices such as prescribed fire to maintain open woodlands, savannas and barrens. Set a goal for a net increase of 11,000 acres of this habitat type.

Grassland - Improve by encouraging conversion from fescue to warm season grasses, discouraging overgrazing and providing education and assistance for landowners.

Wetlands - Construct 2-3 ephemeral wetlands on public sites each year. Inventory croplands on state sites to identify lands marginal for cultivation and begin by converting these first. Begin a program to encourage landowners to construct and maintain “fishless” impoundments to benefit amphibians and dragonflies. Set a goal for 15-25 new impoundments per year on private lands.

Lakes & Ponds - Promote sound management of water, by producing educational materials for landowners which would cover runoff, pollution and siltation threats to impoundments.

Streams - Increase education efforts in areas of high development or karst topography. Widen and protect riparian areas along high quality streams. Begin restoration efforts on the Saline River and its tributaries.

Caves - Work with landowners and local volunteer groups (grotto's, etc.) to locate and map all caves and sinkholes in the division. Provide technical support and incentives for protection at biologically significant caves. Protect all significant bat hibernacula with preservation agreements and/or gating projects. Maintain 30 m vegetated buffer around caves, sinkholes, and springs. Gate appropriate bat hibernacula (caves, mine entrances), and create Indiana bat winter hibernacula in southern Illinois by opening abandoned/sealed mines.

Primary Communities - Complete inventory of cliff and shelter bluff/overhang habitats and take steps to protect these habitats on public lands and educate private landowners to the uniqueness of these rare habitats. Restoration and management of glades on public and private lands should become a priority. Efforts to work with private landowners to prevent destruction of glade habitat should be increased along with education. Elimination or relocation of recreational activities such as equestrian trails traversing glades should be a top priority.

Natural Communities

Xeric upland forest, upland oak-hickory forest, shale glades, limestone glades, sandstone glades, cliffs, shelter bluffs, barrens, caves and sinkholes

Critical Species

Alligator snapping turtle, timber rattlesnake, ruffed grouse, Bachman's sparrow, Henslow's sparrow, hooded warbler, ovenbird, worm-eating warbler, southeastern myotis, gray myotis, Indiana bat, Rafinesque's big-eared bat

Emphasis Game Species

White-tailed deer, wild turkey, gray and fox squirrel, eastern cottontail, raccoon, large-mouth bass, black and white crappie, bluegill, redear sunfish, spotted bass, channel catfish

Nongame Indicator Species

American and Fowlers' toad, black kingsnake, slimy salamander, red-bellied woodpecker, pileated woodpecker, Carolina wren, Carolina chickadee, prairie warbler, Louisiana water thrush, summer tanager, red-eyed vireo

Recreational Opportunities

Horseback riding, hunting (upland and forest game), trapping, fishing, hiking, wildlife observation, biking. All outdoor activity is unique in this natural division, considering the easy access to large blocks of public land and the opportunity for solitude in wilderness areas.

Educational/Interpretive

Portions of a National Wildlife Refuge, National Forest, four state parks, a state trail, and Dixon Springs Agriculture Center; fire/timber stand improvement demonstration areas are being developed on at least five sites.

Natural Resource Commodities

Forest products, hunting reserves/clubs/outfitters

Conservation Opportunity Areas

LaRue - Pine Hills - Western Shawnee - Trail of Tears

Protected lands - Pine Hills Ecological Area/Research Natural Area, LaRue Ecological Area/Research Natural Area, Ozark Hills Nature Preserve

Conservation philosophy - Maintain connectivity among Ozark, Shawnee Hills and Lower Mississippi River Bottomlands Natural Divisions with riverine, swamp, bottomland forest, bluff, and upland forest, glade and barrens communities; protect and proactively manage for the unique flora and fauna native to these ecosystems; use sound management decisions guided by historical conditions

Priority Resources (Shawnee) - high-quality streams, glades, barrens, large oak-hickory forest tracts, Neotropical migratory birds

Objectives - restoration and management of a forest >50,000 acres; proactively manage natural communities

Priority actions - use prescribed fire to manage fire climax communities of glades, barrens, and upland forests; permanent protection of land parcels with high quality community types; reforestation to create larger patches.

Partners - Illinois Department of Natural Resources, U.S. Forest Service, The Nature Conservancy

Research, monitoring & evaluation - research and management can be conducted by the Illinois Department of Natural Resources, Southern Illinois University (Carbondale

and Edwardsville campuses), Southwest Illinois College, and the Illinois Natural History Survey

* See also *Ozark* and *Lower Mississippi River Bottomlands* natural divisions

Eastern Shawnee

Protected lands - Shawnee National Forest

Priority resources - high-quality streams, glades, barrens, large oak-hickory forest tracts, Neotropical migratory birds

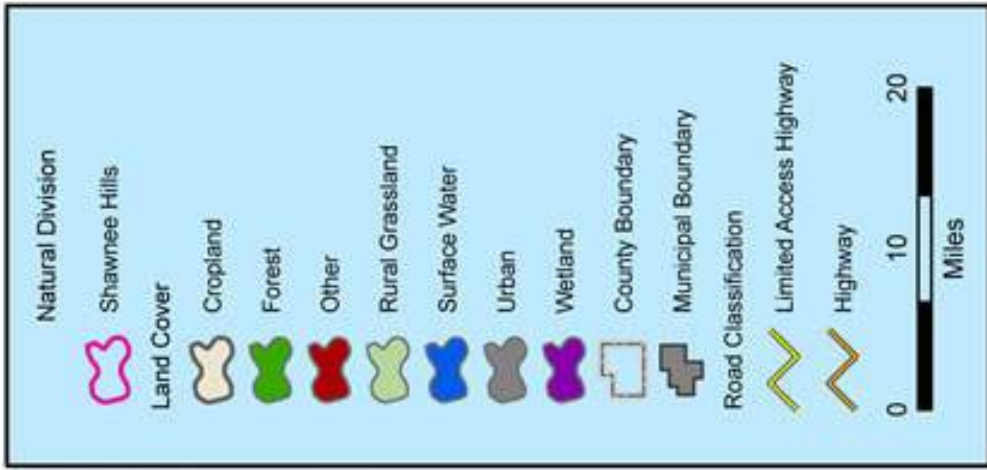
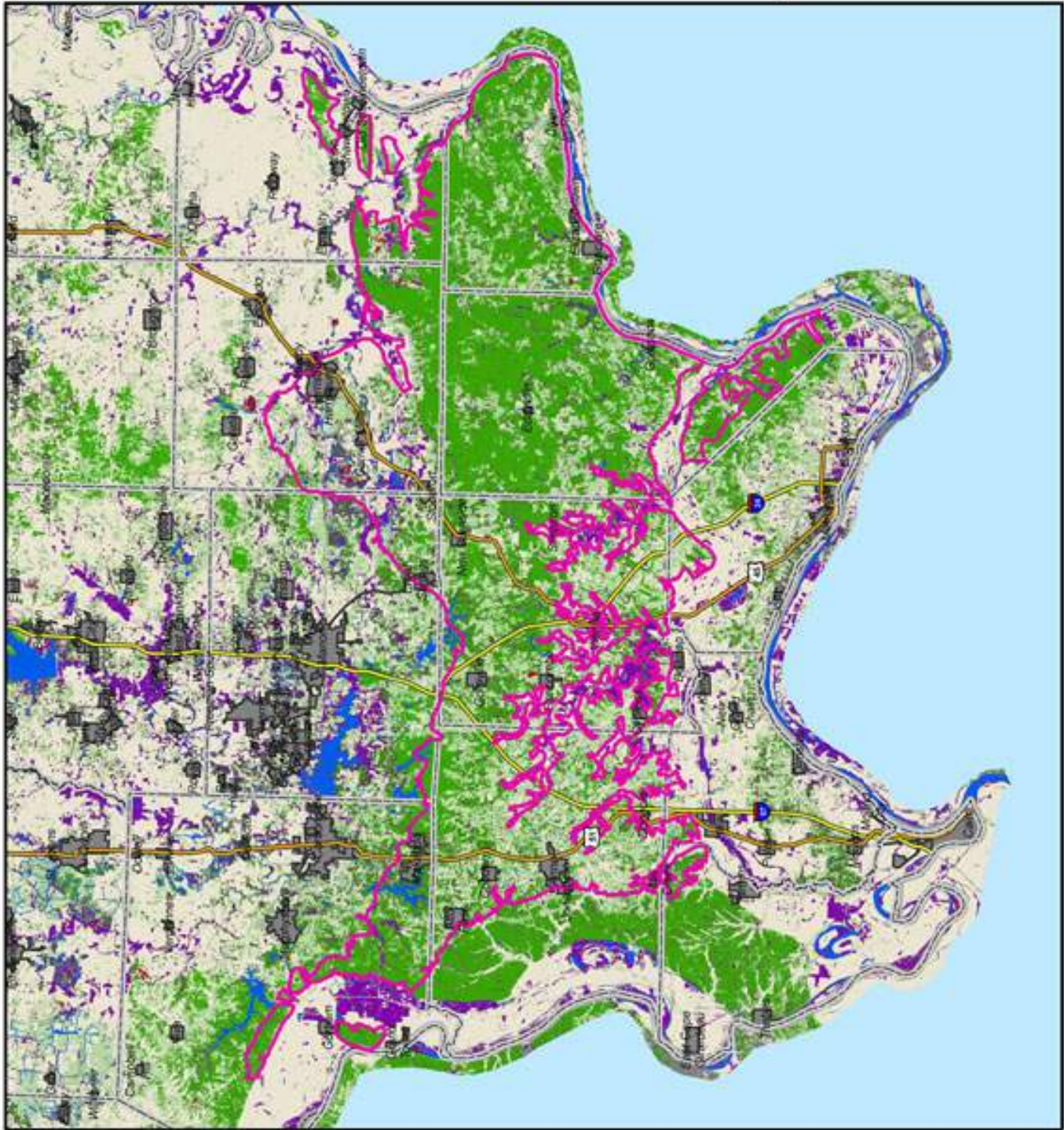
Objectives - restoration and management of a forest >50,000 acres; proactively manage natural communities

Priority actions - use prescribed fire to manage fire climax communities of glades, barrens, and upland forests; permanent protection of land parcels with high quality community types; reforestation to create larger patches

Partners - U.S. Forest Service, Illinois Department of Natural Resources, Illinois Nature Preserves Commission

Research, monitoring & evaluation - research and management can be conducted by the Illinois Department of Natural Resources, Southern Illinois University-Carbondale, and the Illinois Natural History Survey

Contributors: David Allen, Jody Shimp, Bob Lindsay



IV. K. The Southern Till Plain Natural Division

Characteristics

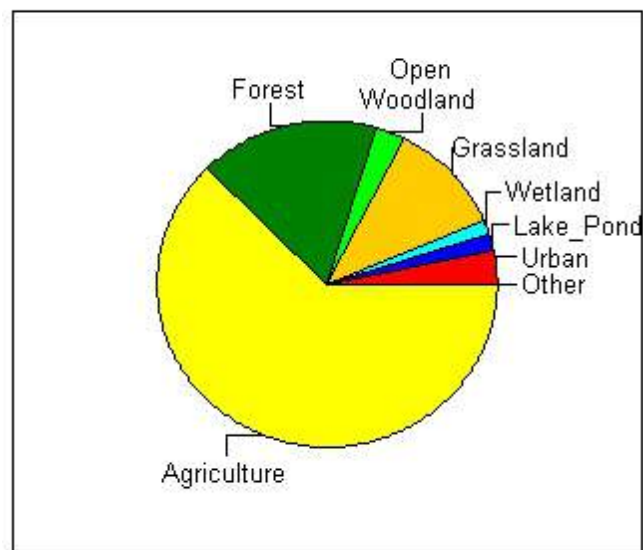
The Southern Till Plain Natural Division of south-central Illinois is a dissected Illinoisan till plain south of the terminal Wisconsinan moraine. Forest was found along streams and prairie occupied the level uplands. Although about 40% of the natural division was prairie at the time of European settlement, upland soils are largely alfisols formed under forests. These soils are relatively poor because of high clay content and frequent “claypan” subsoil. Because these soils have a comparatively light color, upland prairies here have been referred to as the “gray prairie.” Southern flatwoods is a characteristic natural community found on level uplands and river terraces. Crayfish frog, ornate box turtle and remnant populations of greater prairie-chickens are characteristic animals of the Southern Till Plain Natural Division. The division encompasses large portions of the Kaskaskia River and Big Muddy River watersheds, and tributaries to the Wabash River. Extensive areas of river floodplain and ancient glacial lakebeds were occupied by forested wetlands and some wet prairies. Upland prairies were highly interspersed in the Southern Till Plan, and many were likely quite open due to the influence of fire.

Major Habitats & Challenges

Forest - historic over-grazing, species composition, invasive species, fire suppression, fragmentation, poor timber harvest practices, changes in hydrology, exurban development

Open Woodland/Savanna/Barren - scarcity, overgrazing, succession, lack of prescribed fire, invasive species, poor timber harvest practices, exurban development

Land Cover of the Southern Till Plain Natural Division



Grassland - scarcity, fragmentation, dominance by invasive species (especially fescue), overgrazing of pasture, excessively high or low disturbance levels, low structural diversity, loss and degradation of prairie remnants; much of the grassland acreage in the division is temporary in the Conservation Reserve Program

Wetlands - scarcity, altered hydrology, dominance by invasive plants, sedimentation

Lakes and Ponds - sedimentation, nutrient loading, backwater lakes have been nearly eliminated; water level fluctuations in the reservoirs and downstream of Rend and Carlyle lakes

Streams - sediment load, incision, lack of riparian habitat, channelization; impoundment for water supply, flood control, and recreation; runoff from urban areas, livestock facilities, and coal/oil extraction

Opportunities

Large, publicly- and corporately-owned grasslands (many on reclaimed mine lands) have existing and potential wildlife benefits (Prairie Ridge State Natural Area and Pyramid State Park are Illinois Department of Natural Resources-managed examples). Large concentrations of Conservation Reserve Program grasslands occur in many areas of the natural division.

Large flood-prone areas (along Kaskaskia, Little Wabash and Big Muddy Rivers) have wetland and bottomland forest restoration potential through the Wetland Reserve Program, conservation easements and other programs. Illinois' largest concentration of bottomland forest along Kaskaskia River is known to harbor exceptional populations of birds. Large lake and wetland habitats are associated with Carlyle Lake and Rend Lake, though extreme water fluctuations at Carlyle diminish habitat quality.

Management Guidelines

Landscapes

Grasslands: Grassland management landscapes larger than 10,000 acres in the Southern Till Plain Natural Division should contain at least 40% grassland land cover (over 50% in patches larger than 160 acres) and less than 10% combined wooded and urban land covers. At least two additional Bird Conservation Areas (grasslands >3,000 acres; see Fitzgerald et al. 2000) should be established in addition to Prairie Ridge State Natural Area (both units require augmentation; see Walk 2004), and Pyramid State Park (needs management plan). An increase of 240,000 acres of grassland will support wildlife objectives. Grasslands should be managed for diverse structure and vegetation composition across the landscape with prescribed fire, proper grazing, soil disturbance, and invasive species control (mechanical, chemical). Open, treeless, upland grasslands more than 0.5 mile wide are especially important to Species in Greatest Need of Conservation.

Forest, Open Woodland, Savanna and Barren: Restore and manage broad transitions (at least 50 m) from cropland and grassland to closed upland forests using mechanical disturbances and prescribed fire. Identify degraded open woodlands, barrens and savannas, and restore with mechanical removal of undesirable vegetation, and manage with prescribed fire and proper grazing. Inventory, restore and manage all tracts of southern flatwoods of Illinois Natural Areas Inventory grade C or higher, with at least one tract >1,000 acres and at least one tract >500 acres in each the Effingham and Mt. Vernon sections. Restore and manage a bottomland forest tract of >10,000 acres in the Kaskaskia River watershed; restore and manage at least one bottomland forest tract >1,000 in the other major watersheds. Riparian wetlands and bottomland forests should be restored and managed to increase ecological connectivity and decrease fragmentation of patches larger than 500 acres, respectively. A net increase of 65,000 acres of forest and 75,000 acres of open woodland/savanna/barrens is needed to meet wildlife objectives.

Wetland: Restore 3,800 acres of backwater and wetland habitats. Ephemeral and semipermanent (fishless) wetlands associated with grasslands, flatwoods and bottomland

forests are important to many amphibians and reptiles, including crayfish frog, Kirtland's snake and eastern massasauga.

Stream: Restore riparian vegetation along 100% of streams in the natural division.

Lake & Pond: Establish aquatic vegetation on 10-20% of the littoral zone on all impoundments.

Natural communities

Southern flatwoods is largely restricted to the natural division. All of the 700 acres of high-quality remnants occur here. Dry barrens, dry-mesic prairie, dry-mesic forest, dry-mesic savanna, low gradient creeks, big river, and sandstone overhang are natural communities found here, but less commonly in other portions of Illinois.

Critical Species

Western sand darter (Kaskaskia), eastern sand darter (Embarras, Little Wabash River), gravel chub (Kaskaskia), harlequin darter (Embarras), bigeye chub (Embarras, Little Wabash, Big Muddy, Kaskaskia), bigeye shiner (Little Wabash, Kaskaskia), crayfish frog, Kirtland's snake, eastern massasauga, ornate box turtle, Henslow's sparrow, LeConte's sparrow, nelson's sharp-tailed sparrow, grasshopper sparrow, short-eared owl, upland sandpiper, red-shouldered hawk, brown creeper, northern harrier, sedge wren, yellow-billed cuckoo, northern flicker, cerulean warbler, little blue heron, willow flycatcher, least bittern, American bittern, bald eagle, yellow-breasted chat, loggerhead shrike, red-headed woodpecker, osprey, American golden-plover, king rail, American woodcock, dickcissel, field sparrow, brown thrasher, greater yellowlegs, buff-breasted sandpiper, greater prairie-chicken, barn owl, Bell's vireo, Indiana bat, marsh rice rat, golden mouse, river otter, and bobcat

Emphasis Game Species

Largemouth bass, smallmouth bass, warmouth, white bass, yellow bass, bluegill, longear sunfish, redear sunfish, rock bass, white crappie, black crappie, white catfish, blue catfish, channel catfish, flathead catfish, black bullhead, yellow bullhead, freshwater drum,

migratory waterfowl, wild turkey, northern bobwhite, white-tailed deer, eastern cottontail, swamp rabbit, beaver, fox squirrel

Nongame Indicator Species

Forest - eastern box turtle, red-eyed vireo, American redstart

Open Woodland/Savanna/Barren - red-headed woodpecker, eastern kingbird, Baltimore oriole, great crested flycatcher

Grasslands - prairie kingsnake, dickcissel, grasshopper sparrow, eastern meadowlark, field sparrow (shrub-grassland), southern bog lemming, *Microtus* species

Wetlands - willow flycatcher, migratory shorebirds, southern leopard frog, cricket frog, chorus frog, spring peeper, smallmouth salamander

Streams - paddlefish, freckled madtom, shorthead redhorse, flier, pugnose minnow, slenderhead darter, smooth softshell turtle

Recreational Opportunities

Fishing on major reservoirs (Rend, Carlyle), impoundments (Newton, Coffeen, others) and streams; waterfowl hunting (especially at Rend and Carlyle); white-tailed deer, wild turkey, northern bobwhite and mourning dove hunting; furbearer trapping & hunting; Prairie Ridge State Natural Area, Carlyle Lake, and Rend Lake are “destination” birding sites for Illinois within the natural division; large multiple-use recreation facilities at Carlyle Lake, Rend Lake, Pyramid State Park, and Ten-Mile Creek State Fish & Wildlife Area; water sport recreation on Carlyle Lake, Rend Lake; canoeing on streams & rivers; morel and ginseng hunting

Educational/Interpretive

Interpretive trails and wildlife viewing platforms on Illinois Audubon Society properties at Prairie Ridge State Natural Area (Jasper and Marion counties); U.S. Army Corps of Engineers visitors' centers, Eldon Hazlet State Park and Wayne Fitzgerald State Park at Carlyle and Rend Lakes; Illinois Natural History Survey field stations (Great Rivers-Brighton, Ridge Lake - Charleston, Sam Parr - Kinmundy); Southeastern Illinois and Carlyle Lake Birding Trail; Ballard Nature Center, Altamont; Bremer Audubon Sanctuary; White Demonstration Farm, Belleville; Southwest Illinois College Outdoor Classroom, Belleville; Heartland prairie, Alton; St. Clair County Silver Creek nature preserve, Mascoutah; Highland high School Outdoor Classroom; Washington County Storck Woods Nature Preserve; Centralia Park District; Greenville Park District; Frank Holton State Park; Washington County Conservation Area

Natural Resource Commodities

Forest products (timber, medicinal plants, foods, ornamental); Grassland products (grazing, hay); Commercial fisheries; Guided hunting and fishing (local, centered at Carlyle and Rend); Bird-watching, nature viewing (Prairie Ridge State Natural Area); Ecotourism, nature photography, carbon sequestration, soil protection/enhancement, clean air & water, improved human health & quality of life

Conservation Opportunity Areas

Prairie Ridge Landscape

Protected lands - Prairie Ridge State Natural Area (nature preserve, land & water reserve and Illinois Natural Areas Inventory parcels), Twelve-Mile Prairie (conservation easement)

Priority resources - rare and declining grassland wildlife (especially threatened and endangered birds) and grassland-wetland wildlife, remnant prairie communities

Conservation philosophy - The primary goal is development of a grassland ecosystem capable of maintaining viable populations of grassland species, including both permanent residents and migratory species, with emphasis on threatened and endangered species. A secondary goal is the development of a prairie preserve characteristic of the presettlement flora of the Southern Till Plain natural division of Illinois (from Simpson & Esker 1997).

10-Year Goals - add 500 grassland acres per year until target acreages (5,000 acres in each unit) are obtained; improve private land synergies (open space, foraging areas, brood habitat) on 500 acres near each unit within 3 years; establish three 500-acre satellite locations from year 4 to 7 of implementation (see Simpson and Esker 1997, Walk 2004)

Key Actions - Establishing additional habitat at core locations and satellites. Promoting compatible agricultural practices on adjacent private lands (managed grazing, small grains, legumes, idle/fallow areas, and field borders) with incentives and farm programs. Continually addressing grassland management/succession and invasive species (especially fescue) with methods including grazing, prescribed fire, mowing and mechanical and chemical control. Addressing management, restoration and outreach staffing/equipment/facility needs.

Partners - Illinois Department of Natural Resources, Illinois Audubon Society, U.S. Department of Agriculture - Natural Resources Conservation Service & Farm Service Agency, Ameren-CIPS, The Nature Conservancy, Illinois Central Gulf Railroad, Eastern Illinois University, University of Illinois, Illinois Natural History Survey, Endangered Species Protection Board, Illinois Nature Preserves Commission

Research, Monitoring & Evaluation - ongoing and periodic efforts include site breeding bird census, Christmas Bird Count (Jasper County), Spring Bird Count, prairie-chicken lek surveys, prairie-chicken genetic evaluations, threatened/endangered species surveys, herpetological surveys, insect surveys, vegetation cover mapping, research on

grassland birds, mesopredators, reptiles, and prairie restorations (Illinois Department of Natural Resources, Illinois Natural History Survey, Eastern Illinois University, University of Illinois)

Pyramid - Arkland Landscape

Protected lands - Pyramid State Park

Priority resources - grassland, shrubland and wetland wildlife; Henslow's sparrow, northern harrier, short-eared owl, Bell's vireo, loggerhead shrike, northern bobwhite, migratory waterfowl, least bittern; potential landscape for greater prairie-chicken re-introduction

Conservation philosophy - Maintain shrub, marsh and lake habitats in an open grassland matrix to manage priority wildlife resources, while providing high-quality resource-compatible recreation opportunities.

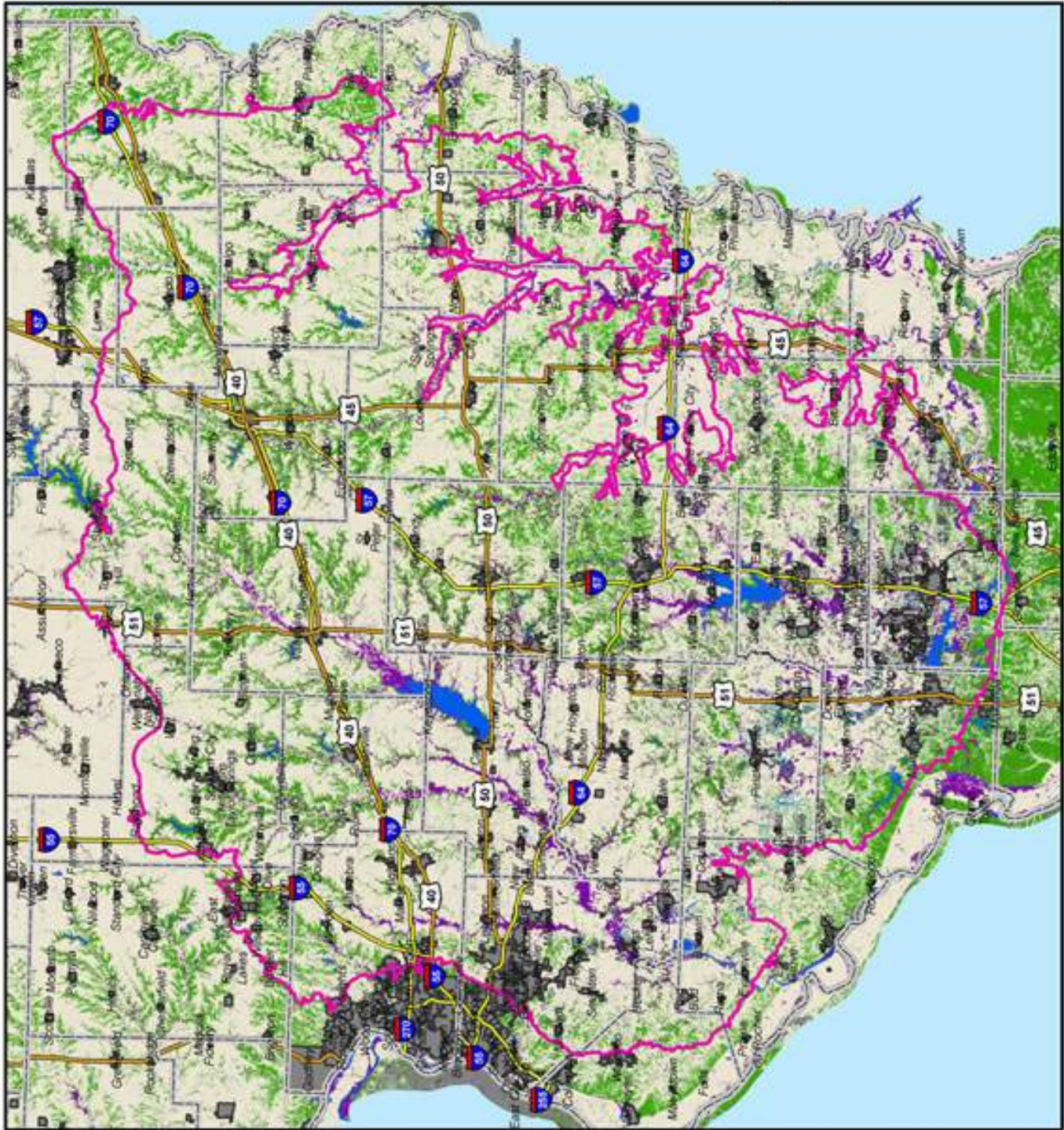
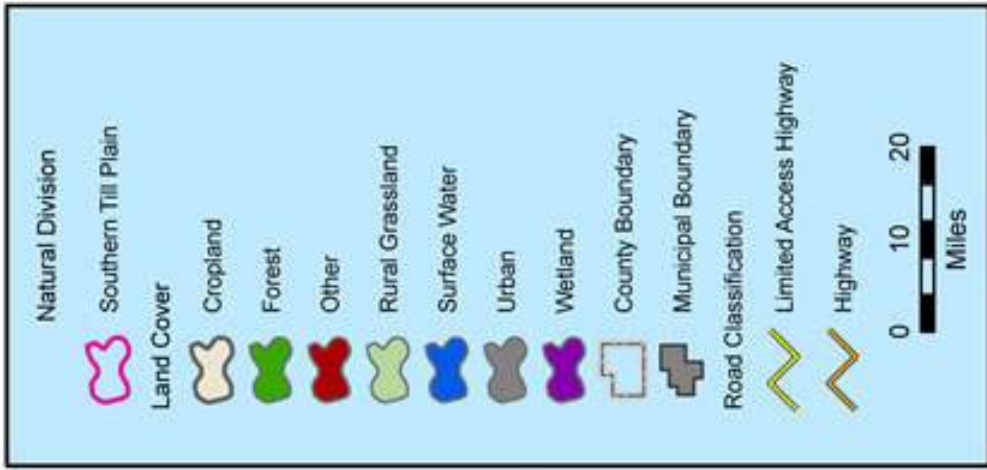
Key Actions - Continually addressing grassland and shrubland management/succession and invasive species with methods including grazing, prescribed fire, mowing and mechanical and chemical control). Develop site management plan that balances natural resource conservation with recreational demands; may require re-designation of "Arkland" portion from State Park to State Fish & Wildlife Area.

Lower Kaskaskia River Bottomlands

Priority Resources - High concentration and large tracts of bottomland hardwood forest (including Illinois' largest forest); area includes one-half of all high quality flatwoods in Illinois. Near-natural floodplain-river ecosystem, wood duck, cerulean warbler, red-shouldered hawk, brown creeper, prothonotary warbler

Partners - U.S. Army Corps of Engineers, Kaskaskia Watershed Association, Illinois Department of Natural Resources, U.S. Department of Agriculture

Contributors: Terry Esker, Marty Kemper, Randy Sauer, Trent Thomas, Jeff Walk, Kevin Woods



IV. L. The Upper Mississippi River and Illinois River Bottomlands Natural Division

Characteristics

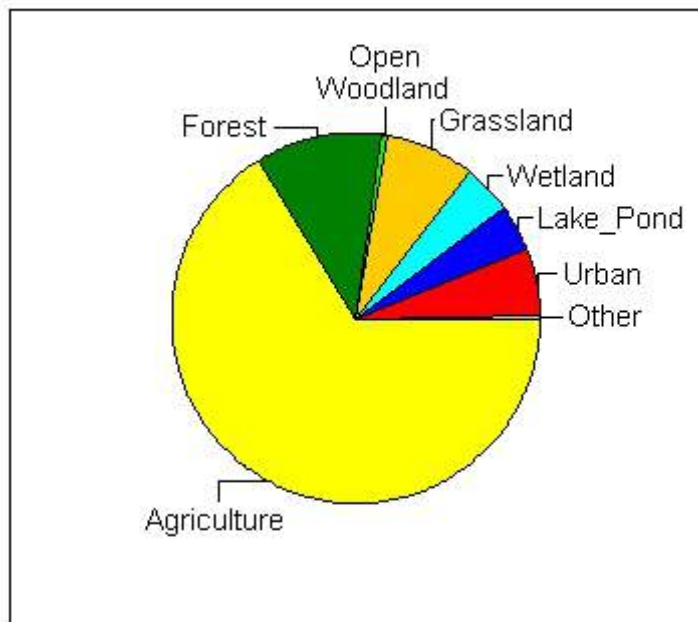
The Upper Mississippi River and Illinois River Bottomlands Natural Division of western and west-central Illinois encompasses the river and floodplains of the Mississippi River above the confluence with the Missouri River, and of the bottomlands and backwater lakes of the Illinois River and its major 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.

Major Habitats & Challenges

Forest - loss of diversity and dominance of silver maple and cottonwood as a result of changes in hydrology, frequency and durations of flood events, over-harvest and the 1993 flood (these species invade bottomland hardwood tree plantings and make successful establishment more difficult), over-browsing by white-tailed deer

Grassland - scarcity; many Conservation Reserve Enhancement Program grasslands were established on forested soils and tend to be low quality, dominated by switchgrass with few or no forbs, and invaded by cottonwoods

Land Cover of the Upper Mississippi River and Illinois River Bottomlands Natural Division



Wetland - sedimentation, unnatural flood regimes, exotic and invasive species (reed canary grass, phragmites, willow, cattails, bighead and silver carp); many historical wetlands are still farmed; availability of state and federal programs limits restoration and management

Lakes & Ponds - Sedimentation has resulted in a lack of deep water fish escape habitat. The combination of flocculent lake bottoms, summer floods (summer bumps), and common carp have resulted in an absence of aquatic plants (moist soil, emergent, and submergent) in the backwater lakes. The conflicting goals of providing river connectivity for fish compared to aquatic vegetation for migrating waterfowl is a significant challenge (lateral connectivity allows fish access to floodplains, whereas levees promote moist soil plant development by excluding common carp and summer flooding). If the goals for the natural division are to be met, a fair and reasonable compromise to this conflict needs to be reached.

Streams - sedimentation, lack of riparian vegetation, channelization and dredging, altered hydrology

Opportunities

Landscape-scale restoration and management is on-going at large state, federal and non-government organization-owned areas in the Upper Mississippi River and Illinois River Bottomlands Natural Division (Woodford State Fish & Wildlife Area, Marshall State Fish & Wildlife Area, Upper Mississippi River National Fish & Wildlife Refuges, Illinois River National Wildlife Refuges, Donnelly State Fish & Wildlife Area, DePue State Fish & Wildlife Area, Hennepin-Hopper Lakes, Emiquon Preserve).

The Conservation Reserve Enhancement Program, Conservation Reserve Program and Wetlands Reserve Program can achieve many of the forest, grassland and wetland habitat goals of the Illinois River portion of the Upper Mississippi and Illinois River Bottomlands Natural Division. The Nature Conservancy's Upper Mississippi River Project works in close partnership with other organizations to conserve and restore the Mississippi River and its major tributaries

by improving water quality, restoring healthy river flows, and reclaiming floodplains as natural habitat.

Leveed cropland has been (and can be) protected from silt deposition and flooding; the infrastructure of levee districts allows for wetland restoration efforts. Wet prairie restoration is feasible along and within drainage ditches and other wet areas. Many privately-held tracts of land in the floodplain are large, and attractive for large-scale restoration and management. Many private duck clubs adjacent to the Illinois and Mississippi Rivers are managed as moist soil habitat. Some of the Illinois' tributary streams (i.e. both Crow Creeks, Big Sandy Creek) are less flood prone than the River. Adjacent fields with low levees provide ideal locations for reforestation or wetland development.

Management Guidelines

This division consists of two major parts; the leveed, and unleveed portions of the floodplain. Management outside of the levees is river-stage dependent. In many cases flood events render long-term vegetation management strategies ineffective and impractical. Vegetation management within the leveed portion of the division has greater potential. Wetland habitats have potential to increase. Both grassland and forested acreage would increase in association with wetland restoration.

Landscapes

Forest - Increase forest acreage by 36,000 acres, in floodplains and along riparian corridors. Restore isolated and connected floodplains along rivers and streams to promote floodplain function and habitats. Emphasize restoring and managing bottomland hardwoods in larger blocks on forested soils.

Streams - Prevent the invasion by black carp and other invasive species. Restore tributary streams to reduce head-cutting and sediment transmission to larger rivers. Remove dramatic water level changes associated with operation of wicket dams at Peoria and

LaGrange. Maintain all existing connections between backwaters and main channel (connections at the 50% exceedance flow duration). Reduce low-water fluctuations along the mainstem Illinois River where possible, concentrating on the months of May through October. Eliminate excessive sediment delivery to specific high value habitat both along the main channels and in tributary areas of rivers and streams. Restore or maintain main stem to tributary connectivity, where appropriate, on major rivers and streams. Restore and maintain side channel habitats.

Lakes and Ponds - Promote aquatic plants (including moist soil) for waterfowl and restoring and managing adequate deep water escapement for riverine fishes. Restore and rehabilitate backwaters: restoration should result in a diversity of depths (a general target would be to have the following distributions of depths: 5% >9 feet, 10% 6-9 feet, 25% 3-6 feet and 60% <3 feet). Compact sediments to improve substrate conditions for aquatic plants, fish and wildlife, and identify beneficial uses of dredged sediments.

Wetlands - Emphasize restoring and managing healthy, functioning wetlands. Restore and manage an additional 20,000 acres of wetlands.

Grasslands - Restore and manage grasslands with high species diversity on grassland soils; a net increase of 31,000 acres is needed to meet wildlife objectives.

Natural Communities

Major rivers, backwater lakes/sloughs, side channels, marshes, wet prairie, pin oak/pecan floodplain forest, temporary and permanent wetlands, seeps, fens

Critical Species

Numerous species of mussels, paddlefish, smooth soft-shell turtle, canvasback, lesser scaup, king rail, black rail, Wilson's snipe, northern harrier, bald eagle, osprey, bobcat, prothonotary warbler, least bittern, American bittern, great egret, black-crowned night-heron, snowy egret, little blue heron, barn owl, red-headed woodpecker, river otter, Indiana bat, gray

fox. The Illinois River Valley, and Chautauqua National Wildlife Refuge in particular, is a shorebird concentration area of international importance.

Emphasis Game Species

White-tailed deer, wild turkey, waterfowl (mallard, wood duck), furbearers (muskrat, beaver, raccoon, mink, muskrat, red fox), northern bobwhite, bullfrog, snapping turtle, crappie, bass, channel catfish

Non-game Indicator Species

Wetland - spring peepers, gray tree frogs, red-eared slider, northern water snake, great blue heron, great egret, migratory shorebirds, prothonotary warbler, Baltimore oriole, spotted sandpiper

Forest - red-headed woodpecker, bats

Grassland - common yellowthroat

Recreational Opportunities

Deer, turkey, furbearer, and waterfowl hunting, fishing, trapping, boating, camping, birding/wildlife viewing for American white pelicans, shorebirds, wading birds, waterfowl, bald eagles and others at numerous outstanding sites, including Hennepin-Hopper Lakes and Chautauqua National Wildlife Refuge

Educational/Interpretive

Pere Marquette State Park Visitor Center, Two Rivers National Wildlife Refuge Visitor Center, Bald Eagle Appreciation Days, Big River Days

Natural Resource Commodities

Forest products, commercial fisheries, tree nurseries, trapping, hunting opportunity (white-tailed deer, waterfowl)

Conservation Opportunity Areas

Middle Illinois River

Protected lands - Woodford State Fish & Wildlife Area, Marshall State Fish & Wildlife Area, Illinois River National Wildlife Refuges, Donnelly State Fish & Wildlife Area, and DePue State Fish & Wildlife Area, Hennepin-Hopper Lakes, Sanganois State Fish & Wildlife Area, Anderson Lake State Fish & Wildlife Area, Rice Lake State Fish & Wildlife Area, Spring Lake State Fish & Wildlife Area, Banner Marsh State Fish & Wildlife Area, Pekin Lake State Fish & Wildlife Area, numerous Conservation Reserve Enhancement Program, Conservation Reserve Program, and Wetland Reserve Program enrollments

Priority Resources - emergent/moist soil/submergent wetlands, bottomland forest, deep-water habitat, backwater lakes, fish and mussel communities, migratory birds

Conservation philosophy - Promote wetland habitat in backwaters that support viable fish populations and migrating and wintering waterfowl and shorebirds; promote bottomland hardwood forests that support viable populations of wildlife including rare and declining species.

Wildlife and habitat objectives - establish aquatic plants in 20% of the backwater lake surface area; establish deep water fish habitat in 50% of the backwater lakes in the pool

Key actions - aquatic plant and bottomland forest establishment

Partners - Illinois Department of Natural Resources, The Wetlands Initiative, The Nature Conservancy, U.S. Department of Agriculture, Soil & Water Conservation Districts, U.S. Fish & Wildlife Service, U.S. Army Corps of Engineers

Implementation resources - Current and future Farm Bill conservation programs, U.S. Army Corps of Engineers programs, Migratory Waterfowl Stamp funds, North American Wetland Conservation Act

Monitoring and evaluation mechanisms- Indicator species need to be designated and monitored. Annual aerial photos taken in October and digitized could be used to measure plant coverage in the backwaters.

Upper Mississippi River

Priority resources - mussel and fish communities, migratory birds

Lost Mound - Hanover Bluff - Mississippi Palisades

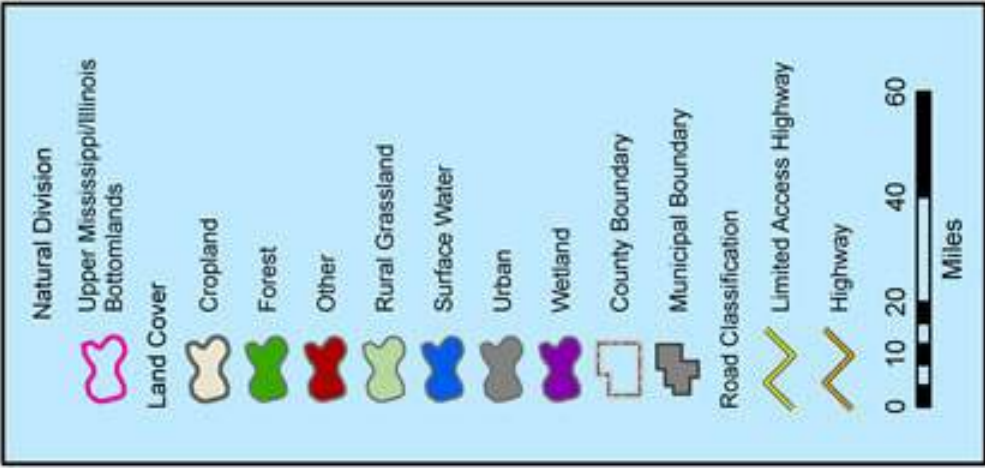
Protected Lands: Upper Mississippi River National Fish & Wildlife Refuge - Lost Mound unit, Hanover Bluff Nature Preserve, Mississippi Palisades State Park

Conservation Philosophy: Restoration of the continuum of riverine (Mississippi River bottomlands), prairie (Lost Mound), and upland forest (Hanover Bluff, Mississippi Palisades) as an ecosystem landscape.

Partners: U.S. Fish & Wildlife Service, Illinois Department of Natural Resources, The Friends of the Depot, The Prairie Enthusiasts, The Nature Conservancy, Jo Daviess Natural Areas Guardians, Driftless Area Partnership, Natural Land Institute, Jo Daviess Conservation Foundation, Blufflands Alliance, National Wild Turkey Federation

* See also *Illinois River and Mississippi River Sand Areas* and *Wisconsin Driftless* natural divisions

Contributors: Ed Anderson, Dean Corgiat, Jon Handel, and Mike Wefer



IV. M. The Wabash Border Natural Division

Characteristics

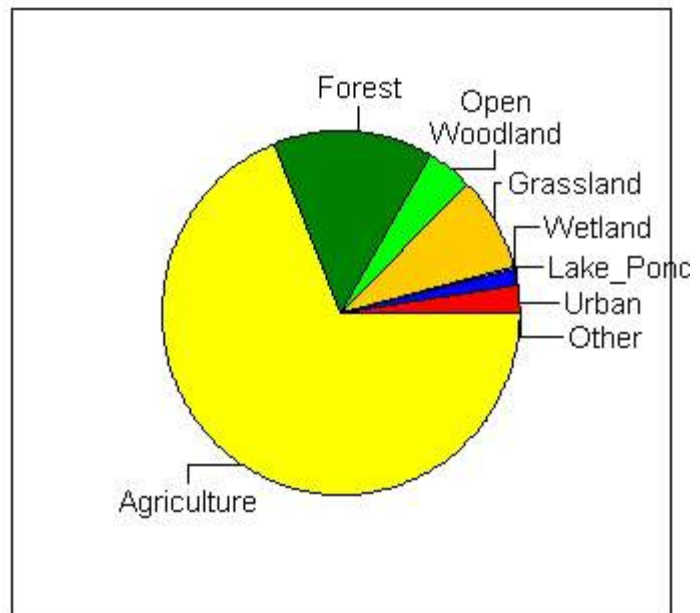
The Wabash Border Natural Division includes the bottomlands and the loess-covered uplands bordering the Wabash River and its major tributaries in southeastern Illinois. Lowland oak forests with beech, tuliptree and other species are characteristic of the eastern deciduous forest. The ravines and uplands were primarily forested throughout the Natural Division. Barrens were common in the southern part of the division. Grassland primarily existed as large scattered tracts in Wabash River bottoms and terraces. Cliffs are primarily sandstone exposures that are widely scattered, mostly in the southern half of the division along ravines of the larger Wabash tributaries.

The Wabash River drainage contains several distinctive fishes and mussels and once supported a large and diverse bottomland landscape supporting large forest tracts, wet prairies, sand barrens, wetlands, canebreaks, and oxbow lakes and meander scars. Cypress swamps occurred in the far southern end of the natural division.

Major Habitats & Challenges

Forests - invasion by exotic plants (especially garlic mustard, bush honeysuckle); increase in maples and mesophytic tree species accompanying decline in oak abundance and recruitment; fragmentation, loss of connectivity in riparian areas

Land Cover of the Wabash Border Natural Division



Open Woodland/Savanna/Barren - scarcity, succession to closed forest, exotic species (especially autumn olive)

Grasslands - fragmentation (small tract size); exotic species (especially tall fescue, autumn olive); succession to shrubland/secondary growth; lack of management (burning, discing); termination of Conservation Reserve Program contracts; recreational mowing of idle acres

Wetlands (including wet prairie, canebreaks, mudflats, and meander scars) - drainage, levees and ditches, exotic species (e.g., reed canary grass and *Phragmites*), increased tiling of cropland

Lakes & Ponds - sedimentation and nutrient loading, drainage of oxbow and backwater lakes, pesticide runoff

Streams (including Wabash River) - sedimentation, channelization, impoundments, levees, hydrologic modification, low quality riparian buffers and lack of habitat connectivity along riparian zones

Primary Communities (scattered sandstone outcrops supporting relict northern plants) - unknown

Opportunities:

The Wabash Border Natural Division supports a high proportion of geographically restricted plants and animals more typical of the eastern deciduous forest (e.g., American beech, mussels, fishes, amphibians and reptiles). Landscape-scale management is facilitated by large public ownership in the Vermilion River Section of this Natural Division (Kickapoo State Park, Middle Fork State Fish and Wildlife Area, Woodyard State Natural Area, Forest Glen County Park, Kennekuk Cove County Park).

The Wabash River is the largest un-dammed river east of the Rocky Mountains and supports diverse fish and mussel communities. The Middle Fork Vermilion River is the only National Wild and Scenic River in Illinois. The bottomlands of the Wabash River provide one of the few locations for restoration of canebreaks on a biologically significant scale. Waterfowl and shorebird management areas can also be established along the Wabash River, in partnership with the State of Indiana.

State and federal programs (Environmental Quality Incentives Program, Landowner Incentives Program, Illinois Forestry Development Act, Conservation Reserve Program, Wetland Reserve Program) have high potential for improving existing habitat and establishing additional grassland, wetland and forest habitat on private lands in the natural division. Conservation partners exist in this natural division and future opportunities can build on their previous accomplishments. The Vermilion County Conservation District is an example of an active conservation group in this natural division.

Management Guidelines:

Landscapes

Forest - Contiguous forest should be present along all lower order streams, ravines, and other areas of sloping topography. Forest blocks of at least 500 acres should be present in half the townships and 3-5 blocks of bottomland forest over 1,000 acres should be established. Prescribed burning and selective invasive species control should be initiated in oak-dominated stands to maintain and perpetuate oak dominance. Riparian forests should be at least 2 times as wide as the adjacent stream for all drainages. Forests should grade into open woodland or savanna habitats on adjacent uplands. Forested buffers and corridors should be maintained or created within 500 m of all ephemeral ponds. The objective is a net increase of 21,600 acres (including bottomland forest) by 2025.

Grassland - Grasslands in the Wabash Border Natural Division should be at least 80 acres in size. About 80-100 units should be in tracts 160 acres or larger and 20-30 units over 500 acres, both with less than 10% wooded or developed lands. Improve roadside grasslands on 300 acres per township. Enhance the quality of existing pastures and idle grasslands with

fescue conversion, improved grazing practices, prescribed fire, soil disturbance and other techniques. The objective is a net increase of 41,600 acres by 2025.

Open Woodland/Savanna/Barrens - Open woodland, savanna and barren focus areas should be at least 320 acres and consist of a minimum 30-40% savanna, barrens, or open woodland, 20% grassland, and 10% forest. Additionally, savanna, barrens, or open woodland habitats should be encouraged in all isolated woodlots under 15 acres in size. The objective is a net increase of 11,200 acres by 2025.

Wetland - Wetland complexes in the Wabash Border Natural Division should be at least 160 acres in size with 6-10 units 500-1,000 acres in size, and one complex >3,000 acres. Wabash River bottom wetlands should be approximately 40% wetland, wet prairie, and/or canebrake, and at least 10% gravel prairie, sand barrens, and open woodland. Other wetlands should be approximately 40% wetland with upland buffer equal to or greater than the wetland area. The objective is a net increase of 3,000 wetland and backwater acres (excluding bottomland forest) by 2025.

Streams - Restore up to 100% riparian land cover (twice the width of the stream and inclusive of the 100-year floodplain). Protect and enhance conditions of the coolwater streams.

Lakes & Ponds - Establish aquatic vegetation on 10-20% of the littoral zone on all impoundments.

Natural communities

Streams and rivers in the natural division have large numbers of rare and declining fish and mussels, many no longer found elsewhere in Illinois. Many of the fish communities associated with slack water habitats and aquatic vegetation are rare and/or declining. Species such as bowfin, gar species, warmouths, and orange-spotted sunfish have declined dramatically in population size. Large river backwaters and floodplains with southern species have bottomland forest, wetland, and canebreak restoration potential.

The eastern deciduous forests of North America reach their westmost extent in the Wabash River Natural Division. These forests, dominated by beech-maple-yellow poplar and associated animals, are of limited extent in Illinois and warrant restoration and management. Ephemeral woodland ponds host rare amphibians not found elsewhere in Illinois.

Sandstone cliffs include unique assemblages of relict northern plants.

Critical Species

Invertebrates: clubshell, rabbitsfoot, little spectacle case, wavy-rayed lampmussel, purple lilliput, rainbow, fat pocketbook, Indiana crayfish

Fishes: eastern sand darter, gravel chub, bluebreast darter, Iowa darter, harlequin darter, starhead topminnow, bigeye chub, redspotted sunfish, bantam sunfish, river redhorse, river chub, bigeye shiner, blacknose shiner, weed shiner, northern madtom

Amphibians: Jefferson's salamander, silvery salamander, hellbender, four-toed salamander, mudpuppy, wood frog

Reptiles: river cooter, smooth softshell turtle, copperbelly watersnake, eastern ribbon snake, alligator snapping turtle

Birds: American black duck, red-shouldered hawk, interior least tern, northern harrier, least bittern, American bittern, loggerhead shrike, hooded merganser, osprey, king rail

Mammals: river otter, bobcat, Indiana bat, swamp rabbit, gray fox

Emphasis Game Species

Largemouth bass, smallmouth bass, spotted bass, warmouth, yellow bass, green sunfish, bluegill, longear sunfish, redear sunfish, rock bass, white crappie, black crappie, blue catfish, channel catfish, flathead catfish, black bullhead, yellow bullhead, sauger, walleye, freshwater drum, northern bobwhite, wild turkey, American woodcock, ringneck pheasant (Vermilion River Section only), white-tailed deer, eastern cottontail, swamp rabbit, fox and gray squirrels

Nongame Indicator Species

Upland Forest - wood frog, red-backed salamander, Acadian flycatcher, wood thrush, red-shouldered hawk, Louisiana waterthrush

Bottomland Forest - brown creeper, barred owl, pileated woodpecker, northern parula, yellow-throated warbler, prothonotary warbler

Open Woodland, Savanna, Barren - eastern spadefoot toad, red-headed woodpecker, Carolina wren, blue-winged warbler, mockingbird, yellow-breasted chat, lark sparrow

Grasslands - eastern meadowlark

Wetlands (including wet prairie, canebreaks, mudflats, and meander scars) - black-necked stilt, swamp sparrow, sedge wren

Streams (including Wabash River) - Wabash-endemic crayfish, American eel, highfin carpsucker, blue sucker, banded pygmy sunfish, bluntnose darter, lake chubsucker, spottail darter, silver lamprey, ribbon shiner, ghost shiner, rosyface shiner, silverband shiner, pugnose minnow, mountain madtom, southern redbelly dace, paddlefish, blacknose dace, shovelnose sturgeon, central mudminnow, black redhorse, queen snake

Primary Communities - black rat snake (hibernacula)

Recreational Opportunities

Fishing (especially stream fishing), trapping, upland game hunting, forest game hunting, furbearer hunting, waterfowl hunting, canoeing, wildlife watching

Educational/Interpretive

Beall Woods State Park & Natural Area, Vermilion County Conservation District, Eastern Illinois University, Indiana State University, Vincennes University, Robeson Hills Nature Preserve, New Harmony Historic Site (Indiana)

Natural Resource Commodities

Forest products (ginseng and seeds), commercial fishing, native plant seed collection, outdoor recreation/nature-based tourism

Conservation Opportunity Areas

Vermilion River (Middle Fork, North Fork and Salt Fork) & Little Vermilion River

Protected Lands - Kickapoo State Recreation Area, Middle Fork State Fish & Wildlife Area, Kennekuk Cove County Park, Woodyard State Natural Area, Fleirman's River Nature Preserve

Priority Resources - streams (National Wild & Scenic River), fishes, mussels, geographically restricted amphibians

Conservation Philosophy - Maintain and enhance Scenic River Corridor and buffer areas, utilize historic vegetation conditions as a guide for a mosaic of prairie, shrubland, savanna, and open woodland on sandy terraces and flat uplands, dry-mesic and mesic forest in ravines, emphasizing forest establishment and enhancement.

Objectives - assess streambank erosion and stabilization needs; protect and restore terrace wetlands and all seeps, maintain 3-5 forested tracts >200 acres; develop channel evolution model for river to help identify future management needs; enhance oak recruitment in existing wooded tracts; decrease amount of 'hard' habitat edges through burning, invasive species control, and planting.

Priority Actions - hydrologic analysis and plan (especially vis-a-vis streambanks and channel stability); restoration of degraded habitats using historical vegetation conditions as a guide; landowner contact for all rare resources in database; establish amphibian breeding habitat adjacent to existing woodlands, forests, and woodland/forest restorations; control/remove exotic species; reduce hard habitat edges; increase prescribed burning, especially in oak woodlands and forests; perform biotic inventories and establish monitoring protocols

Partners - Illinois Nature Preserves Commission, National Park Service, Dynegy Midwest Generation; U.S. Department of Agriculture Natural Resource Conservation Service, Vermilion County Conservation District; Vermilion County Soil & Water Conservation District, Prairie Rivers Network, Volunteer Stewardship Network, canoe outfitters, Illinois Department of Natural Resources

Conservation Resources - Illinois Nature Preserves Commission Landowner Contact, U.S. Fish & Wildlife Service W-76-D; State Wildlife Grants, C2000, National Park Service

Research, Monitoring, and Evaluation - Illinois Natural History Survey, University of Illinois, Eastern Illinois University, Illinois State Water Survey, Illinois State Geological Survey, Critical Trends Assessment Program, Prairie Rivers Network

Wabash River, Floodplain & Backwater Ponds

Priority Resources - free-flowing river, bottomland forest, backwater ponds, baldcypress communities, cane restoration, successional areas, shallow-water wetlands, mussels, fishes, river cooter, alligator snapping turtle, copperbelly watersnake, migratory waterfowl, shorebirds, interior least tern, cerulean warbler, red-shouldered hawk, brown creeper, prothonotary warbler

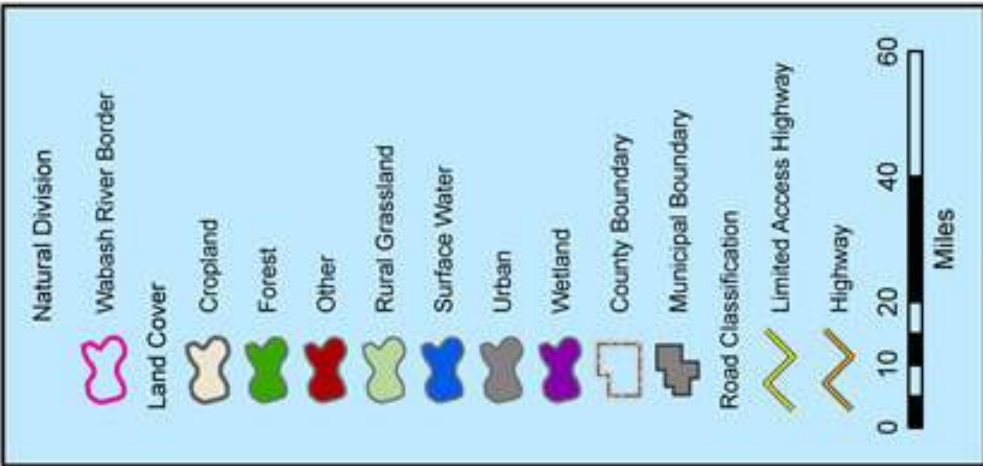
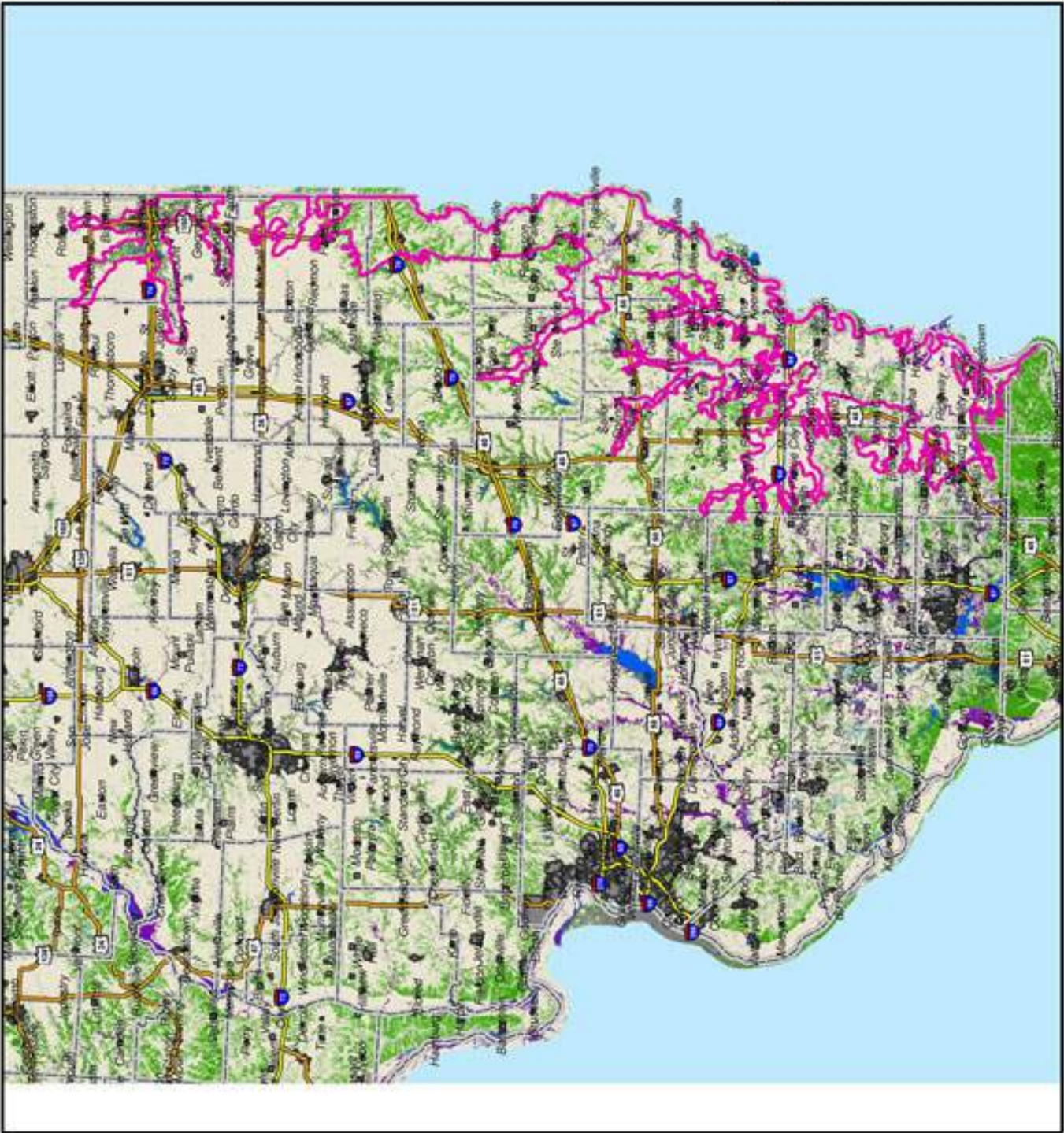
Key Actions - No coordinated conservation effort is underway at present in Illinois or with Indiana. A natural resources inventory of the area, including compilation of available data and field surveys, is essential.

Middle Little Wabash River

Priority Resources - Bottomland forest, wetlands, migratory waterfowl, cerulean warbler, red-shouldered hawk, copperbelly watersnake, brown creeper, prothonotary warbler

Key Actions - No coordinated conservation effort is underway at present. A natural resources inventory of the area, including compilation of available data and field surveys, is essential.

Contributors: Robert Szafoni, Paul Brewer, Terry Esker, Dan Newhouse, Trent Thomas



IV. N. The Western Forest-Prairie Natural Division

Characteristics

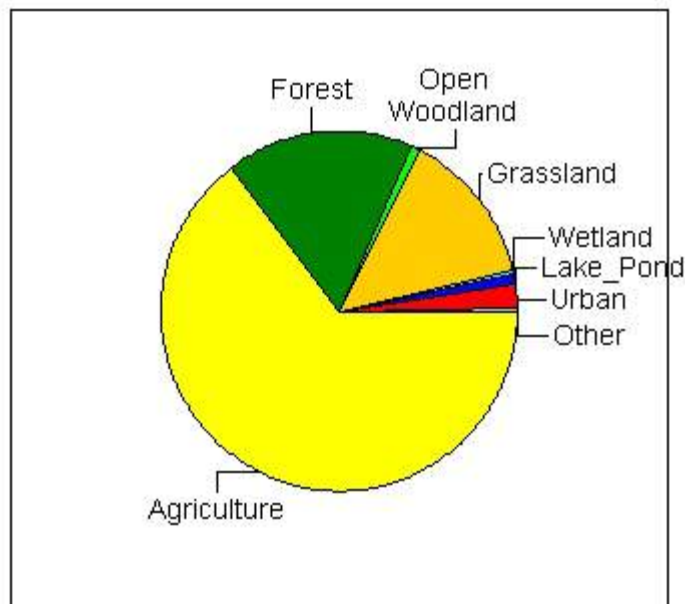
The Western Forest-Prairie Natural Division of west-central Illinois is a strongly dissected glacial till plain of Illinoian and Kansan age. Open woodland was the predominant vegetation, with considerable prairie on the level uplands. This character is reflected today with forests in riparian zones and on steep hillsides, and agriculture and rural grasslands in upland areas. This division has a well-developed natural drainage system with major streams having significant flood plains. 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.

Major Habitats & Challenges

Forests – destruction by bulldozing/brush clearing, excessive deer browsing, livestock grazing has degraded structure and floral diversity, invasive species, lack of proper timber management and fire are reducing oak-hickory and open forests; gully erosion on steeply sloped forest lands is problematic

Open Woodland/Barren/Savanna - succession to closed forest; other problems in these habitats are similar to challenges in forest of the division; poor management has diminished the abundance and quality of savanna-type habitats

Land Cover of the Western Forest-Prairie Natural Division



Grasslands - scarcity due to conversion to cropland; destruction of prairies occurred so long ago, there is little awareness or motivation to restore this ecosystem; pastures are monotypic cool-season grasses and have little structural diversity; dominance by tall fescue and exotic plants; several thousand acres of Conservation Reserve Program grasslands lack management exclusive of compliance mandated periodic mowing—these grasslands have poor structure and plant diversity, and offer limited wildlife habitat benefits

Streams - sedimentation, water quality, peak flood volumes have increased and base flows decreased due to drainage alteration, primarily in rural landscapes; dissected topography, drainage alteration, and agricultural tillage exacerbate the secondary problems of high turbidity and siltation, caused by erosion of loess soils from upland sources and stream channels

Lakes and Ponds - drainage alteration and agricultural tillage have resulted in excessive erosion of loess soils, diminishing water quality and reducing depth of ponds and lakes

Opportunities

Due to topography vulnerable to erosion, the natural division is a diverse mix of forest and grassland habitat in addition to cropland. Improving the quality of existing habitats on private lands, with technical assistance and incentives, is essential. Managed grazing is one such tool for improving and maintaining grassland and open woodland habitats. State and federal farm programs, such as the Conservation Reserve Program and the Conservation Reserve Enhancement Program, can achieve many of the habitat goals for additional reforestation and grassland establishment along field borders, waterways and riparian areas on private land. The Western Forest-Prairie Natural Division is renowned for outstanding white-tailed deer and wild turkey resources. Management for a landscape mosaic of grassland/prairie, savanna, and woodland will sustain these emphasis species and benefit an array of species in greatest need of conservation.

The Lamoine River Ecosystem Partnership of local citizens can facilitate popular support, funding (C2000 and other sources), implementation and evaluation of habitat and watershed improvement. Several Illinois Department of Natural Resources-owned sites can serve as examples of habitat types and models for biodiversity management.

Management Guidelines

Landscapes

An emphasis on managing habitats (grassland and forest edges) that will support and enhance characteristic habitat (shrubland, grassland, weedy patches and interspersed cropland) for northern bobwhite and eastern cottontail rabbit should be a habitat priority for the division.

Forest - Increase by 46,800 acres. Forests should grade into open woodland or savanna habitats on adjacent uplands. Forested blocks of at least 500 acres should be inventoried and prioritized for addition or linking to other forests blocks. Encourage sound management practices to promote healthy upland forests through landowner education/assistance, prescribed burning, timber stand improvements, and invasive species control (mechanical, chemical, or fire).

Open Woodland, Savanna, Barrens - Because savanna was both common as a transitional band between prairie and forest, and as large landscapes of a mix of prairie and trees, it is difficult to determine functional sizes of savanna needed to encompass the breadth of flora and fauna typical of savanna. Analysis of historic vegetation and disturbance regimes and present conditions is needed to make decisions on where forest, prairie or savanna management is appropriate. An increase of 45,000 acres is needed to meet wildlife objectives. Savanna, barrens, or open woodland habitat should be encouraged in isolated woodlots under 15 acres in size. Encourage sound management practices to maintain and increase the extent of natural savannas and barrens through landowner education and assistance, prescribed

burning, selective woody encroachment removal and exotics control (mechanical, chemical, or fire).

Grassland - Increase by 135,000 acres to meet wildlife objectives; at least one ecological pattern grassland complex should be identified for consideration at locations of former large prairies. Enhance the quality of existing pastures and idle grasslands with fescue conversion, improved grazing practices, prescribed fire, soil disturbance and other techniques. The CP-33 practice of the Conservation Reserve Program has a minimum of a 30-foot grassy field border for establishment; the CP-2 warm-season grass practice is functional as quality nesting and roosting cover for an abundance of wildlife species regardless of acreage. Open, treeless, upland grasslands more than 0.5 mile wide are especially important to Species in Greatest Need of Conservation.

Streams - Riparian forests should be at least 2 times as wide as the adjacent stream for all drainages.

Natural communities

Prairie remnants, glacial drift hill prairie, dry-mesic savannas, dry-mesic barrens, seeps, barrens, riparian corridors, large blocks of oak-hickory forest

Critical species

Creek heelsplitter and monkeyface, regal fritillary, darter species, shiner species, freckled madtom, Kirtland's snake, slender glass lizard, bald eagle, loggerhead shrike, brown creeper, barn owl, northern harrier, upland sandpiper, short-eared owl, Henslow's sparrow, cerulean warbler, Bewick's wren, bobcat, Franklin's ground squirrel, gray fox, Indiana bat, river otter

Emphasis Game Species

Uplands - northern bobwhite, white-tailed deer, wild turkey, American woodcock, fox and gray squirrel

Streams - channel catfish, flathead catfish, smallmouth bass, largemouth bass, beaver, raccoon, wood duck, mallard

Lakes and ponds - bluegill, largemouth bass

Nongame Indicator Species

Stream - creek chub, blacknose dace, northern hogsucker, shorthead redhorse, stonecat, fantail darter, orangethroat darter, slenderhead darter

Grassland - 13-lined ground squirrel, bobolink, eastern and western meadowlarks, dickcissel, sedge wren

Open Woodland/Savanna/Barren - red-headed woodpecker, eastern kingbird, Baltimore oriole, yellow-billed cuckoo, Bell's vireo, indigo bunting, field sparrow

Forest - pileated woodpecker, Cooper's hawk, Kentucky warbler, American redstart, brown creeper, bobcat

Recreational Opportunities

Hunting, especially for white-tailed deer and wild turkey, draws people from the entire nation to this region. Deer quality is nationally/internationally renown. Catfish and pond fishing, mushroom hunting, upland game hunting, furbearer hunting and trapping, fall driving tours (e.g.. Spoon River Drive).

Educational/Interpretive

Dickson Mounds Museum

Natural Resource Commodities

Commercial hunting, especially for deer, is a very important commodity that drives land purchases, land uses, and income potential in this division. Forest products (e.g. timber production) have a strong economic market here. Fur trapping, livestock forage (hay/pasture), Spoon River commercial fishing.

Conservation Opportunity Areas

Lower LaMoine River

Protected areas - Conservation Reserve Enhancement Program contracts

Priority resources - extensive upland oak-hickory forest, open woodland/savanna, and bottomland forest

Partners - Lamoine River Watershed Partnership, Illinois Department of Natural Resources, Natural Resources Conservation Service, Quail Unlimited, National Wild Turkey Federation

Implementation resources - Conservation Reserve Program, Conservation Reserve Enhancement Program, Forestry Incentive Program, Supplemental Incentive Program, Forestry Development Act, Private Land Incentive Program, Acres for Wildlife Program

Siloam Springs Complex

Protected areas - Siloam Springs State Park and Buckhorn Unit, Weinberg-King State Park including Cecil White and Scripps units

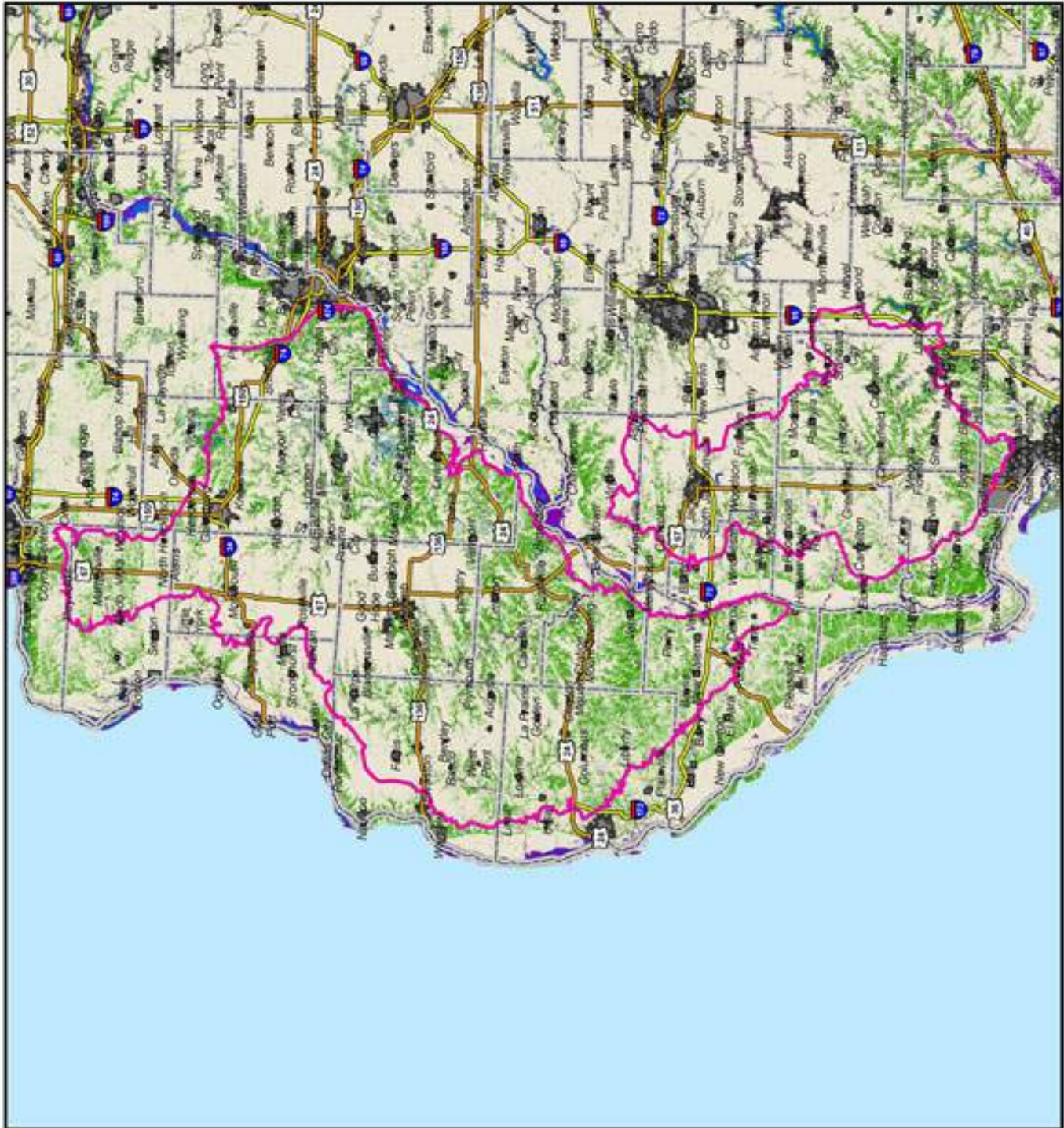
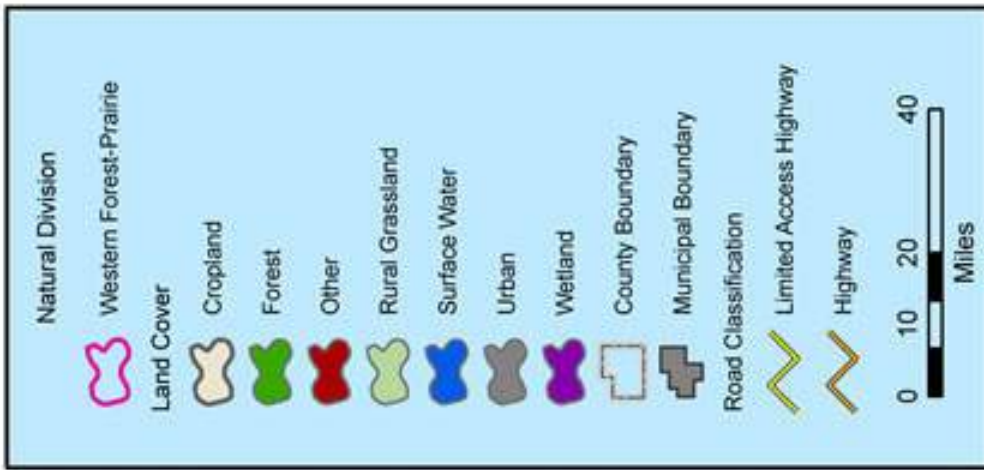
Priority resources - extensive upland oak-hickory forest, open woodland/savanna, and prairie remnants

Key Actions - Determine appropriate extent of grassland, open woodland and forest; restore open woodlands and savannas

Partners - Illinois Department of Natural Resources, Natural Resources Conservation Service, Quail Unlimited, National Wild Turkey Federation

Implementation resources - Conservation Reserve Program, Conservation Reserve Enhancement Program, Forestry Incentive Program, Supplemental Incentive Program, Forestry Development Act, Private Land Incentive Program, Acres for Wildlife Program

Contributors: Kent Boyles, Doug Carney, Mark Phipps, Brad Poulter



IV. O. Regional Assessment of the Wisconsin Driftless Natural Division

Characteristics

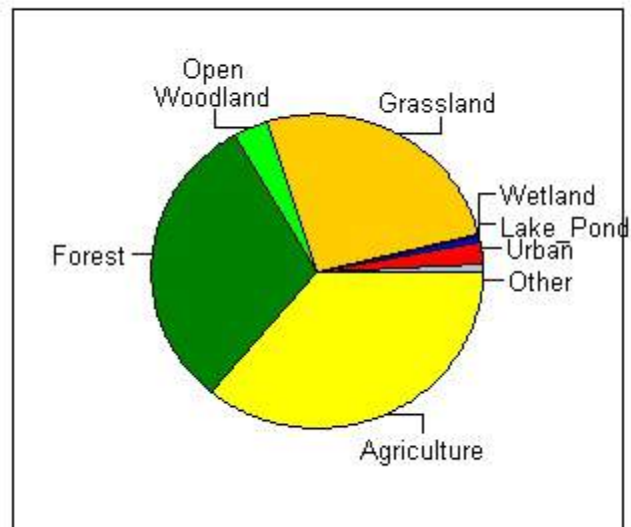
The Wisconsin Driftless Natural Division is part of an area extending from the northwestern corner of Illinois into Iowa, Wisconsin and Minnesota that apparently escaped Pleistocene glaciation. Bordered by the Mississippi River Bottomlands on the west and characterized by rugged terrain that was originally 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 Driftless area is so named because it has little or no “drift” - the sediments deposited across the remainder of northern and central Illinois by glaciers that bypassed this corner of the state. The rough, unglaciated terrain features wooded uplands, rolling hills, narrow valleys, numerous streams, springs, and cliffs and bluffs.

Major Habitat Types & Challenges

Streams (Galena, Plum and Apple River Systems): siltation, excessive nutrient loads, impacts from grazing, thermal degradation of coolwater streams; the Galena River below the city of Galena suffers from excessive erosion due to the channelization of the stream; increases in boat traffic, particularly jet skis, in narrow, highly erodible streams may be problematic

Forest - fragmentation and loss of forests from developments (e.g., subdivisions and houses) and other disturbances, insufficient oak

Land Cover of the Wisconsin Driftless Natural Division



regeneration due to fire suppression and other factors which has fostered invasion of sugar maple and other species, impacts from livestock grazing, impacts from invasive plants (bush honeysuckle, buckthorn, garlic mustard), invasive insect pests, excessive deer browse

Open Woodland, Savanna - fragmentation, impacts from livestock grazing, impacts from exotic species (bush honeysuckle and buckthorn), excessive deer browse, woody species invasion or natural succession to forest due to fire suppression and other factors

Grassland - fragmentation, impacts from grazing, woody species invasion or natural succession to forest due to fire suppression and other factors

Cave - filling of sinkholes, groundwater contamination, degraded habitat in recharge areas

Primary Communities (dolomite cliffs, algific slopes) - disturbances to blufflands above cliffs, e.g., development, grazing, and logging

Opportunities

The Wisconsin Driftless Natural Division has a high proportion of its land in forest and grassland cover. Agriculture is the dominant land use with croplands and grasslands (mostly pasture) combining for almost three-fourths of the land. Due to the rugged terrain, less farmland in this area are in row crops (32% of agricultural land compared to 70% statewide). Most of the forested areas are found on the slopes along rivers and streams. Several large tracts of upland forest and/or grassland habitat are protected by public ownership which facilitates landscape-scale management in cooperation with public and private partnerships. The Conservation Reserve Program has created tracts of warm-season grass plantings and tree plantings providing additional wildlife habitat and reducing erosion.

Management Guidelines

Landscapes

Forest - A net increase of 11,000 acres will achieve wildlife objectives. Riparian forests should be at least 2 times as wide as the adjacent stream for all drainages. Forests should grade into open woodland or savanna habitats on adjacent uplands. Forested blocks of at least 500 acres should be inventoried and prioritized for addition or linking to other forests blocks. Encourage sound management practices to promote healthy upland forests through landowner education/assistance, prescribed burning, timber stand improvements, and exotics control (mechanical, chemical, or fire).

Open Woodland, Savanna - Increase by 4,000 acres. Savanna or open woodland habitats should be encouraged in isolated woodlots under 15 acres in size. Encourage sound management practices to promote healthy upland forests through landowner education/assistance, prescribed burning, timber stand improvements, and exotics control (mechanical, chemical, or fire).

Grassland - On highly erodible farm land, terraces should be encouraged, and grass waterways planted in the valleys. Enhance the quality of existing pastures and idle grasslands with fescue conversion, improved grazing practices, prescribed fire, soil disturbance and other techniques. Protect, restore and encourage sound management to maintain and increase the extent of prairie remnants and hill prairies to historic boundaries through landowner education and assistance, prescribed burning, selective woody vegetation removal and invasive species control (mechanical, chemical, or fire).

Streams - Livestock should be fenced away from the stream, and should be watered using single, small "cattle crossings" or alternate water sources. Riparian habitat (forest, open woodland or grassland, as site-appropriate) should be at least 2 times as wide as the adjacent stream for all drainages.

Caves - Protect and manage forest and savanna habitat in cave recharge areas.

Natural communities

High-gradient coolwater streams, upland forest, sand prairie, dolomite prairie, loess hill prairie, sand hill prairie, savanna, sand savanna, sedge meadow, spring seepages, dolomite cliff, cave, algific slope

Critical species

Insects - Gorgone checkerspot (*Chlosyne gorgone*), prairie walking stick (*Diaperomera velii*), leafhopper (*Polyamia herbida*), leafhopper (*Polyamia obtecta*), Edward's hairstreak (*Satyrium edwardsii*), leafhopper (*Scaphytopius cinereus*), lead plant flower moth (*Schinia lucens*), regal fritillary (*Speyeria idalia*)

Crustaceans - Iowa Pleistocene snail, Iowa amphipod

Mussels - slippershell mussel, black sandshell

Fish - longnose dace, largescale stoneroller, Ozark minnow, brook trout

Amphibians - four-toed salamander

Reptiles - timber rattlesnake, lined snake

Birds - upland sandpiper, loggerhead shrike, cerulean warbler

Mammals - bobcat

Emphasis Game Species

Smallmouth bass, brown trout, walleye, white-tailed deer, wild turkey

Nongame Indicator Species

Stream: northern hogsucker, southern redbelly dace, honeyhead chub, suckermouth minnow, northern hogsucker, spotted sucker

Grassland: grasshopper sparrow, Henslow's sparrow, lark sparrow, savannah sparrow, dickcissel, bobolink, western meadowlark, eastern meadowlark

Forest: veery, ovenbird, scarlet tanager, wood thrush

Recreational Opportunities

In addition to the excellent smallmouth bass fishery, the Apple River is stocked each spring with adult size rainbow trout as a "put and take" fishery. Canoeing is popular in the Galena River to the mouth at the Mississippi River. Apple River Canyon State Park and Mississippi Palisades State Park provide camping, hiking, bird watching, hunting, and other activities.

Hunting for upland game, deer, wild turkey, and furbearers; ecotourism - wildlife viewing, particularly bird watching, in forested areas such as Mississippi Palisades and Hanover Bluff

Educational/Interpretive

U.S. Fish & Wildlife Service's Mississippi River Interpretive Center, Lost Mound Unit and Visitor Center, Apple River Canyon State Park, Mississippi Palisades State Park. The Boy Scout's Ulysses S. Grant Pilgrimage attracts thousands of scouts to the Galena area in late April. The U.S. Army Corps of Engineers maintains wildlife viewing areas at the Lock and Dams along the Mississippi River. The Mississippi River Aquarium & Museum in Dubuque has fish, wildlife and historical displays relating to the Mississippi River.

Natural Resource Commodities

Highlighting the recreational aspects of the area, especially the excellent fishing opportunities, helps to focus attention on the streams in the area, and encourages local citizens

to protect the streams. White-tailed deer and wild turkey hunting opportunities are important, as are forest products.

Conservation Opportunity Areas

Lost Mound - Hanover Bluff - Mississippi Palisades

Protected Lands: Upper Mississippi River National Fish & Wildlife Refuge - Lost Mound unit, Hanover Bluff Nature Preserve, Mississippi Palisades State Park

Conservation Philosophy: Restoration of the continuum of riverine (Mississippi River bottomlands), prairie (Lost Mound), and upland forest (Hanover Bluff, Mississippi Palisades) as an ecosystem landscape. Protect, manage, and restore the natural communities of the sites.

Partners: U.S. Fish & Wildlife Service, Illinois Department of Natural Resources, The Friends of the Depot, The Prairie Enthusiasts, The Nature Conservancy, Jo Daviess Natural Areas Guardians, Driftless Area Partnership, Natural Land Institute, Jo Daviess Conservation Foundation, Blufflands Alliance, National Wild Turkey Federation, Illinois Nature Preserves Commission

* See also *Upper Mississippi River and Illinois River Bottomlands* and *Illinois River and Mississippi River Sand Areas* natural divisions.

Wisconsin Driftless Forest

Protected Lands: Witkowsky State Wildlife Area, Winston Tunnel, Tapley Woods

Priority resources: extensive oak-hickory forests, open woodland/savanna, and primary communities

Conservation Philosophy: Protect, manage, and restore the natural communities of the site and provide for compatible recreational activities.

Partners: Illinois Department of Natural Resources, National Wild Turkey Federation, Jo Daviess Natural Areas Guardians, The Prairie Enthusiasts, Jo Daviess Natural Areas Guardians, Driftless Area Partnership, Natural Land Institute, Jo Daviess Conservation Foundation, Blufflands Alliance, The Nature Conservancy

Apple River

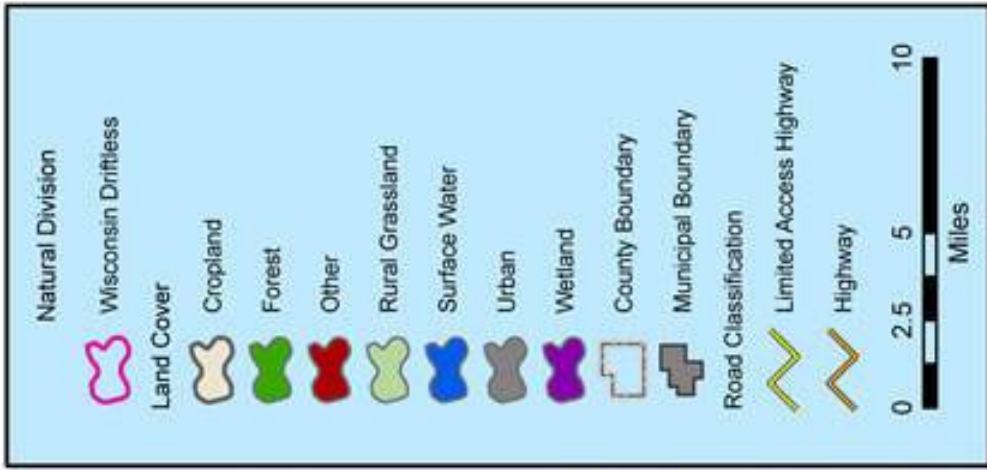
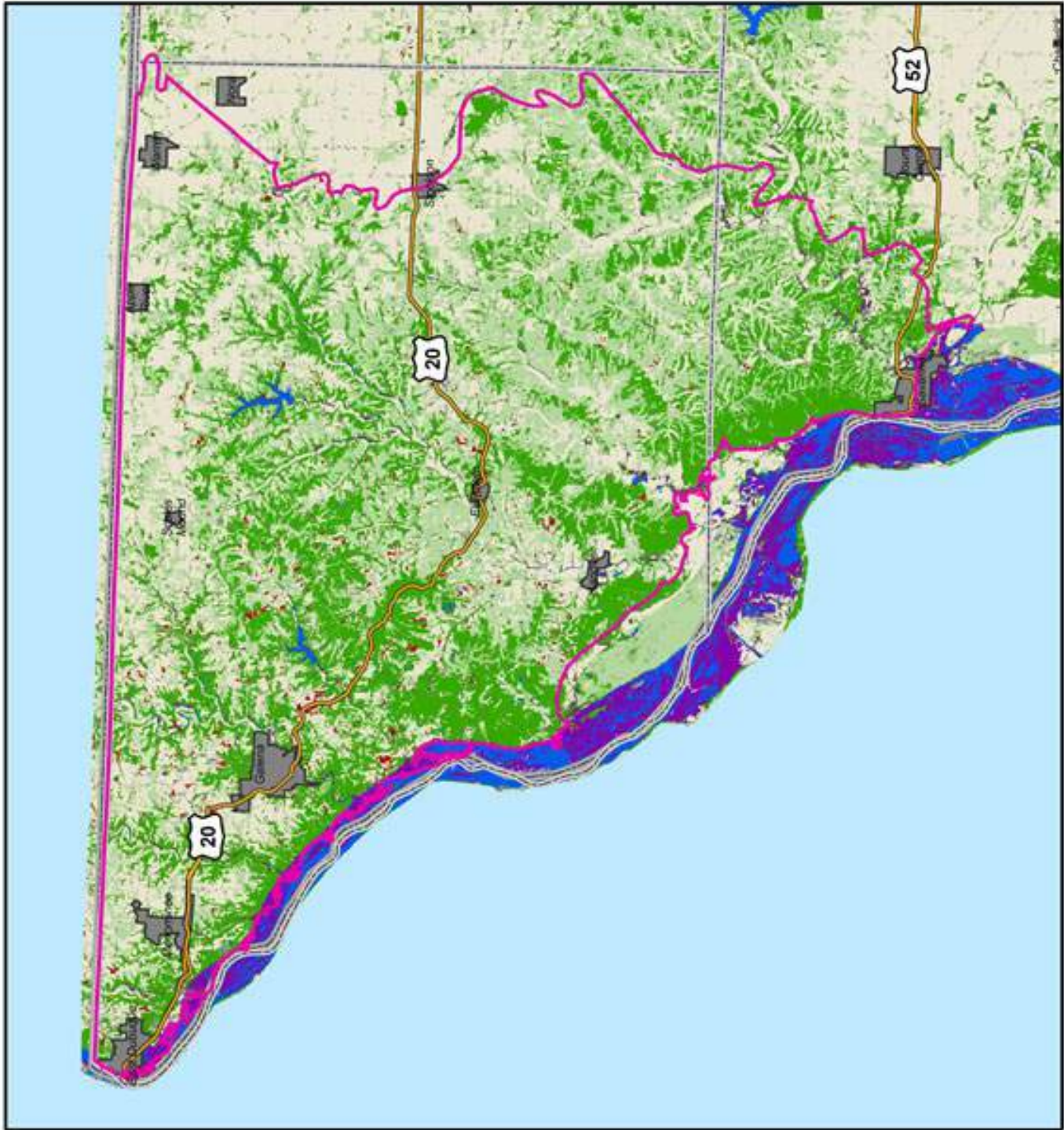
Protected Lands: Apple River Canyon State Park, McKeague Nature Preserve, Thompson Prairie Nature Preserve, Salem Unit, and protected lands of the Lost Mound-Hanover Bluff-Mississippi Palisades Conservation Opportunity Area (see above) along the lower Apple River

Priority Resources: coolwater streams and fishes, freshwater mussels, primary habitats; Trout Unlimited's nascent Driftless Area Restoration Initiative recognizes the need for restoration of hydrologic function, condition, and aquatic populations to coolwater streams, and the opportunity of broad scale interest in brook trout stream restoration within the Driftless area.

Conservation Philosophy: Protect, manage and restore the natural communities of the area and provide for compatible recreational activities. Restore the continuum of the Upper Apple River Illinois Natural Areas Inventory site (coolwater stream with significant primary communities) to the Lower Apple River Illinois Natural Areas Inventory site (mussel beds, bottomland habitat) and the Lost Mound-Hanover Bluff-Mississippi Palisades Conservation Opportunity Area.

Partners: The Prairie Enthusiasts, Jo Daviess Conservation Foundation, Trout Unlimited, The Nature Conservancy, Jo Daviess Natural Areas Guardians, Driftless Area Partnership, Natural Lands Institute, Blufflands Alliance, National Wild Turkey Federation, Illinois Department of Natural Resources, U.S. Fish & Wildlife Service

Contributors: Ed Anderson, Karen Anderson, Chris Kirkpatrick (Jo Daviess Conservation Foundation)



V. PLAN REVIEW & REVISION

Review

A partial draft comprehensive wildlife conservation plan/strategy was made available for public comment on the plan/strategy's website on 12 January 2005, and comments were requested by 1 March 2005. Twenty-eight (28) individuals and organizations requested and were sent hard copies of the partial draft. More than 140 sets of comments were received. With revisions and additions, the complete final draft of the comprehensive wildlife conservation plan/strategy was made available from 9 May to 30 June 2005. Forty-four (44) hard copy and disk copies of the final draft were sent upon request to individuals and organizations. About 80 sets of comments were received. After additional revisions, the Illinois Comprehensive Wildlife Conservation Plan & Strategy was delivered to the National Acceptance Advisory Team on 29 July 2005.

Revision

As natural resource conditions change, human priorities evolve, conservation action progress, and new information becomes available, the plan/strategy will need to be revised. As the lead natural resources agency in Illinois, the Illinois Department of Natural Resources has responsibility for updating and revising the comprehensive wildlife conservation plan/strategy. Several expected types of updates will need to be made with varying frequency (Table 9). Unexpected revisions and updates likely will be required as well.

The Comprehensive Wildlife Conservation Plan & Strategy is required to be revised at intervals not to exceed ten years. However, the Illinois Department of Natural Resources may elect to formally revise the entire Plan/Strategy at any earlier time. The essential steps that were used successfully in the initial planning process have been modified, and the time that will be required to complete each stage has been estimated (Table 10). Conditions at the time of revision will guide whether each of these steps are appropriate, and indicate if others are necessary.

VI. SUMMARY & BEGINNING IMPLEMENTATION

The Illinois Comprehensive Wildlife Conservation Plan & Strategy identifies the state's Species in Greatest Need of Conservation, those with low or declining populations and indicative of the state's health and diversity, from all taxonomic groups. Desired conditions for the Species in Greatest Need of Conservation, sportfishes, game animals, and major habitat types have been described as well. Habitat loss has historically been the greatest stress to wildlife populations, and continues to be problematic. Degrading condition of remaining habitat—particularly due to the combined and related effects of invasive species, changing structure/composition, and altered patterns of disturbances such as flooding and fire—adversely affects most populations.

Priority actions to address problems and achieve goals are presented in seven overlapping campaigns, focused upon Forests, Streams, Wetlands, Farmlands & Prairies, Invasive Species, Land & Water Stewardship, and Green Cities. State, federal and local agencies, private organizations and landowners are currently undertaking many of these actions, though where they are applied and effort devoted to them may need to be evaluated in light of statewide objectives. Monitoring populations, habitats, and the effectiveness of conservation actions builds upon existing programs, though new efforts and better information sharing across agencies and organizations will be important. Information is lacking on the status of many species and habitat types, the importance of certain potential stresses (e.g., diseases, genetics), and the relative effectiveness of conservation actions. New tools for addressing invasive species, urban wildlife and other issues are needed.

More than 150 federal, state and county agencies, partnerships, institutions, and nongovernmental organizations took part in development of the Illinois Plan/Strategy. Though a website, print media, email updates, planning workshops, and public comment periods, the planning process encouraged broad public participation. The steering committee, consisting of agency staff and representatives from nongovernmental organizations, that provided oversight to the planning process could be expanded into a group providing oversight to implementation. Such a group can ensure key actions are being taken, facilitate partnerships for

implementation, coordinate monitoring and information sharing among agencies and organizations, match partners' activities with sources of support, and seek out and develop additional funding that will be needed to achieve the ambitious goals for wildlife and habitat that are outlined in the Illinois Comprehensive Wildlife Conservation Plan & Strategy. The Illinois Department of Natural Resources will update the plan/strategy as new information becomes available, revise the plan/strategy within 10 years with the participation of conservation partners and the public, and assume a leadership role in implementing the plan/strategy.

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Table 1. Executive Staff in the Illinois Department of Natural Resources Office of Resource Conservation during the planning process.

Office Director - *Mike Conlin, (Brian Anderson)*

Division of Fisheries - *Scott Stuewe*

Division of Habitat Resources - *Todd Strole*

Watershed Protection Section - *Joel Cross*

Division of Wildlife Resources - *John Buhnerkempe*

Program Support Section - *Debbie Bruce*

Operations Section - *Todd Pfeiffer*

Table 2. Composition of the Illinois Comprehensive Wildlife Conservation Plan/Strategy Steering Committee.

Partner Organizations

Ducks Unlimited - *Eric Schenck*

Illinois Audubon Society - *Marilyn Campbell*

National Wild Turkey Federation - *John Burk*

The Nature Conservancy - *Carl Becker*

Illinois Department of Natural Resources

Illinois Natural History Survey - *John Epifanio, Liane Cordle*

Office of Land Management & Education - *Terry Musser*

Office of Realty & Environmental Planning - *David Baker, Lisa Dowson, Wayne Hartel, Brian Reilly, Tammy Watson*

Office of Resource Conservation

Division of Fisheries - *Steve Pallo, Scott Stuewe*

Division of Habitat Resources - *Glen Kruse*

Watershed Protection Section - *Joel Cross, Steve Sobaski*

Division of Wildlife Resources - *John Buhnerkempe*

Planning Coordinator (committee chair) - *Jeff Walk*

Table 3. Plans used to develop the Illinois Comprehensive Wildlife Conservation Plan/Strategy.

C2000 - Ecosystems Program and Strategic Sub-Watershed Identification Process
Chicago Wilderness Biodiversity Recovery Plan
Conservation by Design - Ecoregional Planning (The Nature Conservancy)
Illinois River Basin Comprehensive Plan
Integrated Management Plan for the Illinois River Basin (same as above?)
Illinois State Comprehensive Management Plan for Aquatic Nuisance Species
Kaskaskia River Watershed: An Ecosystem Approach to Issues & Opportunities
Land and Resource Management Plan
 Midewin National Tallgrass Prairie
 Shawnee National Forest
National Wildlife Refuge Comprehensive Conservation Plans
 Crab Orchard National Wildlife Refuge
 Cypress Creek National Wildlife Refuge
 Illinois River National Fish and Wildlife Refuges
 Mark Twain National Wildlife Refuge Complex
 Upper Mississippi River National Wildlife and Fish Refuge
North American Bird Conservation Initiative
 Central Hardwoods Joint Venture Concept Plan
North American Waterbird Conservation Plan
 Upper Mississippi Valley/Great Lakes Regional draft
North American Waterfowl Management Plan
 Upper Mississippi Valley/Great Lakes Joint Venture
Northern Bobwhite Conservation Initiative
 Bird Conservation Regions 22 & 24

Table 3, continued.

Partners in Flight

North American Landbird Conservation Plan

Physiographic regions 14, 16, 20, 31, 32

Statewide Comprehensive Outdoor Recreation Plan

Statewide public lands Wildlife Habitat Development Project, Wildlife Plan Format
Manual & Guide (Federal Aid Project W-76-D)

United States Shorebird Conservation Plan

Upper Mississippi Valley/Great Lakes Regional Shorebird Conservation Plan

Recovery plans - federally listed species

Iowa Pleistocene Snail

Recovery plans - state listed species

A Plan for the Recovery of the Greater Prairie-Chicken in Illinois

Illinois River Otter Recovery Plan

Illinois Cave Amphipod

Table 4. Criteria for Selecting Illinois' Species in Greatest need of Conservation.

1. All species listed as threatened or endangered in Illinois, including federally listed species that occur within the State.
 2. Species with a global conservation rank indicator of G1, G2, or G3.
 3. Species is rare (small or low population size, density or range) or has significantly declined in abundance or distribution from historical levels.
 4. Species is dependent upon a rare or vulnerable habitat for one or more life history needs (breeding, migration, wintering).
 5. Species is endemic to Illinois, or the Illinois population is disjunct from the rest of the species' range.
 6. Illinois' population of a species represents a significant proportion of the species' global population.
 7. Species is representative of broad array of other species found in a particular habitat.
 8. Species' status is poorly known, but available evidence suggests conservation concern.
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Table 5. Habitat categories and definitions used in the Illinois Comprehensive Wildlife Conservation Plan/Strategy (modified from White 1978 - the Illinois Natural Areas Inventory).

Forest (6 categories; habitats with >80% wooded canopy)

Upland forests, forests that normally do not flood

Sand forest, forests with sandy soils

Floodplain forests, forests that periodically flood

Flatwoods, forests on level or nearly level soils with an impermeable or slowly permeable layer

Successional, a regenerating forest, including 'old fields' with >30% woody cover

Coniferous plantation

Open Woodland/Savanna/Barren (4 categories; habitats with 10-80% wooded canopy and herbaceous ground layer)

Savanna, 10-80% canopy coverage with prairie flora ground layer

Sand savanna, savanna on sandy soils

Barren, inclusions of prairie flora within forests in southern and western Illinois

Open Woodland, inclusive term, especially for habitats with non-prairie ground layers

Grassland (10 categories; herbaceous habitats with <10% wooded canopy)

Prairie, grassland dominated by native grasses and forbs

Sand prairie, prairie with sandy soils

Gravel prairie, prairie with gravelly soils

Dolomite prairie, prairie with dolomite <1.5 m below the surface

Hill prairie, droughty prairie opening on a forested slope

Shrub prairie, community dominated by shrubs and grasses

Hay, grasses and/or legumes that are regularly mechanically harvested

Pasture, herbaceous vegetation that is regularly grazed by livestock

Table 5, continued.

Idle-Introduced, meadow dominated by introduced grass species and not hayed or grazed

Early successional, young herbaceous habitats ranging from bare soils to 'old fields' with <30% woody cover

Wetland (9 categories; hydric habitats with water depths <5 feet)

Marsh, graminoid-dominated wetland with water at or above the soil surface most of the year

Swamp, forested permanent or semi-permanent body of water

Bog, wetlands with low-nutrient, acidic peat deposits

Fen, peat wetland formed with calcareous seepage

Sedge meadow, wetland dominated by sedges

Panne, wet swales of calcareous sand near Lake Michigan

Seep & Spring, saturated soils (seep) and outflow (spring) of ground water

Vernal pool, shallow pools that lose all surface water in most years

Flat, bare soils and early successional vegetation following receding waters

Lake & Pond (4 categories; standing water habitats with water depths >5 feet and general lack of emergent vegetation)

Pond, a small, standing water habitat

Lake, standing water habitat, large and deep enough to have a at least a partial barren, wave-swept shore

Lake Michigan

Impoundment, human-created standing water habitat

Streams (6 categories; flowing water habitats)

Coolwater stream, <200 sq. mile watershed stream with maximum water temperatures typically below 65 F

Table 5, continued.

Warm-water stream, <200 sq. mile watershed stream with max. water temperatures above 65 F

River, >200 sq. mile watershed stream

Major River Channel, main channel of the Mississippi, Illinois, Wabash and Ohio Rivers

Major River Side-Channel

Backwater, area of little or no current, connected to the river during flood events

Primary (3 categories; habitats with little or no soil and maintained in the early stages of primary succession)

Glade, a forest opening caused by bedrock at or near the surface

Bluff & Cliff, vertical exposures of bedrock and unconsolidated material

Lakeshore, lake deposited sands

Cave (2 categories; subterranean dissolution, collapse or crevice habitats not penetrated by sunlight)

Aquatic, pools, streams and waterfalls in caves

Terrestrial, air filled cavities in rock

Cultural (2 categories; human-dominated habitats)

Cropland, fields of row crops, small grains and other crops

Developed land, areas dominated by human structures (buildings, roads, etc.)

Table 6. Stresses considered as potentially having adverse effects on Illinois' Species in Greatest Need of Conservation. Experts ranked each stress as had, having, or likely to have little or no effect on population viability or abundance (1); had, having, or likely to have a moderate effect on population viability or abundance (2); and had, having, or likely to have a severe effect on population viability or abundance (3), and qualified available information for making these determinations as medium/high confidence, low confidence, and very low confidence/no available information.

Habitat Stresses (6):

Extent, the gross amount of habitat

Fragmentation, includes the effects of isolation (the physical separation of habitat patches), juxtaposition (the relative position of habitat types), patch size (the size of individual habitat patches) and edge effects (phenomena of ecotones and patch edges, such as increased mortality)

Composition-Structure, the biological and physical attributes of habitat within a patch

Disturbance/Hydrology, disturbance regimes are the frequency, timing and intensity of disturbances such as fire, and hydrology relates to patterns in water level and availability

Invasives/Exotics, novel species that are changing a habitat (overlaps other habitat stress categories)

Pollution - Sediment, abnormal inputs of chemical or physical materials or heat

Community Stresses (7):

Competitors

Predators

Parasites-Disease

Prey-Food

Hosts

Invasives/Exotics (overlaps one or more community stress category)

Other Symbionts

Table 6, continued.

Population Stresses (4):

- Genetics, genetic problems such as inbreeding, outbreeding depression
- Dispersal, movement of individuals among habitat patches and/or subpopulations
- Recruitment, addition of individuals to breeding populations (birth rates and survival from birth to maturity)
- Mortality

Direct Anthropogenic Stresses (3):

- Killing, direct killing/removal by humans
 - Disturbance, direct harassment by humans
 - Structures-Infrastructure, killing or harassment by structures (dams, towers, etc.) or infrastructure (roads, utility lines, etc.)
-

Table 7. Step-down of statewide habitat objectives to the natural division level. All objectives are in thousands of acres. Not all acreages have been allocated to natural divisions.

Natural Division	% of State Land Area	Upland & Bottomland Forest		Open Woodland, Savanna & Barrens		Grassland		Wetland		Lake & Pond
		Current % Forest Cover ¹	Net Change Objective	Current % Partial Canopy Cover ¹	Net Change Objective	Current % Grassland Cover ¹	Net Change Objective	Current % Wetland Cover ¹	Net Change Objective	Current % Water Cover ¹
Coastal Plain	1.3	23.4	18	1.2	4	20.7	0	3	20	1.5
Grand Prairie	36.1	5.1	54	0.9	45	9.4	400	0.2	5	0.7
Illinois & Mississippi River Sand Areas	0.8	14.9	4	1.1	8	14.8	21	1	1	1.5
Lake Michigan	N/A	0	0	0	0	0	0	0	0	100
Lower Mississippi River Bottomlands	1	11.1	11	0.5	0	5.8	10	3.4	4	2.7
Middle Mississippi Border	4.1	22.8	22	3.1	8	16.1	31	0.2	0.4	0.5
Northeastern Morainal	6.8	9.2	8	4.1	12	10.7	20	1.4	1.5	2
Ozark	1.1	38.1	11	1.4	8	19.7	0	0.7	0.2	0.8
Rock River Hill Country	4.1	9.1	14	1.4	15	16.4	52	0.4	1.5	0.8
Shawnee Hills	2.4	50.1	22	1.7	11	27.6	0	0.9	0.2	1.5
Southern Till Plain	20.1	17.1	65	2.9	75	11	240	1.5	3.8	1.8
Upper Mississippi and Illinois River Bottomlands	3.4	12.2	36	0.6	0	8.8	31	4.6	20	4.6

Table 7, continued.

Natural Division	% of State Land Area	Upland & Bottomland Forest		Open Woodland, Savanna & Barrens		Grassland		Wetland		Lake & Pond
		Current % Forest Cover ¹	Net Change Objective	Current % Partial Canopy Cover ¹	Net Change Objective	Current % Grassland Cover ¹	Net Change Objective	Current % Wetland Cover ¹	Net Change Objective	Current % Water Cover ¹
Wabash Border	4.7	14.7	22	4	11	8.4	42	0.2	3	1.4
Western Forest-Prairie	12.5	16.7	47	1	45	13.8	135	0.4	2	0.8
Wisconsin Driftless	1	30.4	11	3.6	4	26	0	0.2	0.2	0.6
ILLINOIS	100	12.9	350	1.7	250	11.7	1000	0.8	65	1.2

¹Current habitat coverages from Land Cover of Illinois 1999-2000. 'Partial canopy' was used to index Open Woodland, Savanna & Barrens; Grassland is 'rural grassland' land cover.

TABLE 8. Conservation Opportunity Areas.																								
Site -Area	Natural Division											Habitat												
	Coastal Plain	Grand Prairie	Sand Areas	Lwr Miss Btmld	Lake Michigan	Mddl Miss Border	Northeast Moraine	Ozark	Rock River Hills	Shawnee Hills	Southern Till Plain	Uppr MS/L Btmld	Wabash Border	Wstrn Forest-Prairie	Wisconsin Driftless	Forest	Savanna-Barren	Grassland	Emergent Wetland	Forested Wetland	Stream	Lake & Pond	Cave	Primary
Cache River - Cypress Creek	X																		X					
Grand Prairie Grassland Restoration		X															X							
Midwin - Des Plaines - Goose Lake Prairie		X															X							
Kankakee Sands - Kankakee River - Momence Wetlands - Pembroke Savanna		X														X	X	X		X				
Green River		X															X	X		X				
Lower Fox River		X																		X				
Mason County Sand Areas			X													X	X	X				X		
Lost Mound - Hanover Bluff - Mississippi Palisades			X								X			X	X	X	X		X	X				X
LaRue - Pine Hills - Western Shawnee - Trail of Tears				X			X		X							X	X		X				X	X
Pere Marquette					X						X		X			X	X			X				X
Coon Creek - Kishwaukee River - Crow's Foot Marsh						X												X		X				
Illinois Beach - Chiwaukee Prairie				X		X												X				X		X
Lake-McHenry Wetland Complex						X										X	X	X				X		
Upper Des Plaines River						X										X		X		X				

Table 9. Expected updates to the Illinois Comprehensive Wildlife Conservation Plan & Strategy, and their relative frequency.

Perpetual revisions:

- Update databases contributing to the Action Plan, including the Biotics 4 database, Fisheries basin surveys, mussel database, conservation practices tracking database
- Communicate with partner agencies and organizations on implementation, monitoring, evaluation, and revision to conservation actions
- Listen to public natural resource concerns, and respond as appropriate
- Assist in local or region 'step-down' conservation planning, including development of Conservation Opportunity Areas

Annual to biennial revisions:

- Compile the results of surveys, research, and monitoring programs
- Respond to emerging issues and developing opportunities
- Evaluate the effectiveness of conservation actions, and modify as indicated

Two- to five-year revisions:

- Evaluate the status, distribution, and stresses to the Species in Greatest Need of Conservation. The Endangered Species Protection Board formally reviews the state's lists of threatened and endangered species at 5-year intervals (scheduled for 2009 and 2014). Updating the lists of Species in Greatest Need of Conservation can be largely integrated into the activities of the Endangered Species Technical Advisory Committees.
- Evaluate the location and relative condition of habitat types. Land cover analyses have recently been updated at 4-5 year intervals, and this should continue, as land use (especially with respect to development) changes very rapidly in many parts of Illinois. Periodic reports for the Critical Trends Assessment Program provide an excellent summary of the overall condition of Illinois' forests, grasslands, wetlands, and streams.

Table 9, continued

- Identify priority survey and research efforts to determine status, assist in restoration, and improve conservation of wildlife and habitat resources.
-

Table 10. Timeline and activities for 10-year revision to the Illinois Comprehensive Wildlife Conservation Plan & Strategy.

<u>Time to Due Date</u>	<u>Activity</u>
-24 months	Select revision team (coordination, information management, and partner/public contact)
-23 months	Form steering committee of internal and external partners to guide process
-22 months	Revision team reviews plan/strategy, existing databases, and other conservation plans
-20 months	Based on current conditions, revision team refines process outlined here
-18 months	Revision team identifies than assists experts in performing status and stress assessment for Species in Greatest Need of Conservation and habitats
-16 months	Illinois Department of Natural Resources and partners revise wildlife and habitat goals
-12 months	Regional planning workshops to identify issues, revise conservation strategies, and modify Conservation Opportunity Areas
-10 months	Revision team develops draft document
-4 months	Review - Illinois Department of Natural Resources, partners and public
-2 months	Final revision
Completion	Delivery of revised plan/strategy
+ 2 months	Approval of revised plan/strategy; share revised plan/strategy with conservation partners and the public

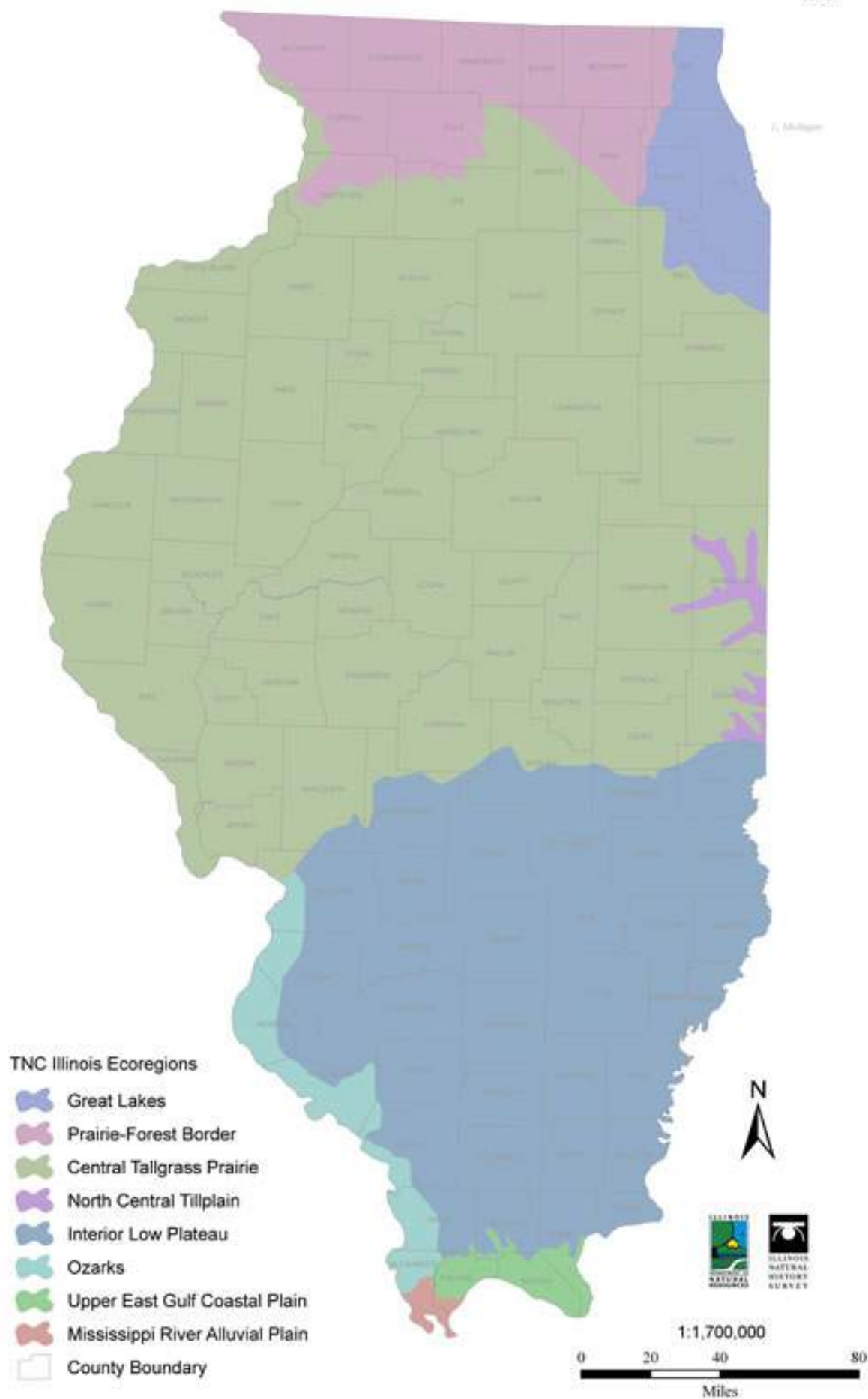


Figure 1. The Nature Conservancy's Ecoregions in Illinois.

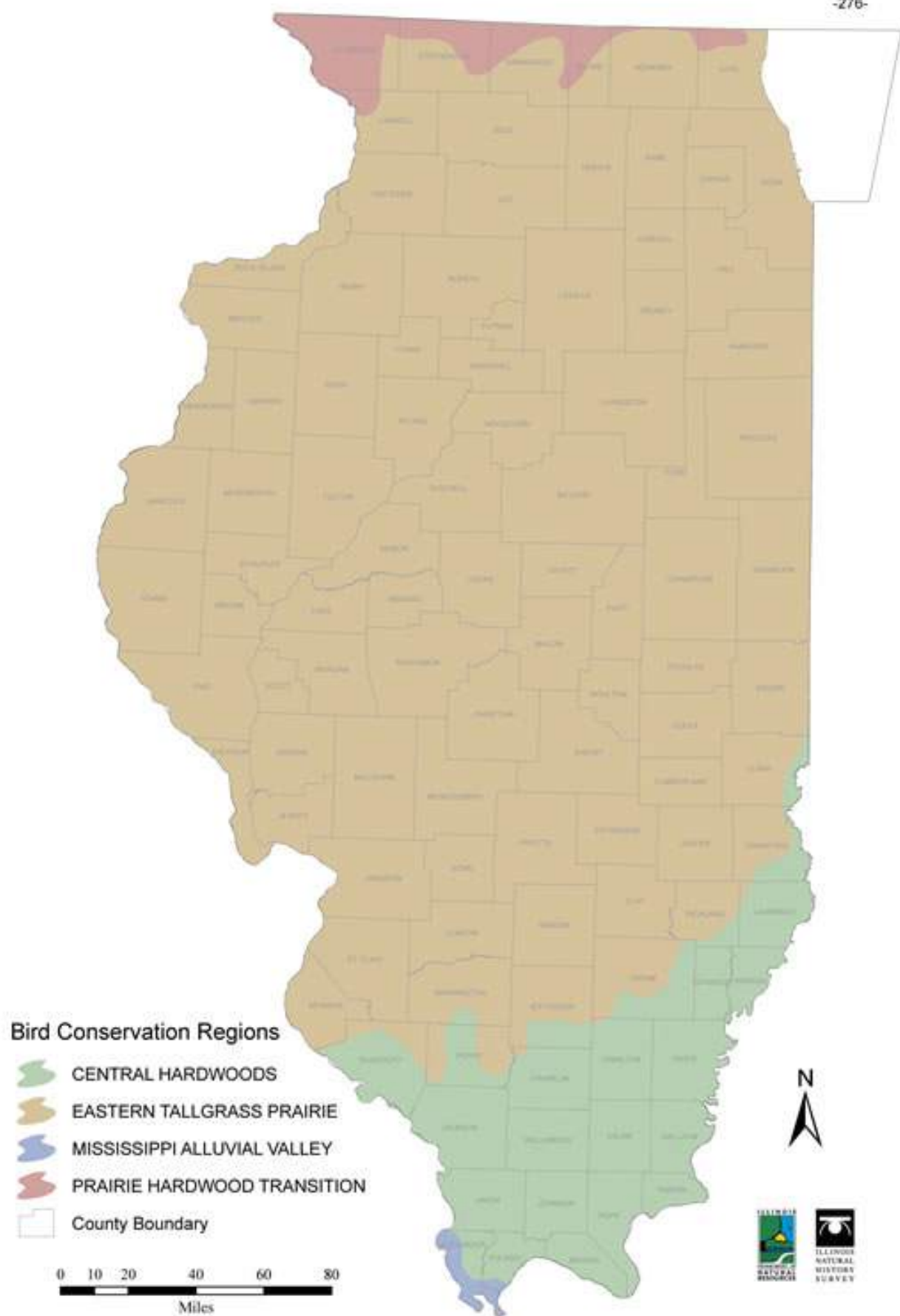


Figure 2. The North American Bird Conservation Initiative's Bird Conservation Regions in Illinois.

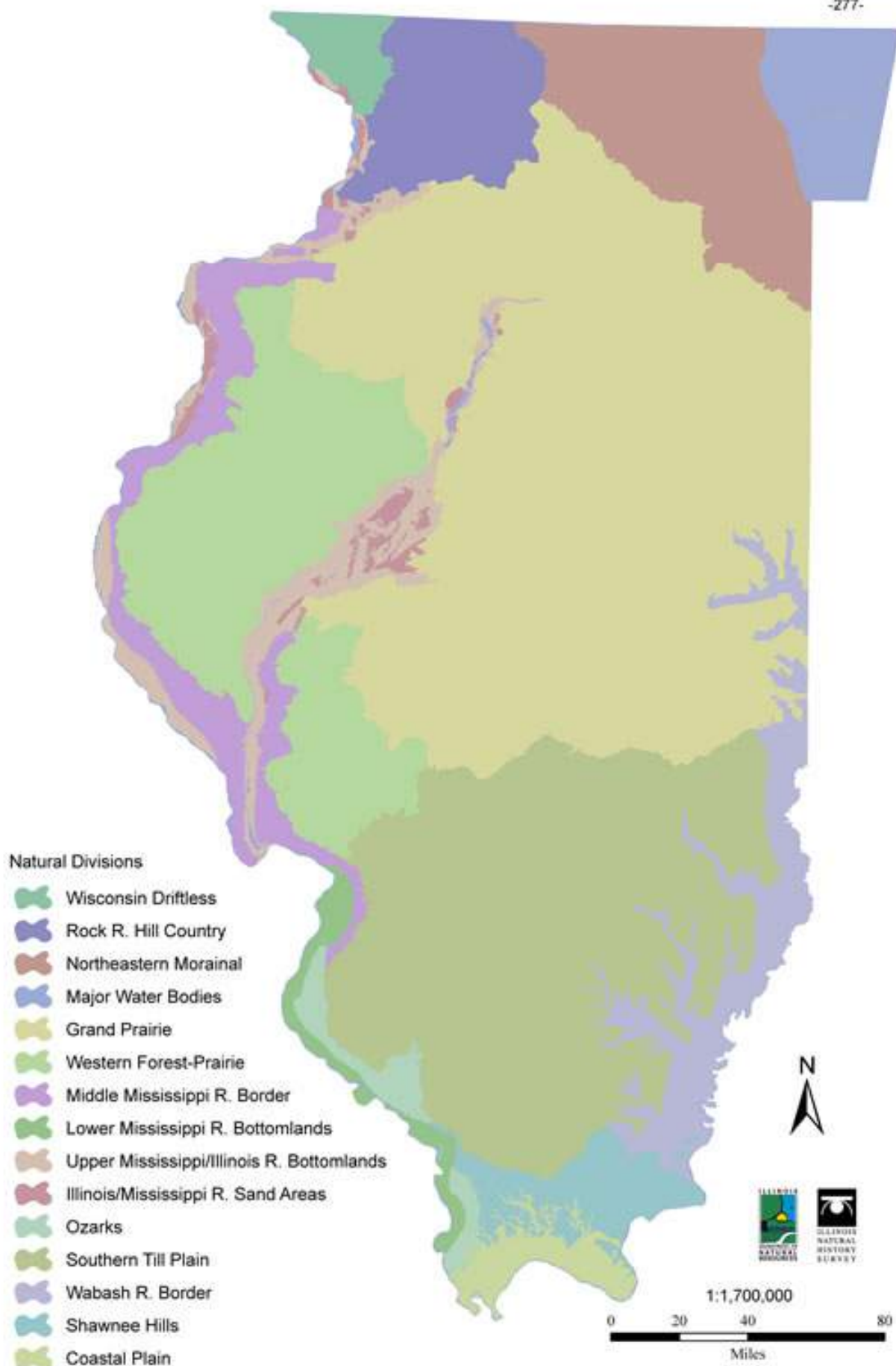


Figure 3. The Natural Division of Illinois. These 15 geographic regions are identified by distinctive geological and biological characteristics.

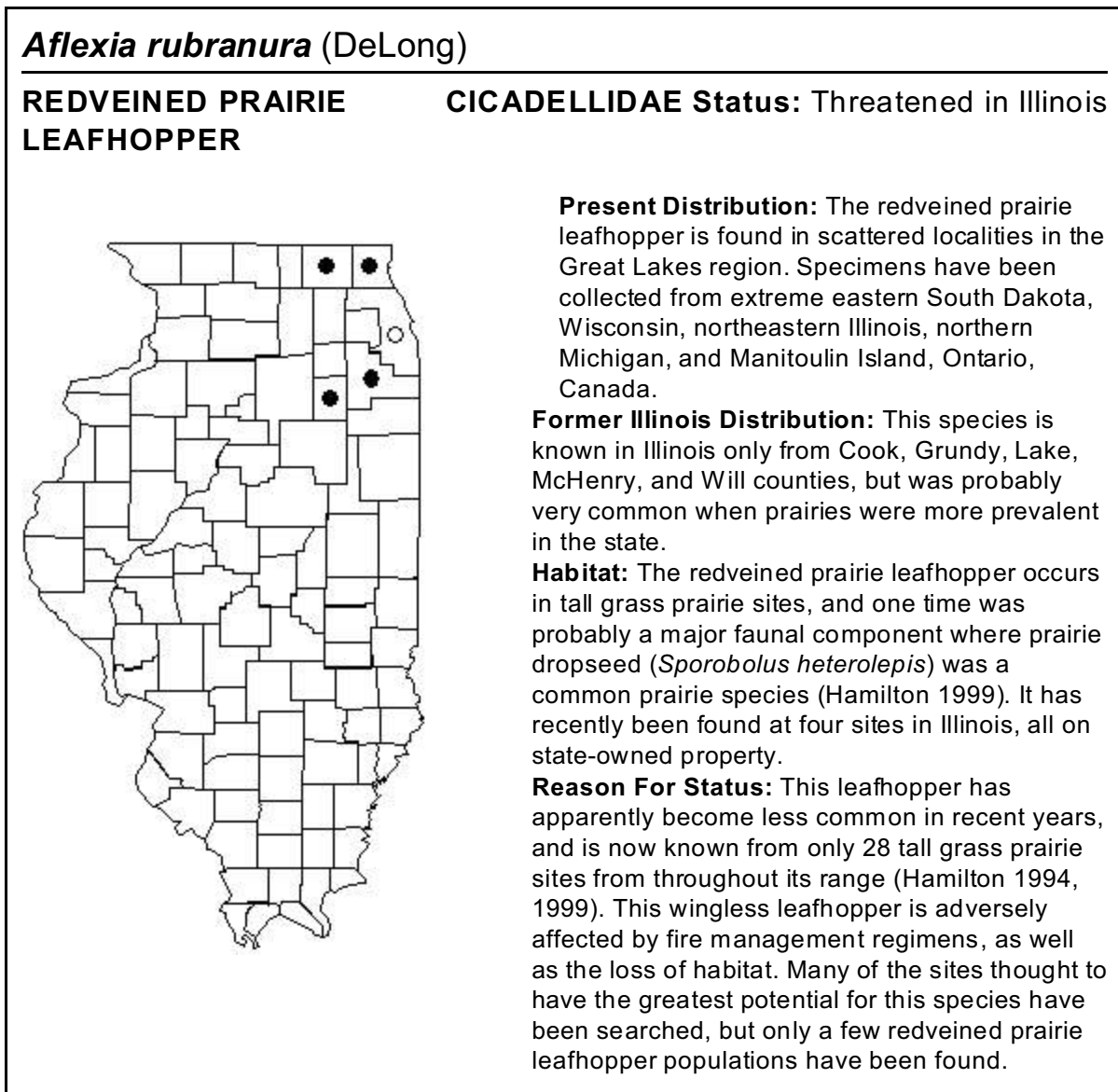


Figure 4. The information on distribution, abundance, habitat association, and status available for the red-veined prairie leafhopper in Nyboer et al. (2004). Similar accounts in this source are available for all of Illinois' Threatened and Endangered Species. The Illinois Department of Natural Resources' Biotics 4 database is the primary source for current distribution information in the state. All of these accounts are on the accompanying "Information on the Distribution and Abundance of Illinois' Species in Greatest Need of Conservation" disk.

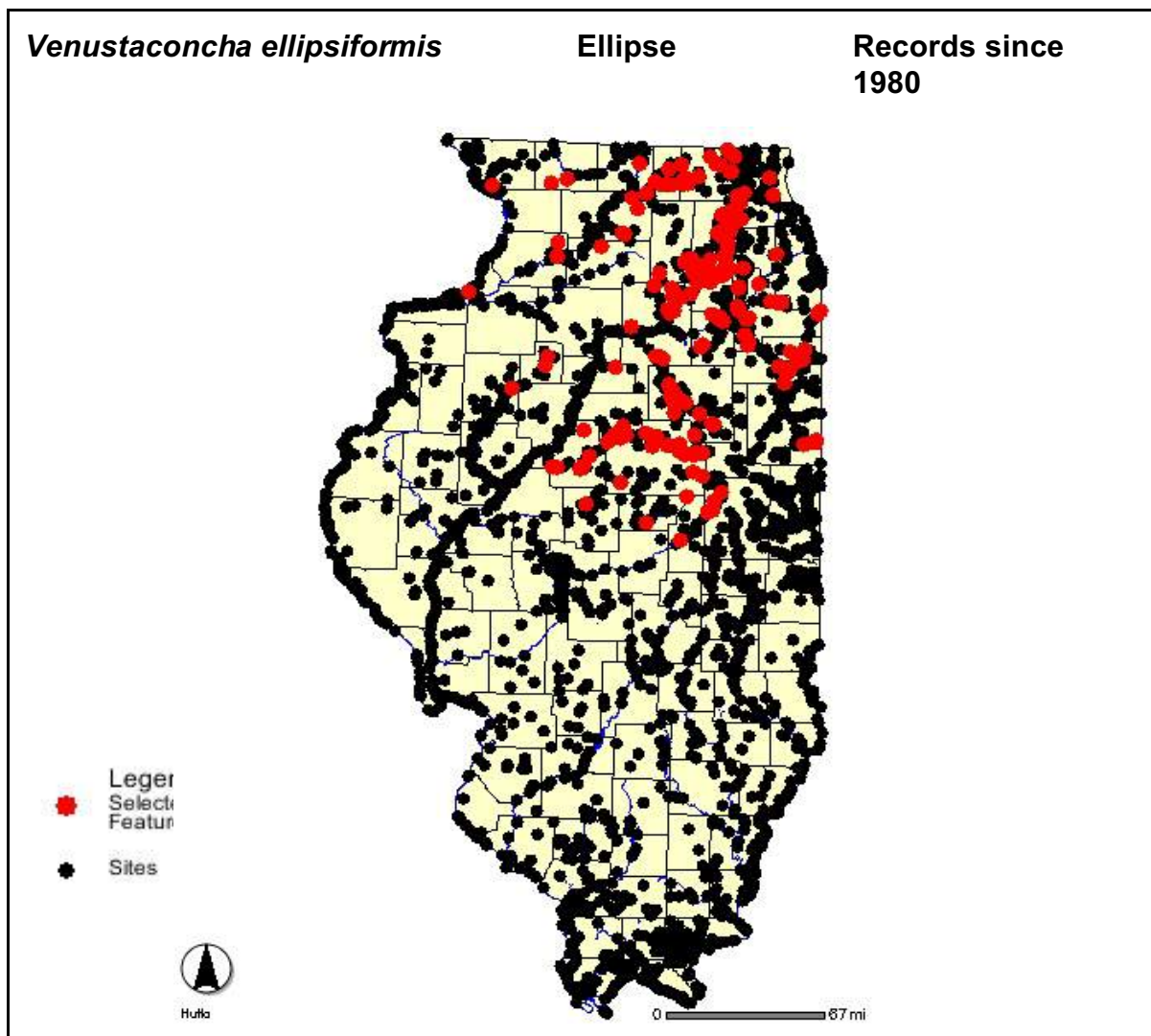


Figure 5. The information on distribution and abundance available for the ellipse, a freshwater mussel, in the Illinois Natural History Survey’s mussel database. Red dots indicate points where the species has been recorded since 1980, brown dots indicate all sample locations since 1980. The database includes location data, survey dates and personnel, and the number and size classes of all live, dead and relict individuals of all species on each survey date. Similar accounts in this source are available for all of Illinois’ Mussels in Greatest Need of Conservation. Similar maps for all of these species are on the accompanying “Information on the Distribution and Abundance of Illinois’ Species in Greatest Need of Conservation” disk.

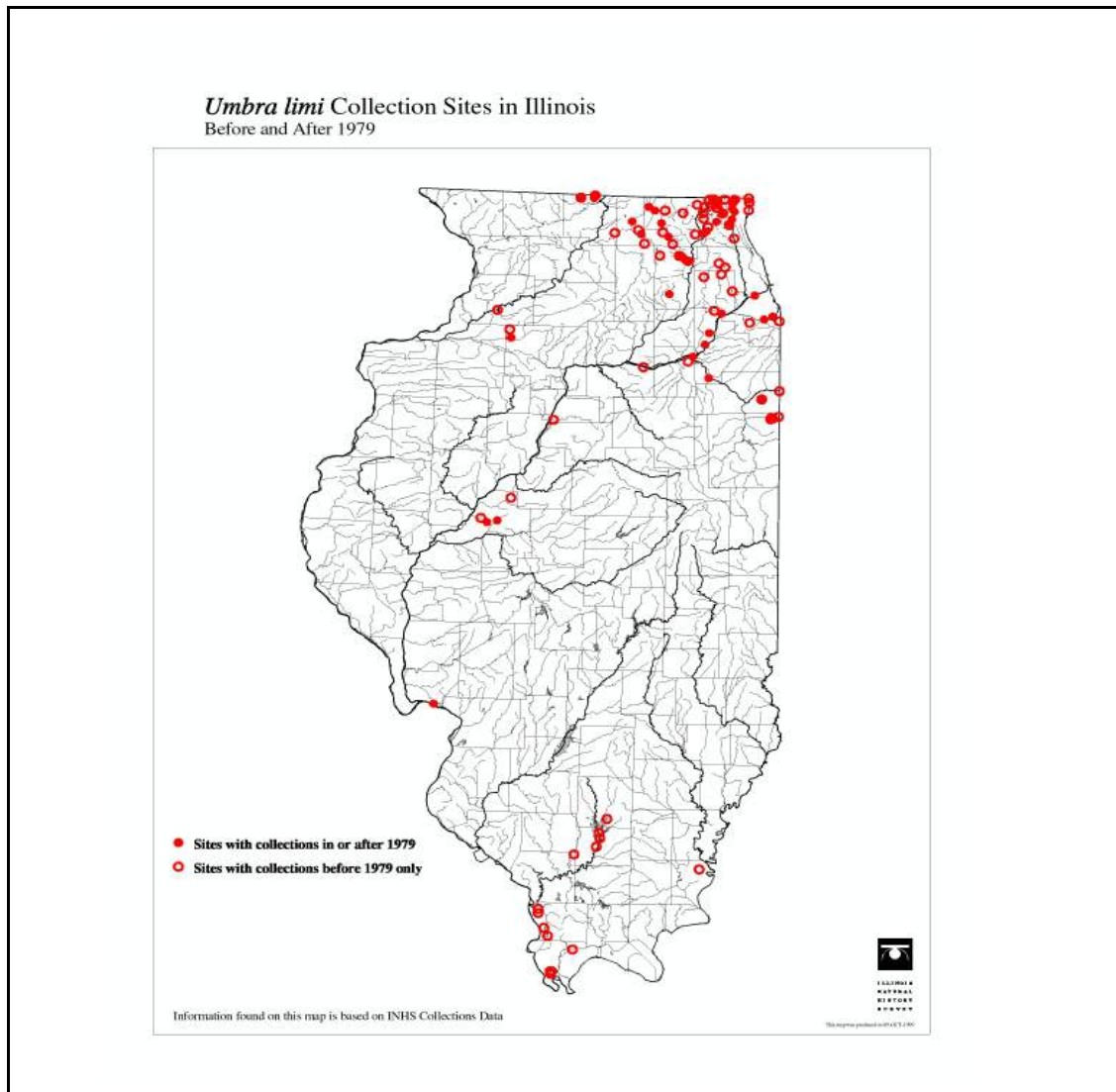


Figure 6. The information on distribution and abundance available for the central mudminnow, *Umbra limi*, in the Illinois Natural History Survey’s fish collections database. Closed dots indicate points where the species has been recorded since 1980, open dots indicate collections in 1979 or earlier. The database includes location data, survey dates and personnel, and the number and size classes of individuals of all species on each survey date. Similar accounts in this source are available for all of Illinois’ Fishes in Greatest Need of Conservation. Similar maps for all of these species are on the accompanying “Information on the Distribution and Abundance of Illinois’ Species in Greatest Need of Conservation” disk.

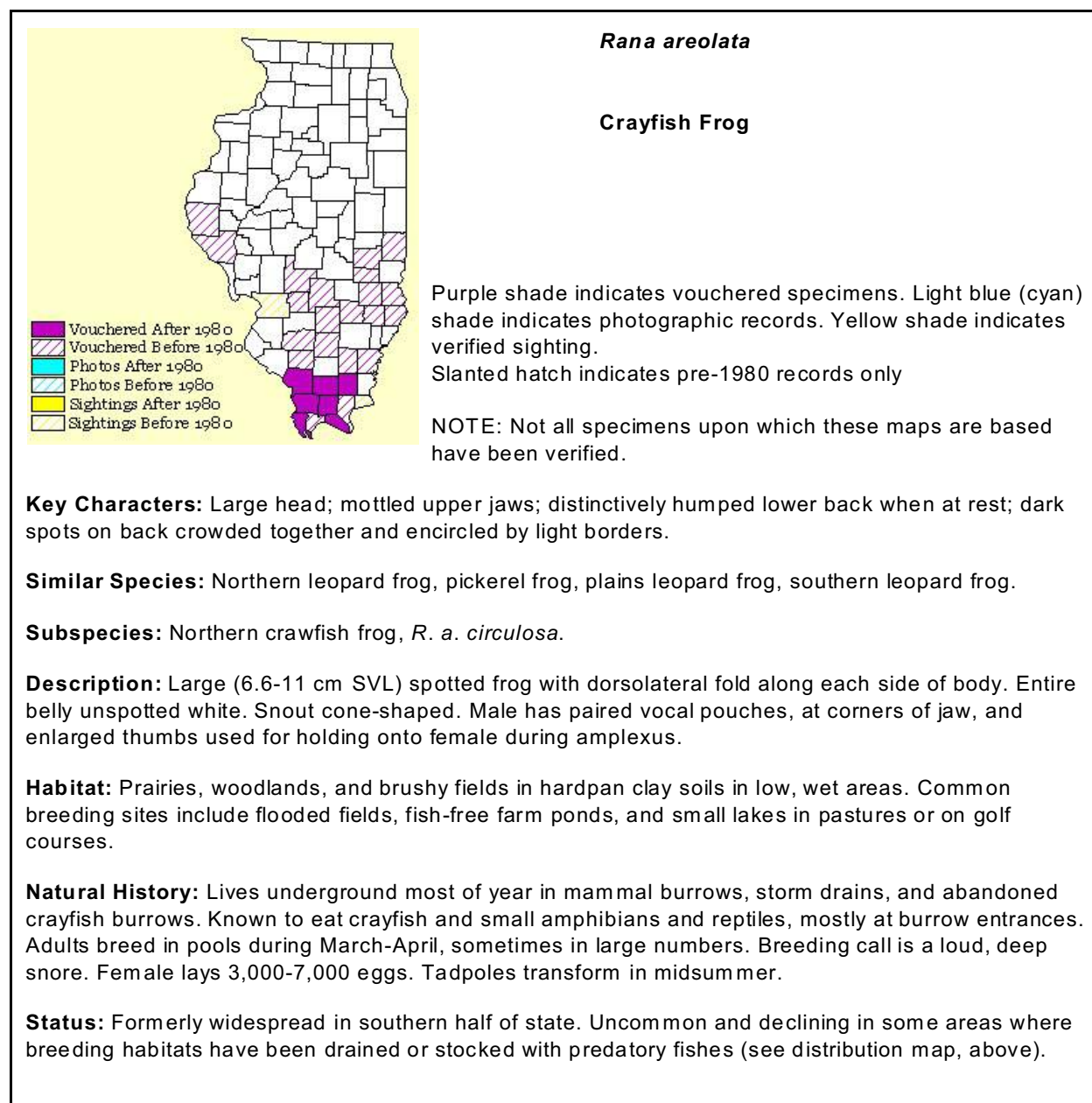


Figure 7. The information on distribution, abundance, habitat association, natural history and status available for the crayfish frog in Phillips et al. (1999). Similar accounts in this source are available for all of Illinois' Amphibians and Reptiles in Greatest Need of Conservation. All of these accounts are on the accompanying "Information on the Distribution and Abundance of Illinois' Species in Greatest Need of Conservation" disk.

Figure 8 (*following two pages*). The information on distribution, abundance, habitat association, and status available for the bobolink in Kleen et al. (2004). Similar accounts in this source are available for all of Illinois' Birds in Greatest Need of Conservation that nest within Illinois. Accounts for all of these species are on the accompanying "Information on the Distribution and Abundance of Illinois' Species in Greatest Need of Conservation" disk.

Bobolink

Dolichonyx oryzivorus



Chicago Academy of Sciences

Code: BOBO

Range-wide Distribution: southern Canada, south to central South America.

ILLINOIS

Abundance: common migrant and fairly common summer resident in north, decreasing southward.

Endangered/Threatened Status: none.

Breeding Habitat: prairies, tall grasslands, wet meadows, and cultivated cropland.

Nest: a cup of coarse grass and forbs lined with finer grasses, in dense cover on the ground.

Egg: 5–6, gray to pale reddish brown, marked with brown or purple.

Incubation: 10–13 days.

Fledging: from 10 to 14 days.

The plumage of the breeding male Bobolink is unique among North American songbirds in that it is white above and black below. Originally a prairie grassland species, the Bobolink now inhabits open fields, hayfields, pastures, and wet meadows and may prefer larger fields with a mixture of grasses and broad-leaved forbs (Martin and Gavin 1995; Fitzgerald and Pothley 2000). Males sing a bubbling song from elevated perches or while flying and circling over their territories. Bobolinks are polygynous; a male frequently pairs with multiple females and the female may lay a clutch of eggs sized by more than one male (Martin 1971; Bollinger

and Gavin 1991; Martin and Gavin 1995). Nests are built with grasses and sedges in depressions on the ground where taller vegetation provides shade. Bobolinks breed in southern Canada and the northern half of the U.S. Although populations fluctuate from year to year and place to place, the population has been steadily declining in recent years because of land use changes (e.g. loss of hayfields), changes in the vegetative composition of hayfields, and mowing practices (Martin and Gavin 1995).

Illinois History

During the late 1800s, Ridgway (1889) reported that the Bobolink bred only in the northern part of Illinois, where it was an abundant summer resident. Cory (1909) likewise indicated that it was "a common summer resident in northern Illinois". Graber and Graber (1963) reported a slight increase in the Bobolink population between 1909 and 1957. From the early 1900s to the 1950s most of the Bobolink population was in the northern part of the state but their numbers had increased substantially in central Illinois by the 1950s (Graber and Graber 1963).

Breeding Bird Survey Trends

Like most other grassland dependent species, Bobolink populations are in serious decline. BBS data indicate decreases in the population at -9.3% per year in Illinois (significant, $P < 0.01$) and -2.8% per year in the upper Midwest (significant, $P < 0.01$) for 1966–2000.

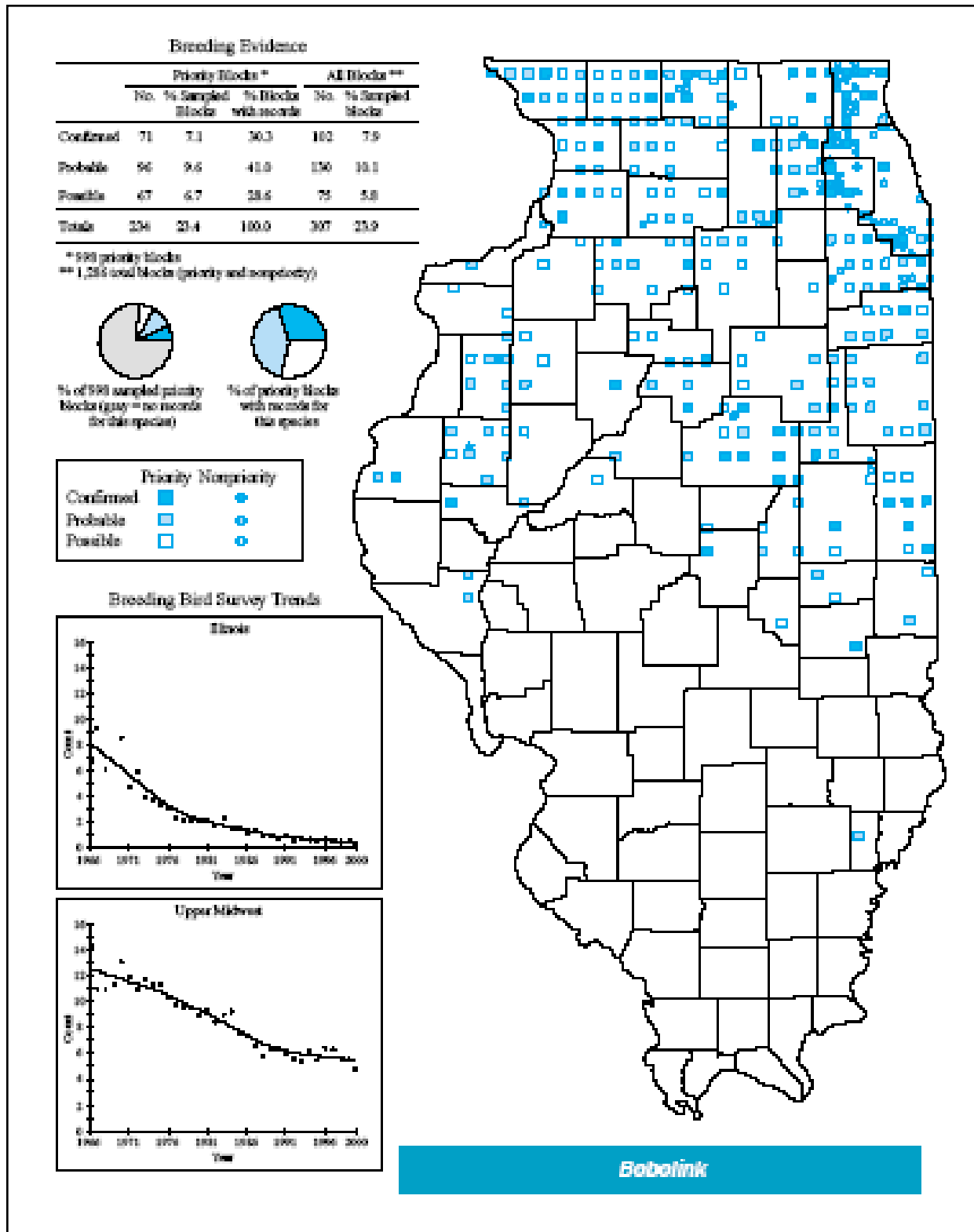
Credibility Index: $IL = 1$ and $UM = 1$.

Distribution

During the atlas project, the Bobolink was limited to the northern half of the state, where they were found in 50 and Confirmed as breeding in 27 counties. The record in Edwards County may have been migrants.

Frequency

The Bobolink was reported from 234 (23.4%) priority blocks and 73 nonpriority blocks. Breeding was Confirmed in 71 (7.1%) of the priority blocks; adults feeding young and fledged young were the most frequently used breeding evidence criteria for these 71 Confirmed records (25 FY and 20 FL records, respectively). It is likely that Bobolinks nested in most blocks in which they were reported.



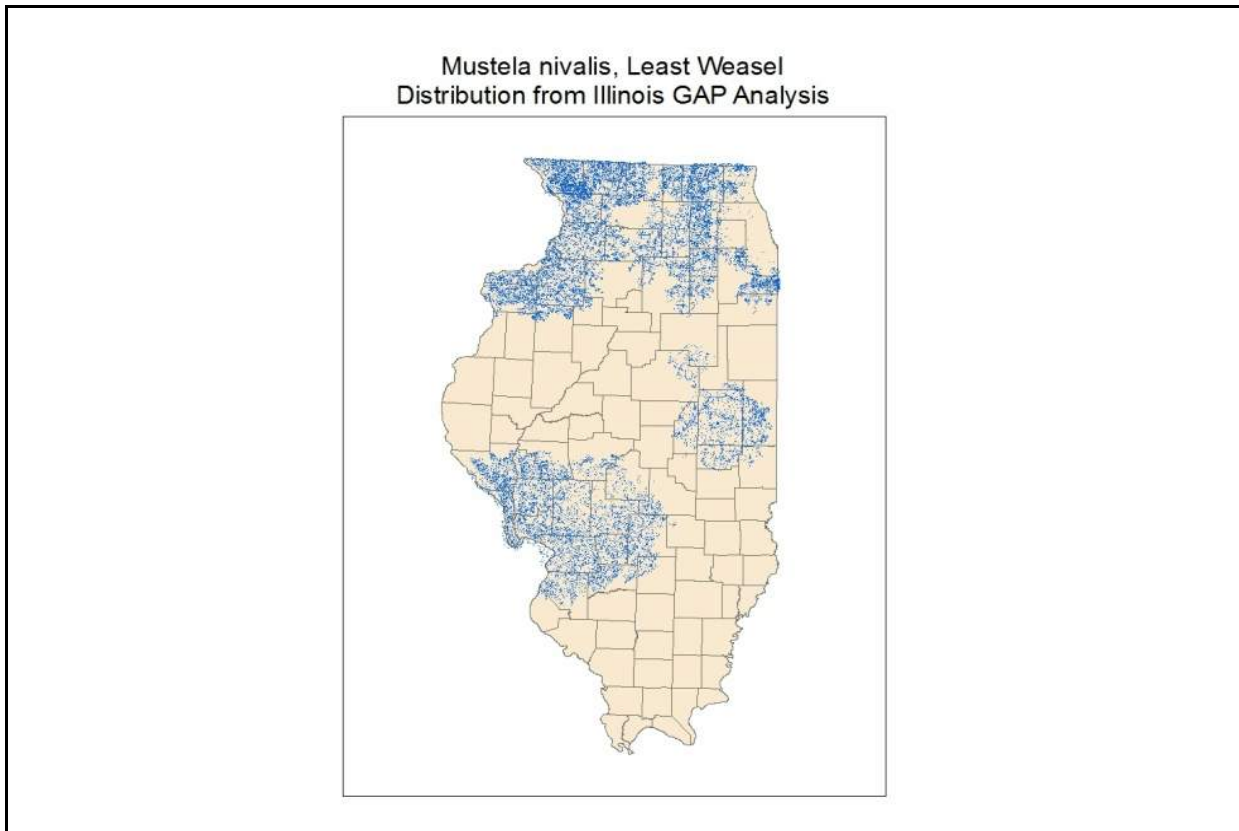


Figure 9. The information on distribution of the least weasel from the Illinois GAP Analysis Project (<http://www.inhs.uiuc.edu/cwe/gap/>). Similar maps from this project are available for all of Illinois' Amphibians, Reptiles, Birds and Mammals in Greatest Need of Conservation. All of these maps for amphibians, reptiles, migrant-only birds, and mammals are on the accompanying "Information on the Distribution and Abundance of Illinois' Species in Greatest Need of Conservation" disk.

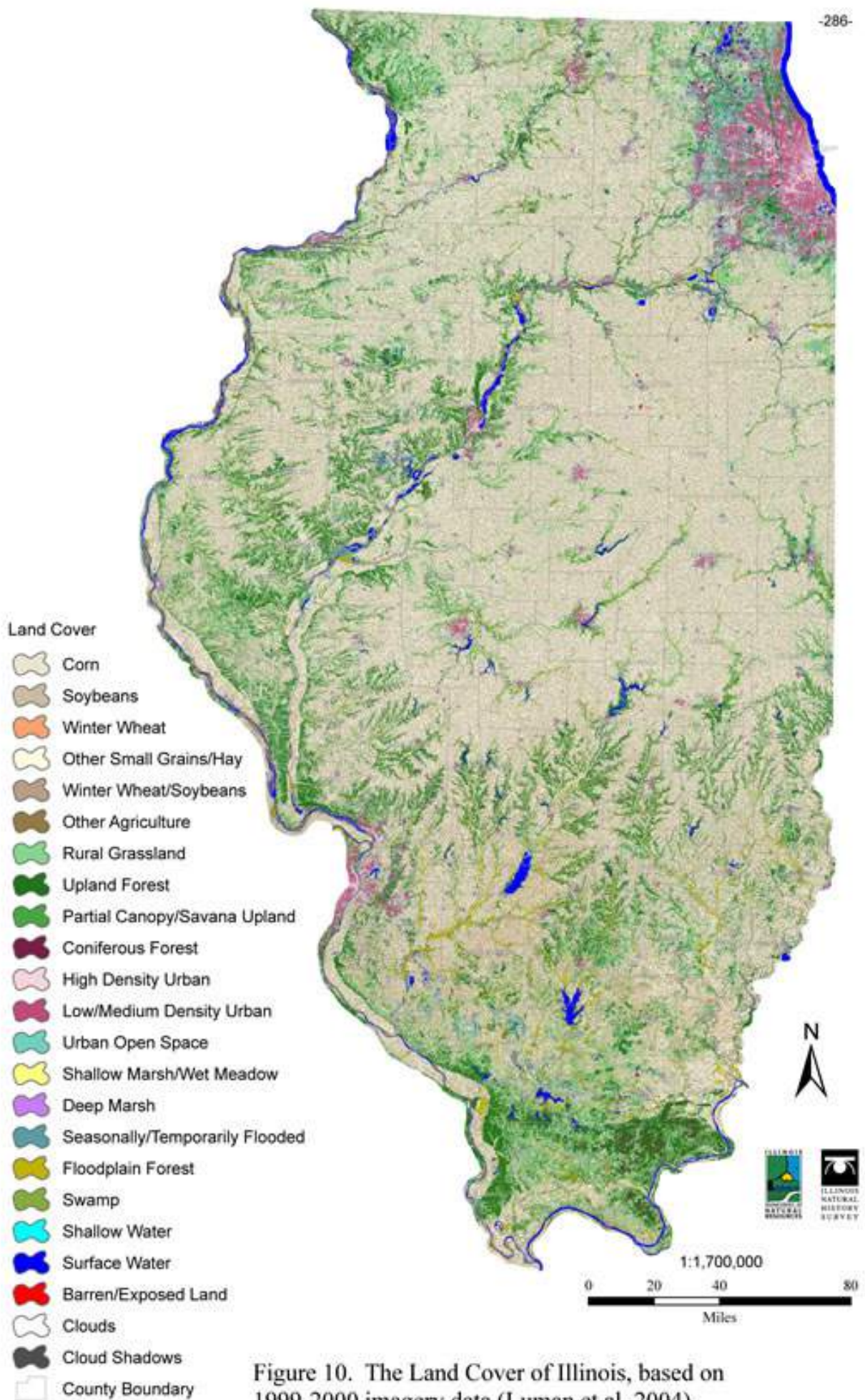


Figure 10. The Land Cover of Illinois, based on 1999-2000 imagery data (Luman et al. 2004).

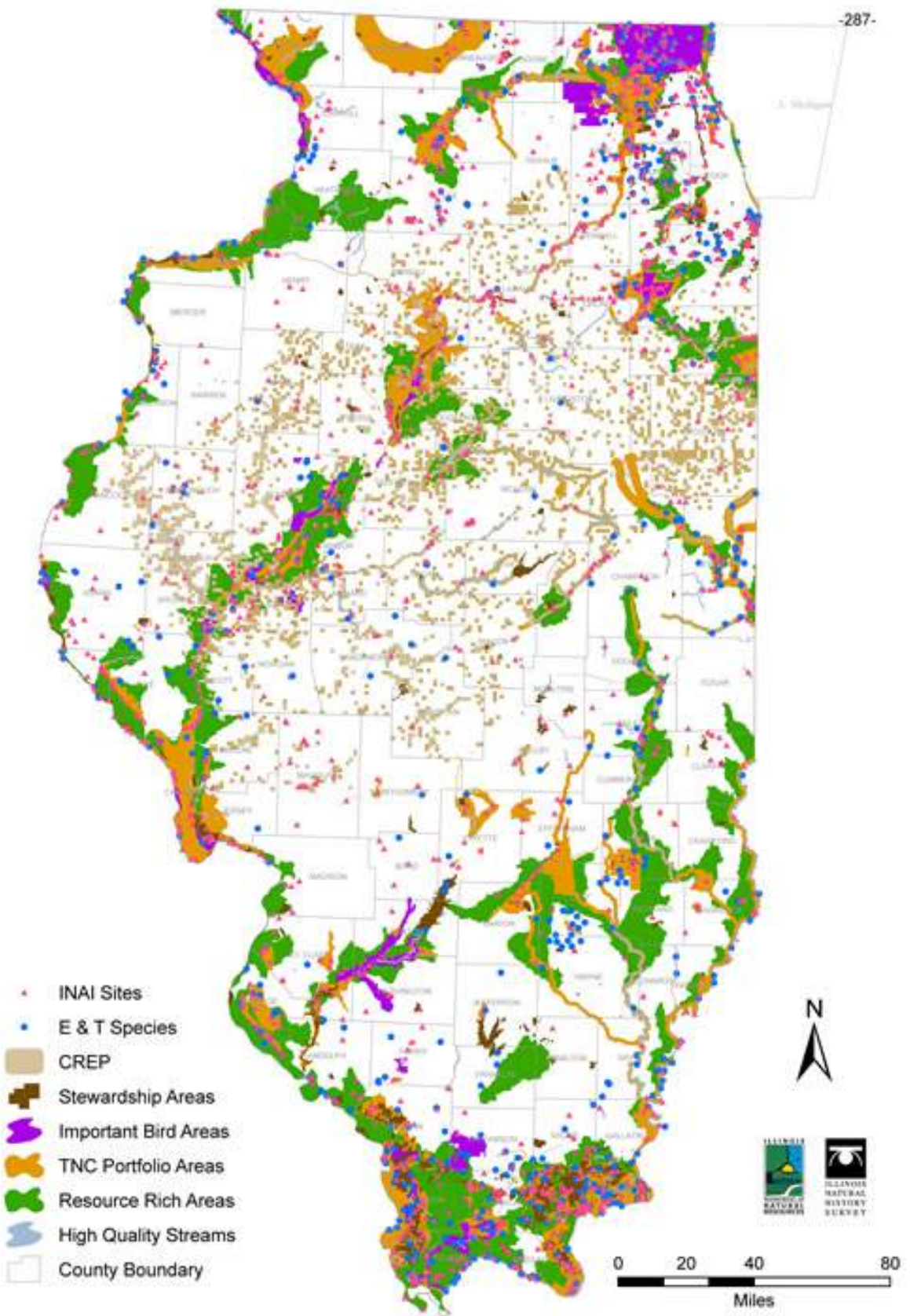


Figure 11. Priority conservation areas identified by other conservation plans and other known resource locations. Information on this map includes Illinois Natural Areas Inventory (INA I) sites, locations of Endangered and Threatened Wildlife since 1995 (E & T Species), sections with Conservation Reserve Enhancement Programs (CREP) contracts, conservation lands of federal, state and county agencies (Stewardship Areas), Important Bird Areas, The Nature Conservancy (TNC) Portfolio Areas, Resource Rich Areas (see Suloway et al. 1996), and Biologically Significant Streams and 'A'-quality streams of the Biological Stream Characterization (High Quality Streams).

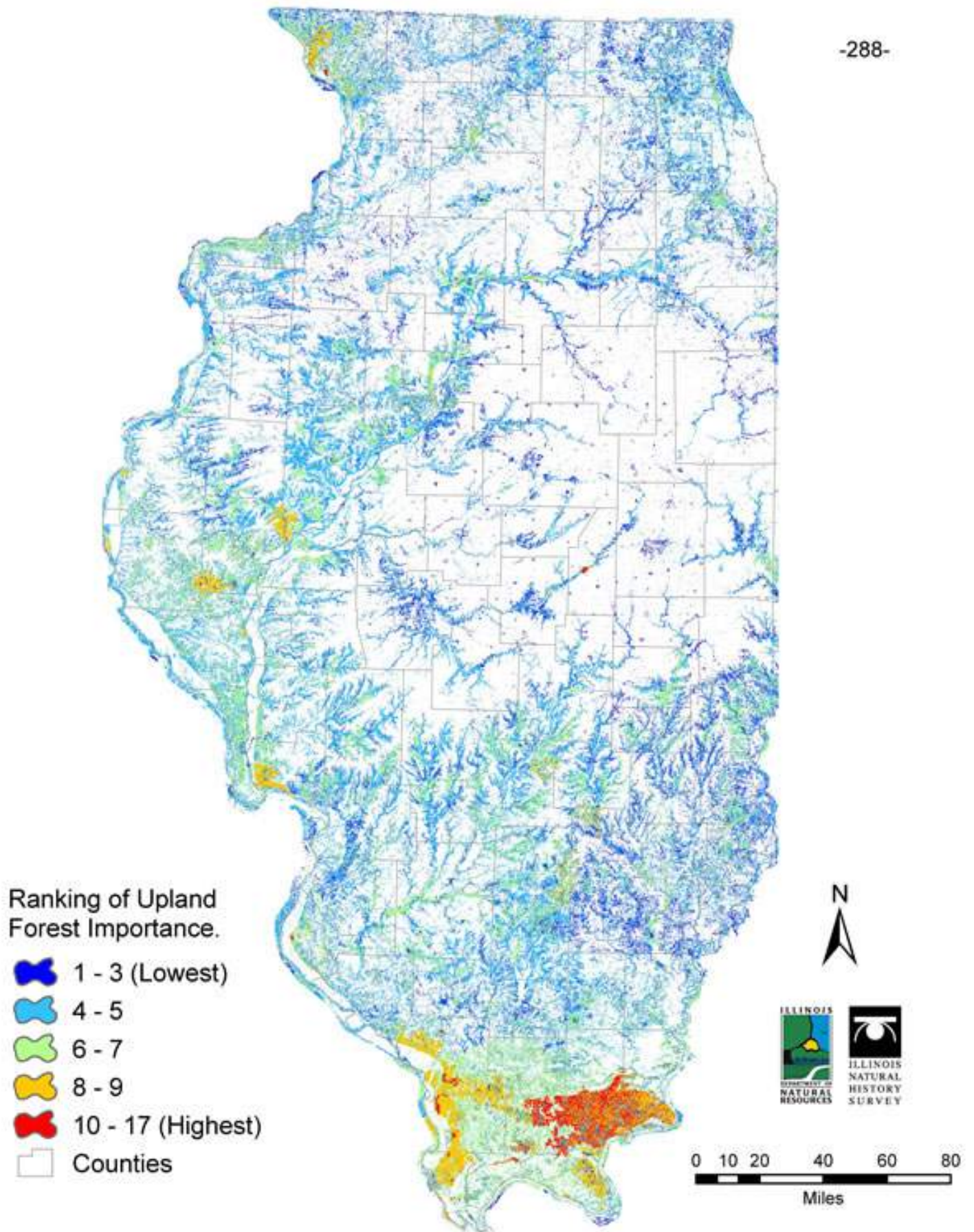


Figure 12. Ranking of upland forest habitat for Illinois' Species in Greatest Need of Conservation, based on forest size, diversity of Species in Greatest Need of Conservation predicted from GAP Analysis, known locations of endangered species, and Illinois Natural Areas Inventory forest communities.

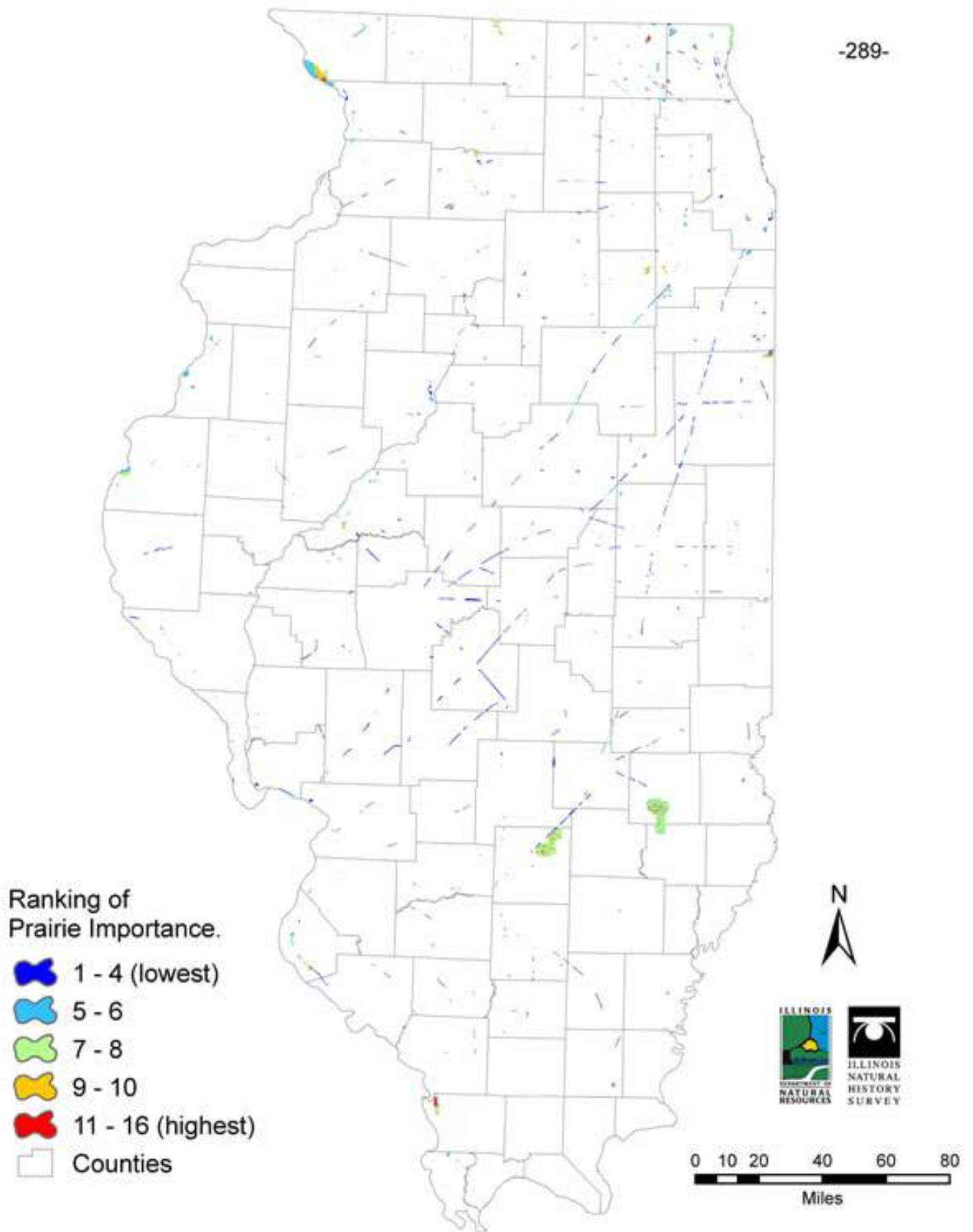


Figure 13. Ranking of prairie areas for Illinois' Species in Greatest Need of Conservation, based on diversity of Species in Greatest Need of Conservation predicted from GAP Analysis, known locations of endangered species, railroad prairie remnants and Illinois Natural Areas Inventory prairie communities.

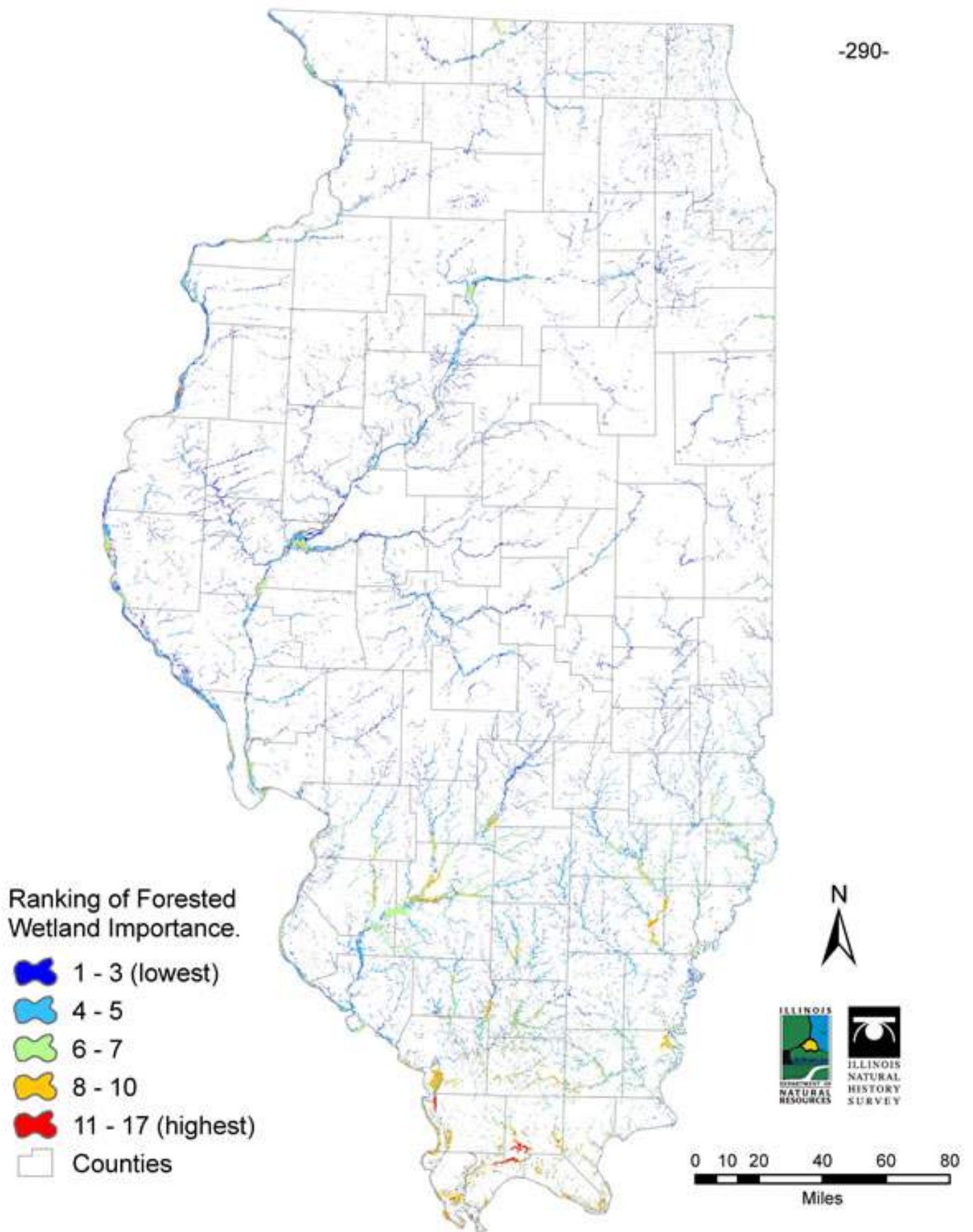


Figure 14. Ranking of forested wetland habitat (bottomland forest and swamp) for Illinois' Species in Greatest Need of Conservation, based on wetland size, diversity of Species in Greatest Need of Conservation predicted from GAP Analysis, known locations of endangered species, and Illinois Natural Areas Inventory forested wetland communities.

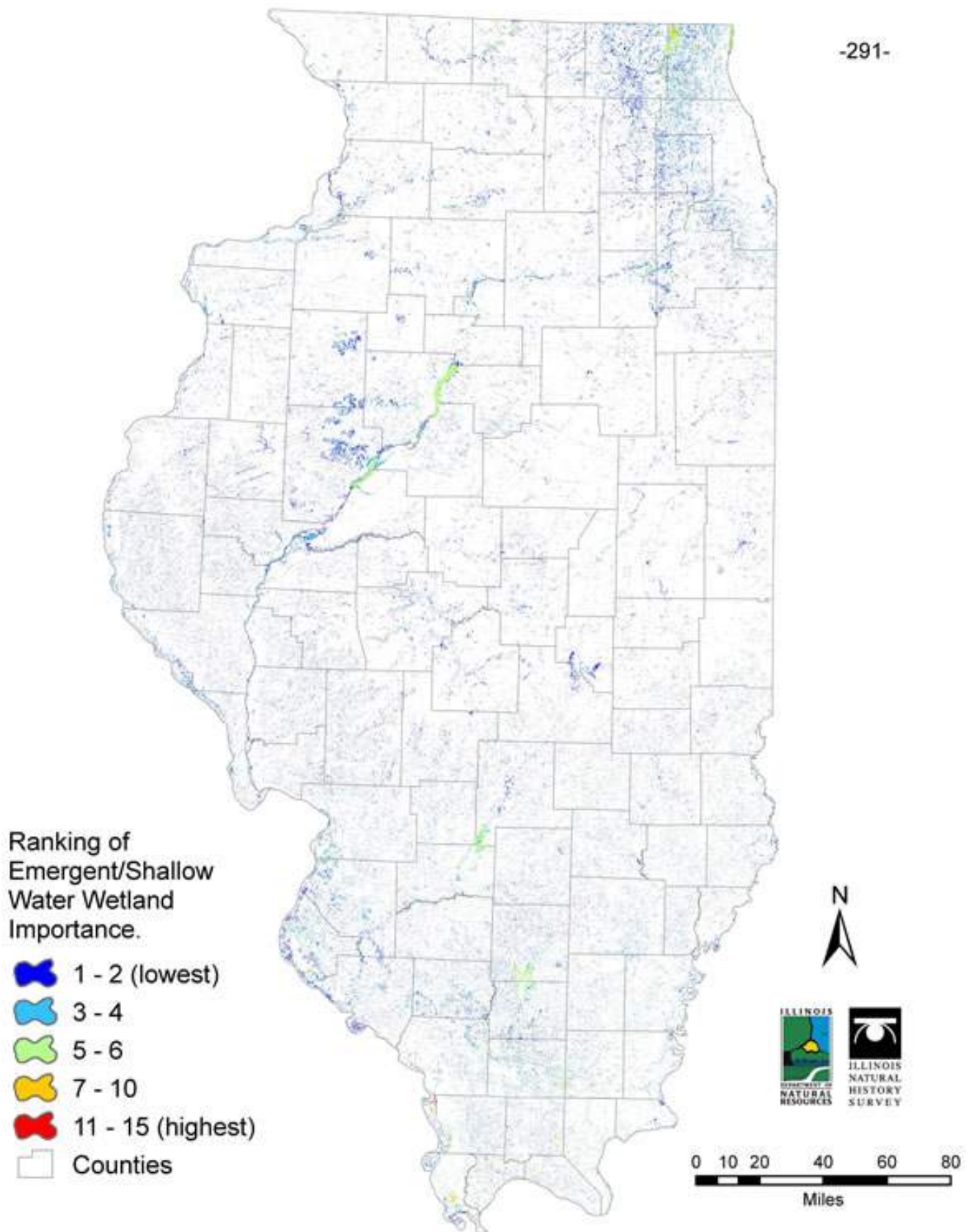


Figure 15. Ranking of emergent wetland habitat for Illinois' Species in Greatest Need of Conservation, based on wetland size, diversity of Species in Greatest Need of Conservation predicted from GAP Analysis, known locations of endangered species, and Illinois Natural Areas Inventory emergent wetland communities.

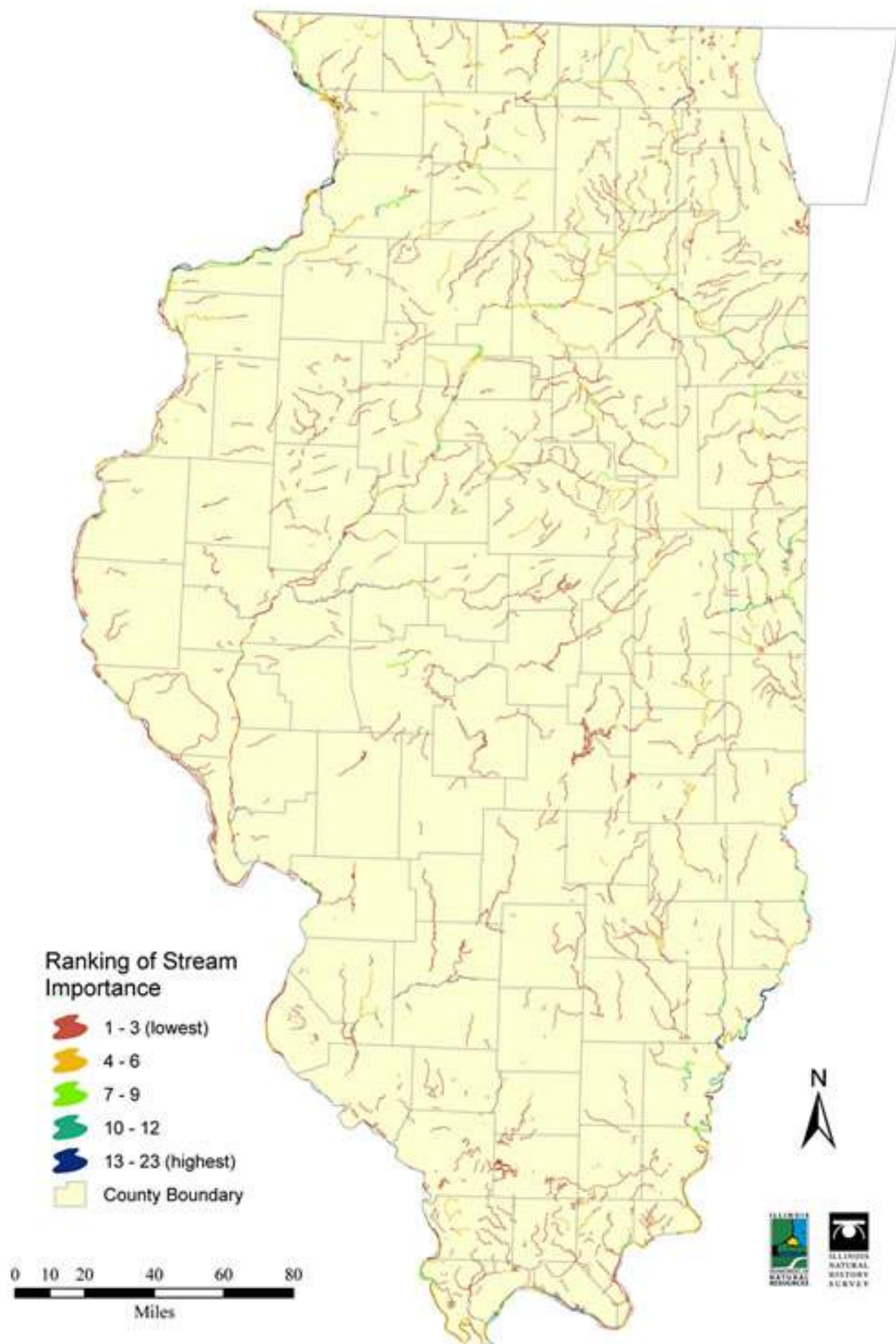


Figure 16. Ranking of stream habitat for Illinois' Species in Greatest Need of Conservation, based on diversity of fish and mussel Species in Greatest Need of Conservation, known locations of endangered species, and Illinois Natural Areas Inventory stream communities.

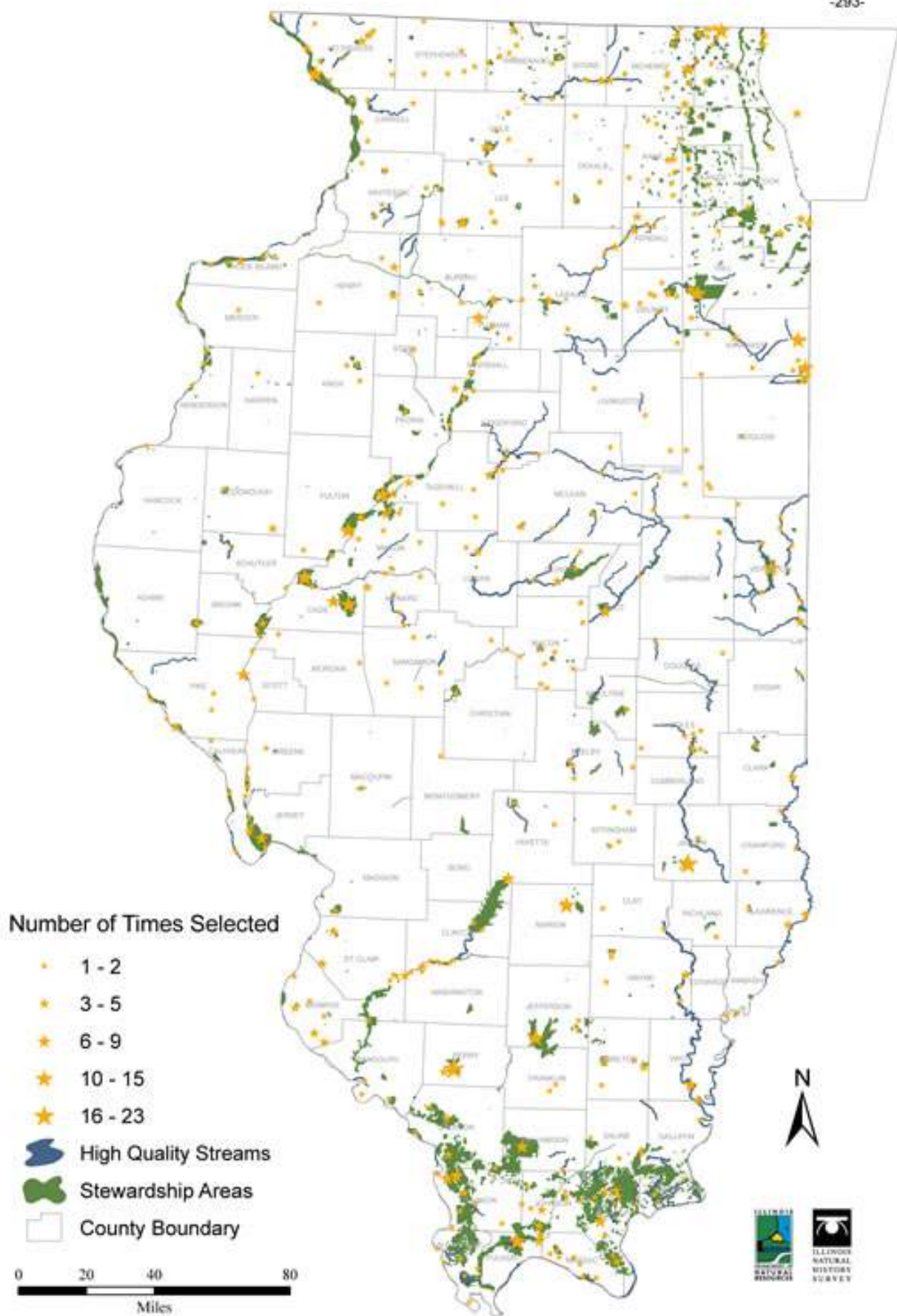


Figure 17. Partner-selected priority areas for conserving Illinois' Species in Greatest Need of Conservation, indicated by participants in planning workshops in 2004. Relative size of stars on the map indicate the number of times an area was marked. High Quality Streams and Stewardship Areas (federal, state and county conservation lands) are shown for reference.

Appendix I. Species in Greatest Need of Conservation for Illinois as identified by eight criteria.

Abbreviations used: **FE** - Federally Endangered; **FT** - Federally Threatened; **FC** - Federal candidate for listing under the Endangered Species Act; **XN** - experimental, nonessential population of a federally-listed species; **SE** - State Endangered; **ST** - State Threatened; **RR** - recent recovery/delisted within 10 years; **G1, G2, G3** - Global Conservation Ranks as indicated by NatureServe Explorer (<http://www.natureserve.org/explorer/> Accessed March 2004)

Criteria for Selecting Illinois' Species in Greatest need of Conservation:

1. All species listed as threatened or endangered in Illinois, including federally listed species that occur within the State.
2. Species with a global conservation rank indicator of G1, G2, or G3.
3. Species is rare (small or low population size, density or range) or has significantly declined in abundance or distribution from historical levels.
4. Species is dependent upon a rare or vulnerable habitat for one or more life history needs (breeding, migration, wintering).
5. Species is endemic to Illinois, or the Illinois population is disjunct from the rest of the species' range.
6. Illinois' population of a species represents a significant proportion of the species' global population.
7. Species is representative of broad array of other species found in a particular habitat.
8. Species' status is poorly known, but available evidence suggests conservation concern.

APPENDIX I.

INVERTEBRATES Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
MOLLUSKS									
Acella haldemani (spindle lymnaea)			G3	1					
Alasmidonta viridis (slippershell mussel)	Streams	ST		1					
Arcidens confragosus (rock pocketbook)	Streams, large rivers			1					
Cincinnatia integra (midland slitsnail)			G3	1					
Cyclonaias tuberculata (purple wartyback)	Streams, large rivers	ST		1					
Cyprogenia stegaria (fanshell mussel)	Large rivers	FE SE	G1	1					
Cumberlandia monodonta (spectacle case mussel)	Large rivers	FC SE	G2	1					
Discus macclintocki (Iowa Pleistocene snail)	Algific slopes	FE SE	G1	1					
Ellipsaria lineolata (butterfly)	Large rivers	ST		1					
Elliptio crassidens (elephant-ear mussel)	Large rivers	ST		1					
Elliptio dilatata (spike)	Streams	ST		1					
Epioblasma triquetra (snuffbox mussel)	Streams	SE	G3	1					
Euchemotrema (= Stenotrema) hubrichti (carinate pillsnail)			G1	1					
Fontigens aldrichi (Hoosier amnicola)			G3	1					
Fontigens antroecetes (Hydrobiid cavesnail)			G2	1					
Fusconaia ebena (ebonyshell)	Large rivers	ST		1					
Gastrocopta rogersensis (a snaggletooth snail)			G2	1					
Lampsilis abrupta (pink mucket)	Large rivers	FE SE	G2	1					
Lampsilis fasciola (wavy-rayed lampmussel)	Streams	SE		1					
Lampsilis higginsii (Higgins eye)	Large rivers	FE SE	G1	1					
Lasmigona compressa (creek heelsplitter)	Streams			1					
Lasmigona costata (fluted shell)	Streams			1					
Ligumia recta (black sandshell)	Streams, Large rivers	ST		1					
Lithasia armigera (armored rocksnail)			G3	1					
Lithasia obovata (Shawnee rocksnail)			G3	1					
Lithasia verrucosa (varicose rocksnail)			G3	1					
Megapallifera ragsdalei (Ozark mantleslug)			G2	1					
Micromenetus sampsoni			G2	1					
Oxyloma salleanum (Louisiana ambersnail)			G3	1					
Paravitrea significans (domed supercoil)			G3	1					
Plethobasus cooperianus (orange-foot pimpleback)	Large rivers	FE SE	G1	1					
Plethobasus cyphus (sheepnose mussel)	Streams, Large rivers	FC SE	G3	1					
Pleurobema clava (clubshell)	Streams	FE SE	G2	1					
Pleurobema cordatum (Ohio pigtoe)	Large rivers	SE	G3	1					
Pleurocera alveare (rugged homsnail)			G3	1					
Potamilus capax (fat pocketbook pearly mussel)	Large river	FE SE	G1	1					
Ptychobranhus fasciolaris (kidneyshell mussel)	Streams, Large rivers	SE		1					
Pyrgulopsis scalariformis (moss pyrg)			G1	1					
Quadrula cylindrica (rabbitsfoot mussel)	Streams, Large rivers	SE	G3	1					
Quadrula metanerva (monkeyface)	Streams, Large rivers			1					
Simpsonaias ambigua (salamander mussel)	Streams	SE	G3	1					
Somatogyrus depressus (sandbar pebblesnail)			G2	1					
Stagnicola woodruffi (coldwater pondsnail)			G3	1					
Strobilops affinis (eightfold pinecone)			G3	1					
Succinea forsheyi (spotted ambersnail)			G3	1					
Triodopsis discoidea (rivercliff threetooth)			G3	1					
Triodopsis fraudulentia (baffled three-tooth)			G3	1					
Toxolasma lividus (purple lilliput mussel)	Streams	SE	G2	1					
Valvata perdepressa (purplecap valvata)			G3	1					
Vallonia gracilicosa (multirib vallonia)			G3	1					
Venustaconcha ellipsiformis (ellipse)	Streams		G3	1					

INVERTEBRATES (Mollusks), continued Name	Habitat Association	Criteria								
		1	2	3	4	5	6	7	8	
Villosa iris (rainbow mussel)	Streams	SE		1						
Villosa lienosa (little spectacle case mussel)	Streams	ST		1						
Viviparus intertextus (rotund mysterysnail)			G2	1						
Viviparus subpurpureus (olive mysterysnail)			G2	1						
Xolotrema obstrictum (sharp wedge)			G3	1						
Zonitoides limatulus (dull gloss)			G3	1						
CRUSTACEANS										
Bactrurus brachycaudus			G3	1						
Cambarus laevis (crayfish)			G3	1						
Caecidotea beattyi (a cave obligate isopod)	Caves Caves		G3	1						
Caecidotea bicrenata (a cave obligate isopod)			G3	1						
Caecidotea lesliei (isopod)	Groundwater	SE		1						
Caecidotea packardi (a cave obligate isopod)	Caves		G3	1						
Caecidotea spatulata (a cave obligate isopod)	Caves	SE	G3	1						
Caecidotea tridentata			G3	1						
Crangonyx anomalus (anomalous spring amphipod)	Seeps, springs, caves	SE		1						
Crangonyx packardi (amphipod)	Caves	SE	G3	1						
Diacyclops clandestinus (a cave obligate copepod)	Caves		G3	1						
Gammarus acherondytes (Illinois cave amphipod)	Caves	FE SE	G1	1						
Gammarus bousfieldi (Bousfield's amphipod)	Gravel shoals of Ohio River		G1	1						
Orconectes illinoisensis (Illinois crayfish)			G3	1						
Orconectes indianensis (Indiana crayfish)	rocky streams	SE	G3	1						
Orconectes kentuckiensis (Kentucky crayfish)	rocky streams	SE	G2	1						
Orconectes lancifer (shrimp crayfish)	deep water at Horseshoe Lake	SE		1						
Orconectes placidus (bigclaw crayfish)	gravel, rocky streams & rivers	SE		1						
Orconectes stannardi (crayfish)			G2	1						
Stygobromus iowae (Iowa amphipod)	Algific slopes	SE	G3	1						
Stygobromus subtilis (subtle cave amphipod)	Caves		G3	1						
Order Anostraca	ephemeral wetlands				1				1	
INSECTS										
Abagrotis orbis	sand prairie			1						
Acanthametropus pecatonica (Pecatonica River mayfly)			G2	1						
Acontia lactipennis	sand prairie			1						
Acrolepiopsis leucoscia	sedge meadow			1						
Acronicta tritona				1						
Aeshna mutata (spatterdock damer)			G3	1						
Aflexia rubranura (redveined prairie leafhopper)	xeric/mesic prairie	ST	G1	1						
Agonopterix hyperella	wet prairie			1						
Agonopterix lythrella	wet prairie			1						
Agrotis stigmata	sand savanna			1						
Allocapnia illinoensis (a stonefly)			G3	1						
Ambesa laetella	sand			1						
Amblyscirtes aesculapius (lace-winged roadside-skipper)			G3	1						
Amblyscirtes carolina (Carolina roadside skipper)			G3	1						
Amblyscirtes linda (Linda's roadside-skipper)			G2	1						
Amblyscirtes reversa (reversed roadside-skipper)			G2	1						
Ancylis semiovana	sand savanna			1						
Apamea lutosa	prairie			1	1					
Apamea (Agroperina) lutosa	prairie			1						
Apamea (Crymodes) relicina	prairie			1						
Apamea alia	prairie			1						
Apamea impulsa	prairie			1						
Apamea indocilis	prairie			1						

INVERTEBRATES (Insects), continued Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
Apamea lignicolora	prairie			1					
Apamea plutonia	prairie			1	1				
Apodrepanulatrix liberaria	sand savanna			1					
Archanara laeta	sedge meadow			1					
Archanara subflava	prairie			1					
Aristotelia elegantella	prairie			1					
Arphia pseudonietana	gravel prairie			1					
Atascosa glareosella	dunes			1					
Aterpia approximana	wet prairie			1					
Atrytone arogos (arogos skipper)	prairie	SE	G3	1					
Atrytonopsis hianna	sand prairie			1					
Attenuipyga vanduzeei	xeric prairie			1					
Auridius helvus				1					
Bagisara gulfare				1					
Boloria selene myrina	wet prairie			1					
Bombus fraternus				1					
Bruchomorpha extensa	mesic prairie			1					
Bruchomorpha oculata	prairie			1	1				
Calephelis borealis (northern metalmark)			G3	1					
Calephelis muticum (swamp metalmark)	fen	SE	G3	1					
Callophrys irus (frosted elfin)	sand savanna		G2	1					
Callophrys polios	sand prairie			1					
Calyptra canadensis	wet prairie			1					
Camelobaetidius waltzi (a mayfly)			G3	1					
Capis curvata	prairie			1					
Carectocultus perstrialis				1					
Carmenta anthrasipennis	mesic/wet prairie			1					
Catocala abbreviatella	xeric prairie/savanna			1					
Catocala amestris	sand savanna			1					
Catocala antinympa	sand savanna			1					
Catocala atocala (an underwing moth)			G3	1					
Catocala dulciola (quiet or sweet underwing)			G3	1					
Catocala gracilis	sand savanna			1					
Catocala marmorata (marbled underwing)			G3	1					
Catocala praeclara	prairie			1					
Catocala relicta	sand savanna			1					
Catocala similis	sand savanna			1					
Catocala sordida	sand savanna			1					
Catocala whitneyi (Whitney's underwing)	hill prairie		G3	1					
Centropitulum walshi (a mayfly)			G2	1					
Chlorotettix dentatus	wet prairie/woods			1					
Chlorotettix fumidus	silt loam savanna			1					
Chlorotettix limosus	wet prairie			1					
Chlosyne gorgone carlota	xeric prairie			1					
Chlosyne harrisii	Fens			1					
Chortodes (Hypocoena) defecta	wet prairie			1					
Chortodes (Hypocoena) enervata	wet prairie			1					
Chortodes (Hypocoena) inquinata	sedge meadow			1					
Cicaudula cyperacea	prairie			1	1				
Cicaudula straminea	prairie			1	1				
Cicindela ancociscenensis (a tiger beetle)			G3	1					
Cloeon cognatum (a mayfly)			G3	1					
Commellus colon	sand prairie			1					
Cosmotettix beirni	wet savanna/flat woods			1					
Cosmotettix bilineatus	wet prairie			1					

INVERTEBRATES (Insects), continued Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
Cosmotettix delector	wet prairie			1					
Cosmotettix luteocephalus	wet prairie			1					
Crambus girardellus	sand prairie			1					
Crambus murellus	xeric prairie			1					
Crambus watsonellus	calcareous prairie			1					
Cryptocala acadensis	sand prairie			1					
Cyclophora pendulinaria	savanna			1					
Deltocephalus gnarus	sedge meadow			1					
Derrima stellata	sand prairie			1					
Destria fumida	wet prairie			1					
Diapheromera velii	xeric prairie			1					
Diceroprocta vitripennis	sand savanna			1					
Dicranopselaphus (variegated false water penny beetle)			G1	1					
Digrammia ordinata	prairie			1					
Elaphria chalcedonia	wet prairie			1					
Enodia creola (creole pearly-eye)			G3	1					
Epipaschiinae				1					
Erastria coloraria	sand savanna			1					
Eremobina jocasta	sand prairie			1					
Eritettix simplex	sand prairie			1					
Erynnis icelus	prairie/sand savanna			1					
Erynnis lucilius	sand savanna			1					
Erynnis martialis (mottled duskywing)	prairie/savanna		G3	1					
Erynnis persius	sand savanna			1					
Euchlaena milnei (a geometrid moth)			G2	1					
Euchloe olympia	sand savanna			1					
Eucoptocnemis fimbriaris	sand prairie			1					
Eucosma bipunctella	mesic prairie			1					
Eucosma fulminana	mesic prairie			1					
Eucosma n.s.	mesic/wet prairie			1					
Eucosma palabundana	sand prairie			1					
Eucosma pandana	prairie			1					
Eucosma rusticana	mesic prairie			1					
Eucosma sombreana	sedge meadow			1					
Euphyes bimacula	mesic/wet prairie			1					
Euphyes dion	prairie			1		1			
Euphyes dukesi (Duke's skipper)			G3	1					
Euphyes niveilinea	prairie			1		1			
Euscelis sahlbergi	wet prairie			1					
Euxoa albipennis	prairie			1					
Euxoa aurulenta	dunes			1					
Euxoa immixta	sand prairie			1					
Euxoa manitobana	sand prairie			1					
Euxoa scandens	sand prairie			1					
Evora hemidesma	prairie			1					
Fagitana littera	wet prairie			1					
Fitchiella robertsoni	hill prairie			1					
Flexamia abbreviata	dry prairie			1					
Flexamia albida	hill prairie			1					
Flexamia areolata	prairie			1		1			
Flexamia atlantica	wet prairie			1					
Flexamia grammica	sand prairie			1					
Flexamia pyrops	xeric prairie			1					
Gabara subnivosella	wet sand savanna			1					
Glaucoopsyche lygdamus	savanna			1					

INVERTEBRATES (Insects), continued Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
Gomphus ventricosus (skillet clubtail)			G3	1					
Graminella oquaka	prairie			1	1				
Grapholita tristrigana	prairie			1					
Gryllotalpa major (prairie mole cricket)			G3	1					
Hadena capsularis	sand savanna			1					
Hadena ectypa	sand savanna			1					
Hebecephalus signatifrons				1					
Hemaris gracilis	sand savanna			1					
Hemileuca maia	sand savanna			1					
Hemileuca nevadensis	sand savanna			1					
Heptagenia patoka (a mayfly)			G2	1					
Heptagrotis phyllophora				1					
Hesperia attalus (dotted skipper)			G3	1					
Hesperia dacotae (Dakota skipper)	xeric prairie	FC	G2	1					
Hesperia leonardus	xeric prairie			1					
Hesperia metea (cobweb skipper)	sand prairie	ST		1					
Hesperia ottoe (otloe skipper)	xeric prairie	ST	G3	1					
Hesperia sassacus	sand savanna			1					
Homoeoneuria ammophila (a sand-filtering mayfly)			G3	1					
Homorthodes furfurata	sand prairie			1					
Hydraecia (Hydroecia) immanis	prairie			1					
Hydraecia stramentosa	mesic prairie			1					
Hyparpax aurora	sand savanna			1					
Hydroperla fugitans (a spring stonefly)			G3	1					
Incisalia polios (hoary elfin)		SE		1					
Iodopepla u-album	sand prairie			1					
Isogenoides varians (a stonefly)			G3	1					
Itame amboflava	mesic/wet prairie			1					
Kansendria kansiensis	sand prairie			1					
Laevicephalus minimus	xeric prairie			1					
Laevicephalus peronatus	savanna			1					
Lemmeria digitalis	wet prairie			1					
Lethe appalachia				1					
Leucania extincta	sand prairie			1					
Limotettix elegans	wet prairie			1					
Limotettix nigrax	wet prairie/savanna			1					
Limotettix parallelus	wet prairie			1					
Limotettix pseudospagneticus	wet prairie			1					
Limotettix truncatus	wet prairie			1					
Lonatura catalina	xeric prairie			1					
Loxagrotis grotei	xeric prairie			1					
Loxocrambus awemensis	dunes			1					
Lycaeides melissa samuelis (Karner blue butterfly)	sand savanna	FE SE		1					
Lycaena helloides	wet prairie			1					
Lycaena xanthoides	wet prairie			1					
Macrochilo (Hormisa) bivittata	prairie			1					
Macrochilo (Hormisa) litophora	prairie			1					
Macrochilo (Hormisa) louisiana	prairie			1					
Macrosteles pottoria	sedge meadows			1					
Melanchnra assimilis	prairie fens			1					
Melanomma auricinctaria	savanna			1					
Melanoplus dawsoni	sand prairie			1					
Memnonia panzeri				1					
Meropleon diversicolor	sedge meadow			1					
Mesamia straminea	mesic prairie			1					

INVERTEBRATES (Insects), continued Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
Nannothemis bella (elfin skimmer)	fen/seep	ST		1					
Neoconocephalus lyristes	sedge meadow/fen			1					
Nephoterix dammersi	xeric prairie			1					
Nicrophorus americanus (American burying beetle)			G2	1					
Nomotettix parvus (low-ridged pygmy grasshopper)			G3	1					
Oarisma powesheik (Powesheik skipperling)	wet prairie		G2	1					
Okanagana balli	silt loam prairie			1					
Olethreutes comandrana	prairie			1					
Olethreutes osmundana	sand prairie/savanna			1					
Oligia obtusa	sand savanna			1					
Oncocnemis riparia	sand prairie			1					
Oncocnemis saundersiana	prairie			1					
Oncocnemis viriditincta	sand savanna			1					
Oncopodura iowae (a cave isopod springtail)			G3	1					
Pachypolia atricornis (three-horned moth)			G3	1					
Paectes abrostolella	sand prairie			1					
Palus bilineatus	prairie			1	1				
Palus delector	prairie			1	1				
Palus luteocephalus	prairie			1	1				
Pangrapta decoralis	sand prairie			1					
Paraleptophlebia sticta (a mayfly)			G1	1					
Paraphlepsius lupalus (leafhopper)		SE		1					
Papaipema aerata	unknown			1					
Papaipema araliae (Aralia shoot borer moth)			G3	1					
Papaipema beeriana (blazing star stem borer)	prairie/fen		G3	1					
Papaipema birdi	wet prairie/fen			1					
Papaipema cerina	savanna			1					
Papaipema cerrusata	wet prairie/fen			1					
Papaipema eryngii (rattlesnake-master borer moth)	wet/mesic prairie	SE	G1	1					
Papaipema eupatorii	wet prairie			1					
Papaipema harrisi	fen			1					
Papaipema inquaesita	wet prairie			1					
Papaipema leucostigma	sand savanna			1					
Papaipema limpida	mesic/wet prairie			1					
Papaipema lysimachiae	sedge meadow			1					
Papaipema maritima	prairie/fen			1					
Papaipema necopina	savanna			1					
Papaipema nelita	fen/savanna			1					
Papaipema nepheleptena	wet prairie/fen			1					
Papaipema pterisii	sand savanna			1					
Papaipema rigida	mesic prairie			1					
Papaipema rutila	savanna			1					
Papaipema sciata (cluevers root borer)	prairie/fen		G3	1					
Papaipema silphii (Silphium borer moth)	prairie		G3	1					
Papaipema sp. 10 (Grundy County papaipema)	mesic/wet prairie		G1	1					
Papaipema speciosissima	sand prairie			1					
Papaipema unimoda	prairie/fen			1					
Paraphilaenus parallelus	wet prairie			1					
Paraphlepsius altus	sand prairie			1					
Paraphlepsius carolinus	sand prairie			1					
Paraphlepsius electus	prairie			1					
Paraphlepsius humidus	wet prairie			1					
Paraphlepsius incisus	savanna?			1					
Paraphlepsius lascivius	savanna			1					
Paraphlepsius lupalus	sand prairie	SE		1					

INVERTEBRATES (Insects), continued Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
Paraphlepsius maculosus	sand prairie			1					
Paraphlepsius nebulosus	prairie			1					
Paraphlepsius rossi	savanna			1					
Paraphlepsius solidaginis	prairie			1					
Paraphlepsius texanus	hill prairie			1					
Paraphlepsius umbellatus	prairie			1					
Paraphlepsius umbrosus	wet prairie			1					
Parapoynx maculalis	marsh			1					
Pediasia abnaki	fens			1					
Peltonotellus histrionicus	wet prairie			1					
Perlesta golconda (a stonefly)			G2	1					
Petrophora subaequaria	savanna			1					
Phalaenostola hanhami	prairie			1					
Phytometra ernestinana	prairie			1					
Pieris virginiensis (West Virginia white)			G3	1					
Plagiomimicus (Stibadium) spumosum	prairie			1					
Plagiomimicus heitzmani	prairie			1					
Platyperigea (Caradrina) meralis	sand savanna			1					
Platytes vobisne	wet prairie			1					
Plauditus veteris (a mayfly)			G2	1					
Plusia venusta	wet prairie			1					
Poanes viator	sedge meadow			1					
Polyamia compacta	prairie			1					
Polyamia dilata	hill prairie			1		1			
Polyamia herbida	sand savanna			1					
Polyamia interrupta	sand savanna			1					
Polyamia obtecta	xeric prairie			1					
Polyamia rossi	sand prairie			1					
Polyamia similaris	xeric prairie			1					
Prairiana cinerea	prairie/savanna			1					
Prionapteryx achatina	sand prairie			1					
Prionapteryx nebulifera	dunes			1					
Problema byssus (Byssus skipper)	mesic/wet prairie		G3	1					
Procloeon irrubrum (a mayfly)			G2	1					
Procloeon mendax (a mayfly)			G2	1					
Procloeon quaesitum (a mayfly)			G2	1					
Procloeon simplex (a mayfly)			G2	1					
Proserpinus guarae	mesic prairie			1					
Protorthodes incincta	sand prairie			1					
Psectraglaea carnosus	sand savanna			1					
Pseudanophthalmus illinoisensis (Illinois cave beetle)			G1	1					
Pseudeva purpurigera	wet prairie			1					
Pseudexentera vaccinii	sand prairie			1					
Pygarctia spraguei (Sprague's pygarctic)	sand savanna		G3	1					
Pyla arenaeola	dunes			1					
Pyrausta laticlavia	prairie			1					
Pyrausta orphisalis	prairie			1					
Rhodoecia aurantiago	mesic prairie			1					
Richia n. sp.	sand prairie			1					
Rimulincola divalis			G1	1					
Rosenus cruciatus	sand prairie/savanna			1					
Satyrium edwardsii	savanna			1					
Scaphytopius abbreviatus	sand prairie/savanna			1					
Scaphytopius cinereus	prairie			1					
Scaphytopius dorsalis	xeric prairie			1					

INVERTEBRATES (Insects), continued	Name	Habitat Association	Criteria										
			1	2	3	4	5	6	7	8			
	Scaphytopius rubellus	prairie			1	1							
	Scaphytopius vaccinium	xeric prairie			1								
	Schinia gloriosa	sand & hill prairie			1								
	Schinia gracilentata (bifascia)	wet prairie			1								
	Schinia guarae	mesic prairie			1								
	Schinia indiana	sand savanna			1								
	Schinia jaguarina	mesic-xeric prairie			1								
	Schinia lucens	prairie			1								
	Schinia nundina	sand savanna			1								
	Schinia oleagina	xeric prairie			1								
	Schinia saturata	sand prairie			1								
	Schinia septentrionalis	mesic-xeric prairie			1								
	Schizura apicalis (plain schizura)			G2	1								
	Scudderia pistillata	wet/mesic prairie			1								
	Semiothisa eremiata	sand prairie/savanna			1								
	Serratella frisoni (Frison's serratellan mayfly)			G3	1								
	Siphonurus marshalli (a mayfly)			G3	1								
	Sitochroa dasconalis				1								
	Somatochlora hineana (Hine's emerald dragonfly)	fen/seep	FE SE	G2	1								
	Spartiniphaga includens	wet prairie			1								
	Spartiniphaga inops	wet prairie			1								
	Spartiniphaga panatela	wet prairie			1								
	Speyeria aphrodite	mesic prairie			1								
	Speyeria diana (Diana fritillary)			G3	1								
	Speyeria idalia (regal fritillary)	xeric/mesic prairie	FC ST	G3	1								
	Sphinx eremitus	mesic/wet prairie			1								
	Sphinx luscitiosa	prairie			1								
	Stegasta bosquella	prairie			1								
	Stethophyma lineatum	sedge meadow			1								
	Stroggylocephala mixtus	wet prairie			1								
	Stylurus notatus (elusive clubtail)			G3	1								
	Suleima helianthana	prairie			1								
	Tarachidia binocula	xeric/wet prairie			1								
	Tebenna silphiella	prairie			1								
	Tetralopha baptisiella	prairie			1								
	Texananus cumulatus	sand prairie			1								
	Texananus decorus	prairie			1								
	Thaumatopsis pectinifer	sand			1								
	Tricholita notata	mesic prairie			1								
	Trichosilia manifesta	sand savanna			1								
	Triclonella determinatella	prairie			1								
	Trimerotropis maritima	dunes			1								
	Trimerotropis saxatilis (a grasshopper)			G3	1								
	Ulolonche modesta	sand savanna			1								
	Vaxi auratella	wet prairie			1								
	Vaxi critica	wet prairie			1								
	Xerophloea major	prairie			1	1							
	Xerophloea peltata	sand prairie			1								
	Zomaria interruptolineana	sand prairie/savanna			1								
FLATWORMS													
	Sphalloplana hubrichti (a cave obligate planarian)	caves		G3	1								
MILLIPEDES													
	Semionellus placidus (a millipede)			G3	1								

INVERTEBRATES (Millipedes), continued Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
Tingupa pallida (a cave obligate millipede)	caves		G3	1					
Zosteractis interminata (a millipede)			G3	1					
ARACHNIDS									
Centruroides vittatus (striped scorpion)	Talus slopes, glades			1					
Mundochthonius cavernicola (a troglobitic pseudoscorpion)	caves		G3	1					

APPENDIX I, CONTINUED.

FISHES Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
Acipenser fulvescens (lake sturgeon)	large lakes, rivers	SE	G3	1	1	0	0	1	1
Anguilla rostrata (American eel)	large lakes, rivers	0	0	1	0	0	0	0	1
Ameiurus nebulosis (brown bullhead)	vegetated lakes, low-gradient streams	0	0	1	0	1	0	1	0
Ammocrypta clara (western sand darter)	medium-large rivers over sand	SE	G3	1	1	0	1	1	0
Ammocrypta pellucida (eastern sand darter)	rivers w/ sand substrate	ST	G3	1	1	0	0	1	1
Campostoma oligolepis (largescale stoneroller)	streams, rivers over gravel, rock	0	0	1					1
Carpoides velifer (highfin carpsucker)	pools, backwaters of streams, rivers	0	0	1					1
Catostomus catostomus (longnose sucker)	cold lakes, rivers	ST	0	1	1	0	0	1	0
Centrarchus macropterus (flier)	swamps, backwaters over mud	0	0	1					1
Coregonus artedi (cisco or lake herring)	Lake Michigan	ST	0	1	0	0	0	1	0
Coregonus clupeaformis (lake whitefish)	Lake Michigan	0	0	1	0	0	0	1	0
Cottus bairdi (mottled sculpin)	Lake Michigan	0	0	1					
Cottus carolinae (banded sculpin)	Lake Michigan	0	0	1					
Couesius plumbeus (lake chub)	gravel bottoms, rocky shorelines	0	0	1					
Crystallaria asprella (crystal darter)	sand, gravel runs of rivers	0	0	1					1
Culaea inconstans (brook stickleback)	vegetation in cool streams	0	0	1	1	0	0	0	0
Cycleptus elongatus (blue sucker)	rivers w/ rocky substrate	0	G3	1	1	0	0	1	1
Cyprinella venusta (blacktail shiner)	sandy pools, runs of rivers	0	0	1					
Elassoma zonatum (banded pygmy sunfish)	swamps	0	0	1					
Erimystax x-punctatus (gravel chub)	rivers w/ gravel substrate	ST	0	1	1	0	0	1	1
Erimyzon sucetta (lake chubsucker)	vegetation in lakes, backwaters	0	0	1	1	1	0	1	1
Esox lucius (northern pike - native stocks)	clear, vegetated lakes, backwaters	0	0					1	
Esox masquinongy (muskellunge-native stocks)	cool-water streams, lakes	0	0					1	
Etheostoma camurum (bluebreast darter)	rivers w/ rocky substrate	SE	0	1	1	0	0	1	0
Etheostoma chlorosomum (bluntnose darter)	swamps, backwaters, low-gradient streams	0	0	1	1	0	0	1	0
Etheostoma crossopterygion (fringed darter)	rocky pools, riffles of streams	0	0	1					1
Etheostoma exile (Iowa darter)	vegetation in ponds, lakes	ST	0	1	1	0	0	1	0
Etheostoma histrio (Harlequin darter)	high-gradient rivers over gravel woody debris	SE	0	1	1	1	0	1	1
Etheostoma proelaire (cypress darter)	slow water, vegetation over mud	0	0	1					1
Etheostoma squamiceps (spottail darter)	rocky pools, riffles of streams	0	0	1					
Forbesichthys agassizi (spring cavefish)	springs, caves	0	0	1					
Fundulus diaphanus (banded killifish)	vegetated lakes, low-gradient streams over sand/gravel	ST	0	1	1	0	0	1	1
Fundulus dispar (starhead topminnow)	vegetated lakes, ponds, low-gradient streams	ST	0	1	1	0	1	1	1
Hybognathus hayi (cypress minnow)	swamps, backwaters, low-gradient streams	SE	0	1	1	0	0	0	0
Hybopsis amblops (bigeye chub)	vegetated stream over sand, gravel	SE	0	1	1	0	0	1	1
Hybopsis amnis (pallid shiner)	rivers over sand	SE	0	1	1	0	0	0	1
Ichthyomyzon fossor (northern brook lamprey)	streams and rivers	SE	0	1	0	0	0	0	1
Ichthyomyzon unicuspis (silver lamprey)	streams and rivers over gravel	0	0	1	1	0	0	0	0
Lampetra aepyptera (least brook lamprey)	streams and rivers over sand, gravel	ST	0	1	1	0	0	0	1
Lampetra appendix (American brook lamprey)	streams and rivers over gravel	0	0	1	1	0	0	0	1
Lepomis miniatus (redspotted sunfish)	vegetated backwaters, low-gradient streams	ST	0	1	1	1	0	1	1
Lepomis symmetricus (bantam sunfish)	vegetated swamps, backwaters	ST	0	1	1	0	0	1	0
Lythrurus fumeus (ribbon shiner)	vegetated low-gradient streams over sand, silt	0	0	1	0	0	0	0	0
Macrhybopsis gelida (sturgeon chub)	rivers over sand, gravel	SE	G3	1	1	0	1	1	1
Macrhybopsis meeki (sicklefin chub)	rivers over sand, gravel	0	G3	1	1	0	1	1	1

FISHES, continued Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
Micropterus dolomieu (smallmouth bass)	cool streams, rivers over gravel, rock	0	0	0	0	0	0	1	0
Micropterus punctulatus (spotted bass)	streams, rivers over gravel, rock	0	0	0	0	0	0	1	0
Moxostoma carinatum (river redhorse)	high-gradient rivers over rocky	ST	0	1	1	1	0	1	1
Moxostoma duquesnei (black redhorse)	streams over sand, rock	0	0	1					
Mxostoma valenciennesi (greater redhorse)	rivers over gravel, rock	SE	0	1	1	0	0	0	1
Myoxocephalus quadricornis (fourhorn sculpin)		0	0						
Nocomis micropogon (river chub)	streams, rivers over gravel, rock	SE	0	1	1	0	0	1	1
Notropis anogenus (pugnose shiner)	vegetated glacial lakes, streams	SE	G3	1	1	0	0	1	0
Notropis boops (bigeye shiner)	streams over sand, gravel	SE	0	1	1	0	0	1	1
Notropis buchmanii (ghost shiner)	large turbid rivers	0	0	1	1	0	0	0	1
Notropis chalybaeus (ironcolor shiner)	vegetated low-gradient streams over sand	ST	0	1	1	1	0	1	1
Notropis heterodon (blackchin shiner)	vegetated low-gradient streams over sand	ST	0	1	1	0	0	1	0
Notropis heterolepis (blacknose shiner)	vegetated cool streams, lakes over sand	SE	0	1	1	0	0	1	1
Notropis maculatus (taillight shiner)	vegetated backwaters, swamps, lakes	SE	0	1	1	0	0	0	1
Notropis nubilus (Ozark minnow)	pools, streams, over grave	0	0	1					
Notropis rubellus (rosyface shiner)	rocky runs of small-medium rivers	0	0	1					
Notropis shumardi (silverband shiner)	turbid rivers over sand, gravel	0	0	1					
Notropis texanus (weed shiner)	vegetated streams over sand	SE	0	1	1	0	0	1	0
Noturus eleutherus (mountain madtom)	high-gradient streams, rivers over gravel, rock	0	0	1	1	0	1	1	1
Noturus exilis (slender madtom)	high-gradient streams, rivers over gravel, rock	0	0	1	1	0	0	1	0
Noturus stigmosus (northern madtom)	streams, rivers over sand, woody debris	SE	G3	1	1	0	0	0	1
Opsopoeodus emilae (pugnose minnow)	vegetated lakes, low-gradient streams	0	0	1	1	0	1	0	1
Perca flavescens (yellow perch)	Lake Michigan	0	0	1					
Percopis omiscomaycus (trout-perch)	lakes, pools over sand	0	0	1	0	0	0	0	0
Phoxinus erythrogaster (southern redbelly dace)	cool streams over sand, gravel	0	0	0	1	0	0	1	0
Polyodon spathula (North American paddlefish)	large silty rivers rich w/ zooplankton	0	0	1	1	0	0	1	0
Rhynchichthys atratulus (blacknose dace)	cool streams over sand, gravel	0	0	0	1	0	0	1	0
Rhynchichthys cataractae (longnose dace)	coolwater streams	0	0	1	1	0	0	1	0
Salvelinus fontinalis	coolwater streams	0	0	1	1	0	0	1	0
Salvelinus namaycush (lake trout)	Lake Michigan	0	0	1	0	0	0	1	0
Scaphirhynchus albus (pallid sturgeon)	large turbid rivers over sand	FE SE	G1	1	1	0	0	1	1
Scaphirhynchus platorhynchus (shovelnose sturgeon)	large turbid rivers	0	0	1	1	0	0	1	1
Stizostedion canadense (sauger)	large rivers	0	0	0	0	0	0	1	0
Stizostedion vitreum (walleye)	streams, rivers, lakes	0	0					1	
Umbra limi (central mudminnow)	vegetation in still water, over mud	0	0	1					

APPENDIX I, CONTINUED.

Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
AMPHIBIANS & REPTILES									
AMPHIBIANS									
Ambystoma jeffersonianum (Jefferson salamander)	forest, ephemeral pools	ST	0	1	1	0	0	0	0
Ambystoma laterale (blue-spotted salamander)	forest, ephemeral pools	0	0	1	1	0	0	0	1
Ambystoma platineum (silvery salamander)	forest, ephemeral pools	SE	0	1	1	0	0	0	0
Ambystoma talpoideum (mole salamander)	swamp	0	0	1	1	0	0	0	0
Cryptobranchus alleganiensis (hellbender)	swift rivers, streams	SE	G3	1	1	0	0	0	1
Desmognathus conanti (spotted dusky salamander)	cool headwaters, forest	SE	0	1	1	0	0	0	0
Gastrophryne carolinensis (eastern narrowmouth toad)	open floodplains, ephemeral pools	ST	0	1	0	0	0	0	0
Hemidactylium scutatum (four-toed salamander)	pools, streams, forest	ST	0	1	1	0	0	0	0
Hyla avivoca (bird-voiced treefrog)	swamp	ST	0	1	1	0	0	0	0
Necturus maculosus (mudpuppy)	gravel-bottom streams, lakes	0	0	1	1	0	0	0	1
Pseudacris streckeri illinoensis (Illinois chorus frog)	sand prairie, ephemeral pools	ST	0	1	1	1	1	0	0
Rana areolata (crayfish frog)	wet grasslands, ephemeral pools	0	0	1	1	0	0	0	1
Rana palustris (pickerel frog)	cool, rocky headwaters, cave entrances	0	0	1	1	0	0	0	1
Rana sylvatica (wood frog)	forest, ephemeral pools	0	0	1	0	0	0	0	1
REPTILES									
Apalone mutica (smooth softshell turtle)	sand-bottom streams	0	0	0	1	0	0	0	1
Clemmys guttata (spotted turtle)	marsh	SE	0	1	1	0	0	0	0
Clonophis kirtlandii (Kirtland's snake)	wet grassland, marsh	ST	0	1	1	0	1	0	1
Crotalus horridus (timber rattlesnake)	forest, rocky slopes	ST	0	1	1	0	0	0	0
Elaphe emoryi (great plains rat snake)	rocky grassland/savanna slopes	SE	0	1	1	0	0	0	0
Emydoidea blandingii (Blanding's turtle)	marsh	ST	0	1	1	0	0	0	0
Farancia abacura (mud snake)	swamp	0	0	1	1	0	0	0	0
Heterodon nasicus (western hognose snake)	sand prairie, sand savanna	ST	0	1	1	1	0	0	0
Kinosternon flavescens (Illinois mud turtle)	wetlands in sand prairie	SE	0	1	1	1	1	0	0
Kinosternon subrubrum (eastern mud turtle)	swamp	0	0	1	1	0	0	0	1
Macrochelys temminckii (alligator snapping turtle)	rivers, swamp	SE	G3	1	1	0	0	0	1
Masticophis flagellum (coachwhip)	rocky grassland/savanna slopes	SE	0	1	1	0	0	0	0
Nerodia cyclopion (Mississippi green water snake)	swamp	ST	0	1	1	0	0	0	0
Nerodia erythrogaster neglecta (n. copperbelly watersnake)	swamp, bottomland forest	***	0	1	1	0	1	0	0
Nerodia fasciata (broad-banded water snake)	swamp	SE	0	1	1	0	0	0	0
Liochlorophis vernalis (smooth green snake)	grassland, savanna, marsh, successional	0	0	1	0	0	0	0	1
Ophisaurus attenuatus (slender glass lizard)	grassland, savanna	0	0	1	1	0	0	0	1
Pseudemys concinna (river cooter)	rivers, swamp	SE	0	1	1	0	0	0	0
Sistrurus catenatus catenatus (eastern massasauga)	marsh, bottomland forest, grassland	FC SE	0	1	1	0	1	0	0
Tantilla gracilis (flathead snake)	rocky, wooded slopes	ST	0	1	1	0	0	0	1
Terrapene omata (ornate box turtle)	grassland	0	0	1	1	0	0	0	1
Thamnophis sauritus (eastern ribbon snake)	bottomland forest, swamp	ST	0	1	1	0	0	0	0
Tropidoclonion lineatum (lined snake)	grassland	ST	0	1	1	0	0	0	0

*** *N. E. neglecta* is protected by Illinois Administrative Rule, part 880.70, in 14 southeastern Illinois counties

APPENDIX I, CONTINUED.

BIRDS Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
Ammodramus henslowii (Henslow's sparrow)	Grassland	ST	0	1	1	0	0	0	0
Ammodramus leconteii (LeConte's sparrow) ¹	Grassland, marsh		0	0	1	1	0	0	0
Ammodramus nelsoni (Nelson's sharp-tailed sparrow) ¹	Grassland, marsh		0	0	1	1	0	0	0
Ammodramus savannarum (grasshopper sparrow)	Grassland		0	0	1	1	0	0	0
Anas rubripes (American black duck) ¹	Forested streams, lakes		0	0	1	1	0	1	0
Ardea alba (great egret)	Forested streams, lakes		0	0	RR	1	0	0	0
Asio flammeus (short-eared owl)	Grassland	SE	0	1	1	0	0	0	0
Aythya affinis (lesser scaup)	Rivers, lakes		0	0	1	1	0	1	0
Aythya valisineria (canvasback)	Rivers, lakes		0	0	1	1	0	1	0
Bartramia longicauda (upland sandpiper)	Grassland	SE	0	1	1	0	0	1	0
Bonasa umbellus (ruffed grouse)	Forest, successional forest		0	0	1	0	0	0	1
Botaurus lentiginosus (American bittern)	Marsh	SE	0	1	1	0	0	1	0
Buteo lineatus (red-shouldered hawk)	Bottomland forest, forest		0	0	RR	0	0	0	1
Buteo platypterus (broad-winged hawk)	Forest		0	0	1	1	0	0	1
Buteo swainsoni (Swainson's hawk)	Savanna, grassland, agriculture	SE	0	1	1	1	0	1	0
Calcarius pictus (Smith's longspur) ¹	Agricultural, grassland		0	0	1	1	0	1	1
Calidris himantopus (stilt sandpiper) ¹	Vernal pool, mudflat, marsh		0	0	1	1	0	0	0
Caprimulgus carolinensis (chuck-will's-widow)	Forest		0	0	1	0	0	0	0
Caprimulgus vociferus (whip-poor-will)	Forest, successional		0	0	1	0	0	0	1
Certhia americana (brown creeper)	Bottomland forest, forest		0	0	RR	0	0	0	0
Chaetura pelagica (chimney swift)	swamp, urban		0	0	1	0	0	1	0
Charadrius melodus (piping plover)	Beach	FE SE	G3	1	1	0	0	0	0
Chlidonias niger (black tern)	Marsh	SE		0	1	1	0	0	1
Chordeiles minor (common nighthawk)	urban, barren, grassland		0	0	1	0	0	0	0
Circus cyaneus (northern harrier)	Grassland, marsh	SE		0	1	1	0	0	1
Cistothorus palustris (marsh wren)	Marsh		0	0	1	1	0	0	0
Cistothorus platensis (sedge wren)	grassland, marsh		0	0	0	1	0	0	0
Coccyzus americanus (yellow-billed cuckoo)	Forest, savanna		0	0	1	1	0	0	0
Coccyzus erythrophthalmus (black-billed cuckoo)	forest		0	0	0	0	0	0	0
Colaptes auratus (northern flicker)	savanna, grassland		0	0	1	0	0	1	0
Colinus virginianus (northern bobwhite)	Successional field, grassland		0	0	1	0	0	1	1
Coturnicops noveboracensis (yellow rail) ¹	Marsh		0	0	1	1	0	0	0
Cygnus buccinator (trumpeter swan) ¹	Marsh, lakes	XN		0	1	0	0	0	0
Dendroica cerulea (cerulean warbler)	Bottomland forest	ST		0	1	1	0	0	1
Dendroica discolor (prairie warbler)	successional		0	0	0	1	0	0	0
Dolichonyx oryzivorus (bobolink)	Grassland		0	0	1	1	0	0	0
Egretta caerulea (little blue heron)	Forested streams, lakes	SE		0	1	1	0	0	0
Egretta thula (snowy egret)	Forested streams, lakes	SE		0	1	1	0	0	0
Empidonax traillii (willow flycatcher)	marsh, successional		0	0	0	1	0	0	0
Empidonax virescens (Acadian flycatcher)	forest		0	0	1	0	0	0	0
Euphagus carolinus (rusty blackbird) ¹	Swamp, bottomland forest		0	0	1	1	0	0	1
Falco peregrinus (peregrine falcon)	Urban, cliffs	FE ST		0	1	1	0	0	0
Gallinula chloropus (common moorhen)	Marsh	ST		0	1	1	0	0	0
Gallinago delicatata (Wilson's snipe)	Marsh, vernal pool		0	0	1	1	0	0	1
Grus americana (whooping crane) ¹	Marsh	XN	G1	1	1	0	0	0	0
Grus canadensis (sandhill crane)	Marsh	ST		0	1	1	0	0	1
Haliaeetus leucocephalus (bald eagle)	Forested streams, lakes	FT ST		0	0	0	0	1	0
Helmitheros vermiformis (worm-eating warbler)	forest		0	0	0	0	0	0	1
Hylocichla mustelina (wood thrush)	forest		0	0	0	0	0	0	1
Icteria virens (yellow-breasted chat)	Successional fields, edges		0	0	1	0	0	0	0

BIRDS, continued Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
Ictinia mississippiensis (Mississippi kite)	Forested streams, lakes	SE	0	1	1	0	0	0	0
Ixobrychus exilis (least bittern)	Marsh	ST	0	1	1	0	0	0	0
Lanius ludovicianus (loggerhead shrike)	Grassland	ST	0	1	1	0	0	0	0
Laterallus jamaicensis (black rail)	Marsh	SE	0	1	1	1	0	0	1
Limnodromus griseus (short-billed dowitcher) ¹	Marsh, vernal pool, mudflat	0	0	1	1	0	0	0	1
Limnothlypis swainsonii (Swainson's warbler)	Bottomland forest	SE	0	1	1	0	0	0	0
Lophodytes cucullatus (hooded merganser)	Forested streams, lakes	0	0	1	0	0	0	0	1
Melanerpes erythrocephalus (red-headed woodpecker)	Savanna	0	0	1	0	0	1	1	0
Nyctanassa violacea (yellow-crowned night-heron)	Swamp	SE	0	1	1	0	0	0	0
Nycticorax nycticorax (black-crowned night-heron)	Swamp	SE	0	1	1	0	0	0	0
Oporornis agilis (Connecticut Warbler) ¹	Forest	0	0	1	0	0	0	0	1
Oporornis formosus (Kentucky warbler)	Forest	0	0	1	1	0	0	1	0
Pandion haliaetus (osprey)	Forested streams, lakes	SE	0	1	1	0	0	0	0
Passerculus sandwichensis (savannah sparrow)	Grassland, agricultural	0	0	1	0	0	0	1	0
Phalaropus tricolor (Wilson's phalarope)	Marsh, vernal pool	SE	0	1	1	0	0	0	0
Pluvialis dominica (American golden-plover) ¹	Agricultural, mudflat, grassland	0	0	1	1	0	1	0	1
Podilymbus podiceps (pied-billed grebe)	Marsh, lakes	0	0	RR	1	0	0	0	0
Protonotaria citrea (prothonotary warbler)	bottomland forest	0	0	0	1	0	0	0	0
Rallus elegans (king rail)	Marsh, grassland	SE	0	1	1	0	0	0	0
Scolopax minor (American woodcock)	Successional fields, ecotones	0	0	1	1	0	0	0	0
Seiurus aurocapillus (ovenbird)	Forest	0	0	1	0	0	0	0	0
Spiza americana (dickcissel)	Grassland	0	0	1	1	0	1	0	0
Spizella pusilla (field sparrow)	successional	0	0	1	0	0	1	0	0
Sterna antillarum (least tern)	Rivers, shoreline	FE SE	0	1	1	0	0	0	0
Sterna forsteri (Forster's tern)	Marsh	SE	0	1	1	0	0	0	0
Sterna hirundo (common tern)	Beach	SE	0	1	1	0	0	0	0
Thryomanes bewickii (Bewick's wren)	Successional areas, forest	SE	0	1	1	1	0	0	0
Toxostoma rufum (brown thrasher)	succssional	0	0	0	0	0	1	0	0
Tringa melanoleuca (greater yellowlegs) ¹	Vernal pool, mudflat, marsh	0	0	1	1	0	0	1	0
Tryngites subruficollis (buff-breasted sandpiper) ¹	Vernal pool, mudflat, marsh	0	0	1	1	0	1	0	1
Tympanuchus cupido (greater prairie-chicken)	Grassland	SE	0	1	1	1	0	1	0
Tyto alba (barn-owl)	Savanna, grassland, agriculture	SE	0	1	1	0	0	0	0
Vermiforma pinus (blue-winged warbler)	successional, forest	0	0	0	0	0	0	0	0
Vireo belli (Bell's vireo)	Successional fields, grassland	0	0	1	1	0	0	0	0
Xanthocephalus xanthocephalus (yellow-headed blackbird)	Marsh	SE	0	1	1	0	0	0	0

¹ - Does not typically breed in Illinois

APPENDIX I, CONTINUED.

MAMMALS Name	Habitat Association	Criteria							
		1	2	3	4	5	6	7	8
Canis lupus (gray wolf) ¹	Forest	FT ST	0	0	0	0	0	0	0
Corynorhinus rafinesquii (eastern big-eared bat)	Forest, caves, mines, buildings	SE G3	1	1	0	0	1	0	0
Lontra canadensis (river otter)	Streams, impoundments	0 0 RR	0	0	0	0	0	0	0
Lynx rufus (bobcat)	Forest, ecotones	0 0 RR	0	0	0	0	1	0	0
Sorex hoyi (pygmy shrew)	Forests, successional areas, bogs	0 0 1	0	0	0	0	0	1	0
Microtus pinetorum (woodland vole)	Deciduous forest, successional forest	0 0 1	0	0	0	0	0	1	0
Mustela nivalis (least weasel)	Grassland, successional, ecotones	0 0 0	0	0	0	0	1	0	0
Myotis austroriparius (southeastern bat)	Forests, caves, mines	SE G3	1	1	0	0	0	0	0
Myotis grisescens (gray bat)	Caves, mines	FE SE G3	1	1	0	0	1	0	0
Myotis sodalis (Indiana bat)	Forests, riparian areas, caves, mines	FE SE G2	1	1	0	0	1	0	0
Neotoma floridana (eastern woodrat)	Rocky cliffs, caves	SE 0 1	1	0	0	0	0	0	0
Ochrotomys nuttalli (golden mouse)	Ecotones, successional fields	ST 0 1	0	0	0	0	0	1	0
Ondatra zibethicus (muskrat)	Marshes, streams, ponds	0 0 0	1	0	0	1	0	0	0
Oryzomys palustris (marsh rice rat)	Marsh, wetland ecotones	ST 0 1	0	0	0	0	0	0	0
Peromyscus gossypinus (cotton mouse)	Forest, swamp	0 0 1	1	0	0	0	0	1	0
Spermophilus franklinii (Franklin's ground squirrel)	grassland, early successional areas	ST 0 0	1	0	0	1	0	0	0
Sylvilagus aquaticus (swamp rabbit)	bottomland forest	0 0 1	1	0	0	0	0	0	0
Tamiasciurus hudsonicus (red squirrel)	Forest, coniferous forest	0 0 1	1	0	0	0	0	0	0
Taxidea taxus (American badger)	Grassland, agricultural	0 0 0	0	0	0	1	0	0	0
Urocyon cinereoargenteus (gray fox)	Forest, successional areas	0 0 0	0	0	0	0	1	0	0

¹ Occurs as a vagrant only in Illinois

APPENDIX II. Status, Objectives, and Stresses to Illinois' Wildlife & Habitat Resources.

Definitions & Methods.

Resource - Species: *Species in Greatest Need of Conservation*, species meeting one or more of the eight criteria used in the selection of species in greatest need of conservation; there is overlap with Game Species, below
Game species, species or groups of species that may be legally harvested for recreation; there is overlap with Species in Greatest Need of Conservation, above

Status (3 columns): *N*, a population estimator, if available
Trend, population trend scored from -2 (strongly decreasing) to +2 (strongly increasing)
Listing, if a species is listed as threatened or endangered

Objectives (3 columns): *N*, targeted population for 2025
Trend, trend required for targeted resource level by 2025
Listing, targeted resource status for 2025

Habitat Stresses (6 columns): *Extent*, the gross amount of habitat
Fragmentation, includes the effects of isolation (the physical separation of habitat patches), juxtaposition (the relative position of habitat types), patch size (the size of individual habitat patches) and edge effects (phenomena of ecotones and patch edges, such as increased mortality)
Composition-Structure, the biological and physical attributes of habitat within a patch

Disturbance/Hydrology, disturbance regimes are the frequency, timing and intensity of disturbances such as fire, and hydrology relates to patterns in water level and availability

Invasives/Exotics, novel species that are changing a habitat (will overlap one or more habitat stress category)

Pollution - Sediment, abnormal inputs of chemical or physical materials or heat

Community Stresses (7 columns): *Competitors*, individuals of same or other species vying for shared resources

Predators, animals that kill and consume other (typically smaller) animals

Parasites-Disease, organisms (typically small) that consume part of, weaken and/or kill, animals

Prey-Food, organisms, their parts or products consumed for energy by an animal

Hosts, an organism necessary for supporting some life history stage of an animal (e.g, plants for larval insects, fishes for larval mussels)

Invasives/Exotics, novel animals functioning as competitors, predators, parasites, etc. (overlaps one or more community stress category)

Other Symbionts, other organisms necessary for a beneficial ecological relationship

Population Stresses (4 columns): *Genetics*, genetic constraints such as inbreeding, outbreeding depression

Dispersal, movement of individuals among habitat patches and/or subpopulations

Recruitment, entry of new individuals into a breeding population, the product of birth rate and juvenile survival

Mortality, death rate for a population

Appendix II (Definitions & Methods), continued.

Direct Human Stresses (3 columns): *Killing*, direct killing/removal by humans

Disturbance, direct harassment by humans

Structures-Infrastructure, killing or harassment by structures (dams, towers, windows, etc.) or infrastructure (roads, utility lines, etc.)

All stresses are scored on a 3-point scale

- 1 - the threat has had, is having, or is likely to have little or no effect on population viability or abundance
- 2 - the threat has had, is having, or is likely to have a moderate effect on population viability or abundance
- 3 - threat has had, is having, or is likely to have a severe effect on population viability or abundance

Quality control/quality assurance is achieved in 3 ways

- (1) All cells are color-coded, reflecting the quantity/quality of information considered for this exercise and the expertise level of the scientist(s) completing the exercise (green: moderate to high confidence; yellow: low confidence; red: very low confidence/no information)
- (2) References for information sources available to support these assessments are provided.
- (3) Scientists completing these exercises are identified

Abbreviations used: **FE** - Federally Endangered; **FT** - Federally Threatened; **FC** - Federal candidate for listing under the Endangered Species Act; **XN** - experimental nonessential population of a federally-listed species; **SE** - State Endangered; **ST** - State Threatened

APPENDIX II.

MUSSELS Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses				Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure	
Alasmidonta viridis (slippershell mussel)	-1		ST				1	1	1	3	1	2	1	1	1	1	2	1	1	1	1	2	2	2	1	3	1
Arcidens confragosus (rock pocketbook)	0						1	1	1	1	1	2	1	1	1	1	2	2	1	1	1	2	2	1	2	1	
Cyclonaias tuberculata (purple wartyback)	-1		ST				1	1	1	2	1	3	1	1	1	1	2	2	1	1	1	2	2	2	2	1	
Cyprogenia stegaria (fanshell mussel)	-2	FE	SE				1	3	1	3	1	3	1	1	1	1	2	2	1	2	1	3	2	1	2	1	
Cumberlandia monodonta (spectacle case mussel)	-2		SE				1	2	1	2	2	3	1	1	1	1	2	3	1	1	1	3	2	2	2	1	
Ellipsaria lineolata (butterfly)	-1		ST				1	1	1	2	2	3	1	1	1	1	2	3	1	1	1	2	2	2	2	1	
Elliptio crassidens (elephant-ear mussel)	-1		ST				1	1	1	2	2	3	1	1	1	1	2	3	1	1	1	3	2	2	2	1	
Elliptio dilatata (spike)	-2		ST				1	1	1	2	1	3	1	1	1	1	2	2	1	2	2	2	2	1	2	1	
Epioblasma triquetra (snuffbox mussel)	-2		SE				1	1	1	2	1	3	1	1	1	1	2	1	1	3	2	3	2	1	2	1	
Fusconaia ebena (ebonyshell)	-1		ST				1	1	1	2	2	3	1	1	1	1	3	3	1	1	1	1	2	2	2	3	
Lampsilis abrupta (pink mucket)	-2	FE	SE				1	3	1	3	1	3	1	1	1	1	2	2	1	2	1	3	2	1	2	1	
Lampsilis fasciola (wavy-rayed lampmussel)	-1		SE				1	1	1	2	1	3	1	1	1	1	2	1	1	1	1	2	2	1	2	1	
Lampsilis higginsii (Higgins eye)	-2	FE	SE				1	2	1	2	2	3	1	1	1	1	2	3	1	2	1	2	2	2	2	1	

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MUSSELS, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses				Direct Human Stresses					
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure
Lasmigona compressa (creek heelspliter)	-1						1	1	2	3	1	2	1	1	1	1	2	1	1	1	1	2	2	1	3	1
Lasmigona costata (fluted shell)	-1						1	1	1	2	1	3	1	1	1	1	2	1	1	1	1	2	2	2	2	1
Ligumia recta (black sandshell)	-1	ST		delist			1	1	1	2	1	3	1	1	1	1	2	1	1	1	1	3	2	2	2	1
Plethobasus cooperianus (orange-foot pimpleback)	-2	FE SE		delist			1	2	1	2	2	3	1	1	1	1	2	3	1	1	1	3	2	2	3	1
Plethobasus cyphus (sheepnose mussel)	-2	SE		delist			1	1	1	2	1	3	1	1	1	1	3	2	1	2	1	3	2	2	2	1
Pleurobema clava (clubshell)	-2	FE SE		delist			1	1	1	2	1	3	1	1	1	1	2	1	1	2	1	3	2	1	2	1
Pleurobema cordatum (Ohio pigtoe)	-1	SE		delist			1	1	1	2	2	3	1	1	1	1	2	3	1	1	1	2	2	2	2	1
Potamilus capax (fat pocketbook pearly mussel)	-2	FE SE		delist			1	1	1	2	2	3	1	1	1	1	1	3	1	1	1	2	2	2	3	1
Ptychobranchnus fasciolaris (kidneyshell mussel)	-2	SE		delist			1	1	1	2	1	3	1	1	1	1	2	1	1	2	2	3	2	1	2	1
Quadrula cylindrica (rabbitsfoot mussel)	-2	SE		delist			1	1	1	2	1	3	1	1	1	1	3	1	1	2	1	3	2	1	2	1
Quadrula metanerva (monkeyface)	-1						1	1	1	2	1	3	1	1	1	1	2	1	1	1	1	2	2	2	2	1
Simpsonaias ambigua (salamander mussel)	-2	SE		delist			1	1	1	2	1	3	1	1	1	1	3	2	1	2	2	3	2	1	2	1
Toxolasma lividus (purple lilliput mussel)	-1	SE		delist			1	1	1	2	1	3	1	1	1	1	2	1	1	1	1	2	2	1	2	1

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MUSSELS, continued Resource - Species	Status	Objectives			Habitat Stresses					Community Stresses					Population Stresses				Direct Human Stresses								
		N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure
Venustaconcha ellipsiformis (ellipse)			-1					2	1	1	2	1	3	1	1	1	1	2	1	1	1	1	1	2	1	2	1
Villosa iris (rainbow mussel)			-2	SE			delist	1	1	1	2	1	3	1	1	1	1	2	1	1	1	1	2	2	1	2	1
Villosa lienosa (little spectacle case mussel)			-1	ST			delist	1	1	1	2	1	3	1	1	1	1	2	1	1	1	1	2	2	1	2	1

Completed by Kevin Cummings and Robert Szafoni, with Dave Day - 6 August 2004

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FISHES, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Structure/Infrastructure	
Cottus bairdi (mottled sculpin)		0					2	2	1	3	1	2	3	3	1	1	1	3	1	1	2	2	1	1	1	2
Cottus carolinae (banded sculpin)		0					2	1	1	3	1	2	2	2	1	1	1	2	1	1	2	2	1	1	1	
Couesius plumbeus (lake chub)																										
Crystallaria asprella (crystal darter)	0?	0																								
Culaea inconstans (brook stickleback)		0					2	2	1	2	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1	
Cycleptus elongatus (blue sucker)		-1					2	3	3	3	1	3	3	1	1	1	3	1	1	2	2	1	1	1	3	
Cyprinella venusta (blacktail shiner)		0					3	2	1	3	1	3	3	1	1	1	1	1	1	3	2	3	1	1	1	
Elassoma zonatum (banded pygmy sunfish)		-1					3	3	2	2	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	
Erimystax x-punctatus (gravel chub)		-1	ST			delist	2	2	3	3	1	3	1	2	1	1	1	2	1	1	1	2	1	1	1	
Erimyzon sucetta (lake chubsucker)		0					3	3	2	2	2	2	1	1	1	1	1	1	1	1	2	1	1	1	2	
Esox lucius (northern pike - native stocks)		-1					3	3	3	3	2	3	1	1	1	1	1	1	1	2	2	2	2	1	1	
Esox masquinongy (muskellunge - native stocks)		0					3	3	3	3	2	3	1	1	1	1	1	1	1	2	2	2	2	1	1	
Etheostoma camurum (bluebreast darter)		0	SE			delist	3	3	3	3	1	3	2	2	1	1	1	3	1	1	2	1	1	1	1	

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FISHES, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Structure/Infrastructure	
Etheostoma chlorosomum (bluntnose darter)		0					1	1	1	2	1	1	2	2	1	1	1	2	1	1	1	2	1	1	1	1
Etheostoma crossopterum (fringed darter)																										
Etheostoma exile (Iowa darter)		1	ST				2	2	2	2	1	2	1	2	1	1	1	2	1	1	2	2	1	1	1	1
Etheostoma histrio (Harlequin darter)		-2	SE				3	3	2	3	1	3	2	2	1	1	1	2	1	2	2	2	1	1	1	2
Etheostoma proelaire (cypress darter)		0					1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Etheostoma squamiceps (spottail darter)		0					2	2	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Forbesichthys agassizi (spring cavefish)		<1000					3	3	1	2	1	2	1	1	1	1	1	1	1	2	2	1	1	1	1	1
Fundulus diaphanus (banded killifish)		-1	ST				2	2	3	2	2	2	1	2	1	1	1	2	1	1	2	2	2	1	1	1
Fundulus dispar (starhead topminnow)		-1	ST				2	2	2	2	2	2	1	2	1	1	1	2	1	1	2	2	1	1	1	1
Hybognathus hayi (cypress minnow)		near 0	SE				3	2	2	2	1	1	2	1	1	1	1	2	1	1	1	2	1	1	1	1
Hybopsis amblops (bigeye chub)		0	SE				2	2	2	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1
Hybopsis amnis (pallid shiner)		1 location	SE				3	3	2	2	1	2	1	2	1	1	1	1	1	1	2	2	1	1	1	1
Ichthyomyzon fossor (northern brook lamprey)		0	SE				2	1	2	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1

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FISHES, continued Resource - Species	Status	Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses									
		N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance/Infrastructure	
Ichthyomyzon unicuspis (silver lamprey)		0					2	1	1	1	1	2	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1
Lampetra aepyptera (least brook lamprey)		0	ST		delist		2	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	
Lampetra appendix (American brook lamprey)		0					2	2	2	2	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	
Lepomis miniatus (redspotted sunfish)		-2	ST		delist		3	3	3	2	2	2	3	2	1	1	1	2	1	3	3	3	2	1	1	1	
Lepomis symmetricus (bantam sunfish)			ST		delist																						
Lythrurus fumeus (ribbon shiner)		-1					1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	2	1	1	
Macrhybopsis gelida (sturgeon chub)		0	SE		delist		3	2	1	2	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	
Macrhybopsis meeki (sicklefin chub)		0					1	1	2	2	1	3	1	1	1	1	1	2	1	1	1	2	1	1	1	2	
Micropterus dolomieu (smallmouth bass)		1					2	2	2	2	2	3	2	2	1	2	1	2	1	2	2	1	1	1	1	2	
Micropterus punctulatus (spotted bass)		-1					1	2	2	2	1	3	2	1	1	1	1	1	1	2	2	2	2	1	1	2	
Moxostoma carinatum (river redhorse)		1	ST		delist		1	2	2	2	2	2	2	2	1	1	1	1	1	1	1	2	1	1	1	1	
Moxostoma duquesnei (black redhorse)		1					1	2	2	2	2	2	2	2	1	1	1	1	1	1	1	2	1	1	1	1	

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FISHES, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Structure/Infrastructure	
Moxostoma valenciennesi (greater redhorse)		1	SE				delist	1	2	2	2	2	2	2	1	1	1	1	1	1	1	2	1	1	1	1
Myoxocephalus quadricornis (fourhorn sculpin)		0						1	1	2	1	2	2	2	1	1	1	2	1	1	1	2	1	1	1	1
Nocomis micropogon (river chub)		-1	SE				delist	1	1	1	1	2	2	1	1	1	1	1	1	1	1	2	1	1	1	1
Notropis anogenus (pugnose shiner)		-2	SE				delist	3	2	3	2	2	2	2	1	1	1	2	1	1	2	2	2	1	1	1
Notropis boops (bigeye shiner)		-2	SE				delist	3	2	3	3	1	3	2	1	1	1	1	1	1	2	2	1	1	1	1
Notropis buchanani (ghost shiner)		-1						2	1	1	2	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1
Notropis chalybaeus (ironcolor shiner)		0	ST				delist	3	3	3	3	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1
Notropis heterodon (blackchin shiner)		0	ST				delist	3	3	3	1	2	2	1	2	1	1	1	1	1	2	1	1	1	1	1
Notropis heterolepis (blacknose shiner)		-1	SE				delist	3	3	3	3	2	2	1	1	1	1	1	1	1	2	1	1	1	1	1
Notropis maculatus (taillight shiner)	1 location	0	SE				delist																			
Notropis nubilus (Ozark minnow)		0						2	2	2	2	1	3	1	1	1	1	1	1	1	2	1	1	1	1	1
Notropis rubellus (rosyface shiner)		-1						1	1	3	3	2	3	2	1	1	1	1	1	1	1	2	1	1	1	1
Notropis shumardi (silverband shiner)		0						2	1	2	2	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1
Notropis texanus (weed shiner)		0	SE				delist	3	3	3	3	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1

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FISHES, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses				Direct Human Stresses					
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structure/Infrastructure
Noturus eleutherus (mountain madtom)		-1					2	1	3	1	1	2	1	1	1	1	1	1	1	1	1	3	1	1	1	1
Noturus exilis (slender madtom)		-1					2	2	2	2	1	3	1	1	1	1	1	2	1	1	2	1	1	1	1	
Noturus stigmosus (northern madtom)		-1	SE			delist	3	1	3	2	1	3	1	1	1	1	1	1	1	1	2	1	1	1	1	
Opsopoeodus emilae (pugnose minnow)		-1					2	2	3	3	1	3	1	1	1	1	1	1	1	1	2	1	1	1	1	
Perca flavescens (yellow perch)		-1					1	2	3	2	3	3	3	3	1	2	1	3	1	2	2	3	3	2	1	1
Percopsis omiscomaycus (trout-perch)		0					1	1	2	2	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	
Phoxinus erythrogaster (southern redbelly dace)		0					2	3	3	3	1	2	1	1	1	1	1	1	1	1	2	2	1	1	1	1
Polyodon spathula (North American paddlefish)		-1					2	3	2	2	2	2	2	1	1	1	1	2	1	1	3	2	1	1	2	3
Rhynchichthys atratulus (blacknose dace)		0					2	2	2	2	1	2	1	1	1	1	1	2	1	1	2	1	1	1	1	
Rhynchichthys cataractae (longnose dace)		0					2	2	2	2	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	
Salvelinus fontinalis (brook trout)		0		2 basins		1	3	2	3	3	1	3	1	1	1	1	1	1	1	2	2	3	3	2	1	2
Salvelinus namaycush (lake trout)																						3				
Scaphirhynchus albus (pallid sturgeon)		-1	FE SE			delist	2	3	2	2	2	2	2	1	1	1	1	2	1	3	3	2	1	1	2	3

IX. Appendices - Appendix II

FISHES, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Structure/Infrastructure	
Scaphirhynchus platorhynchus (shovelnose sturgeon)		-1					2	3	2	2	2	2	1	1	1	1	2	1	1	3	2	1	1	2	3	
Stizostedion canadense (sauger - native stock)		1					2	2	3	1	1	3	1	2	1	1	1	1	1	2	2	3	2	2	1	2
Stizostedion vitreum (walleye - native stock)		1					2	2	3	2	1	3	1	2	1	1	1	1	1	2	2	3	2	2	1	2
Umbra limi (central mudminnow)		0					2	1	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Game Species</i>	(angler days ¹)																									
Trout - Lake Michigan	755199	1					1	1	2	2	1	2	3	2	3	2	1	3	1	2	1	3	2	1	1	1
Trout - inland	597135	0					3	3	3	3	1	3	1	1	1	1	1	1	1	2	2	3	1	1	1	2
Salmon - Lake Michigan	1059145	1					1	1	2	2	1	2	3	2	3	2	1	3	1	2	2	3	2	1	1	1
Smelt	98965	-2					1	1	2	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1
Northern pike, muskie	1062163	0					1	2	2	1	1	2	1	1	1	2	1	2	1	2	1	3	2	1	2	1
Walleye, sauger	2873701	1					2	2	2	2	1	3	1	2	1	1	1	1	1	2	2	3	2	2	1	2
Yellow perch	457143	-2					1	2	3	2	3	3	3	3	1	2	1	3	1	2	2	3	3	2	1	1
Largemouth bass	9442328	0					1	1	2	1	1	2	1	1	2	1	1	2	1	1	1	2	1	1	1	1
Smallmouth bass, spotted bass	1493274	0					2	2	2	3	2	3	2	2	1	2	1	2	1	2	2	2	2	1	1	2
White bass, yellow bass	1028328	0					1	1	2	2	2	3	3	1	1	1	1	3	1	1	1	2	2	1	1	1
Striped bass & hybrids	514616	0					2	1	2	1	1	2	1	1	1	1	1	1	1	1	2	3	2	1	1	1

IX. Appendices - Appendix II

FISHES, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Structure/Infrastructure	
Catfish	6543927	1					1	1	2	2	1	2	1	2	1	1	1	2	1	1	1	3	2	1	1	1
Bullhead	595278	0					1	1	2	1	1	2	1	2	1	1	1	2	1	1	1	2	1	1	1	1
Sunfish	4303202	1					1	1	2	2	2	2	2	2	1	2	1	2	1	2	1	2	2	2	1	1
Crappie	5868962	0					2	1	2	2	2	2	2	2	2	2	1	2	1	2	2	2	2	2	1	2
Carp	812927	-1					1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1
Other fish	161897	0					2	2	2	2	2	2	1	1	1	1	2	1	1	2	2	1	1	1	1	1

¹ Illinois Department of Natural Resources. 2000. 1998 Illinois Sport Fishing Survey. Special Fisheries Report No. 57.

Matrix completed by Trent Thomas, Ann Holtrop, Dave Day, with Jeff Walk; 5 August 2004

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Illinois Department of Natural Resources, Biotics 4 database (T. Kieninger, manager).

APPENDIX II, CONTINUED.

Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses		Structures - Infrastructure					
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal		Recruitment	Mortality	Killing	Disturbance	
<i>Species in Greatest Need of Conservation</i>																											
AMPHIBIANS																											
Ambystoma jeffersonianum (Jefferson salamander)	2 counties		ST				delist	3	2	1	2	1	1	2	1	1	1	1	1	1	2	2	3	1	1	1	1
Ambystoma laterale (blue-spotted salamander)	6 counties	0						1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ambystoma platineum (silvery salamander)	1 county		SE				delist	3	3	2	3	1	1	2	1	1	1	1	1	3	3	1	3	1	1	1	1
Ambystoma talpoideum (mole salamander)		0						1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cryptobranchus alleganiensis (hellbender)	no records since 1990	-2	SE				delist	3	3	3	3	1	3	1	1	1	1	1	1	3	1	3	1	1	1	1	1
Desmognathus conanti (spotted dusky salamander)	2 counties	0	SE				delist	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2
Gastrophryne carolinensis (eastern narrowmouth toad)		-1	ST				delist	3	2	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	
Hemidactylium scutatum (four-toed salamander)		-1	ST				delist	3	3	3	2	3	2	1	1	1	1	1	1	1	3	2	1	1	1	1	
Hyla avivoca (bird-voiced treefrog)	6 counties	-1	ST				delist	2	2	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	

AMPHIBIANS & REPTILES, continued

Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses				Direct Human Stresses		Structures - Infrastructure				
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment		Mortality	Killing	Disturbance	
Necturus maculosus (mudpuppy)		-1					2	2	1	2	1	2	1	2	1	1	1	1	1	2	1	2	2	2	1	1	
Pseudacris streckeri illinoensis (Illinois chorus frog)	7 counties	0	ST				delist	3	2	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Rana areolata (crayfish frog)		-1					2	3	3	3	2	1	2	2	1	1	1	1	1	2	2	3	1	1	2	2	
Rana palustris (pickerel frog)		0					2	2	3	3	1	2	1	1	1	1	1	1	1	2	1	2	1	1	1	1	
Rana sylvatica (wood frog)		0					2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	
REPTILES																											
Apalone mutica (smooth softshell turtle)		0					1	1	2	2	1	2	1	2	1	1	1	1	1	2	1	2	1	2	1	1	
Clemmys guttata (spotted turtle)	1 location	-2	SE				delist	3	3	3	2	1	1	1	2	1	1	1	1	3	2	3	3	3	2	1	
Clonophis kirtlandii (Kirtland's snake)		-1	ST				delist	3	2	3	3	1	1	1	2	1	3	1	1	2	2	2	2	1	1	2	
Crotalus horridus (timber rattlesnake)		0	ST				delist	2	2	2	1	1	1	2	1	1	1	1	1	2	2	3	3	3	2	2	
Elaphe emoryi (great plains rat snake)	2 counties	-1	SE				delist	3	1	2	2	1	1	1	2	1	1	1	1	3	1	3	3	1	2	3	
Emydoidea blandingii (Blanding's turtle)		-1	ST				delist	2	3	2	3	3	2	1	2	1	1	1	1	1	3	3	3	3	2	2	
Farancia abacura (mud snake)		0					delist	1	1	2	2	1	1	1	1	2	1	1	1	1	1	1	2	1	1	2	
Heterodon nasicus (western hognose snake)		0	ST				delist	2	2	3	2	3	1	1	2	1	1	1	1	1	3	2	2	3	2	2	

AMPHIBIANS & REPTILES, continued

Resource - Species	Status			Objectives	Habitat Stresses			Community Stresses							Population Stresses			Direct Human Stresses									
	N	Trend	Listing		N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure
Kinosternon flavescens (Illinois mud turtle)		-1	SE				delist	3	3	3	3	1	1	1	2	1	1	1	1	1	3	1	3	2	1	1	1
Kinosternon subrubrum (eastern mud turtle)		0						1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Macrochelys temminckii (alligator snapping turtle)	no records since 1978	-1	SE				delist	3	3	2	3	1	1	1	1	1	1	1	1	3	1	3	2	1	1	1	
Masticophis flagellum (coachwhip)	no records since 1974	-2	SE				delist	2	1	2	2	1	1	3	1	1	1	1	1	3	1	3	3	1	2	3	
Nerodia cyclopion (Mississippi green water snake)	1 location	0	ST				delist	2	2	1	2	1	1	1	2	1	1	1	1	1	1	1	2	1	1	2	
Nerodia erythrogaster neglecta (n. copperbelly watersnake)		0	Admin Rule 1					2	2	1	2	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	
Nerodia fasciata (broad-banded water snake)	no records since 1954	-2	SE				delist	2	2	2	2	1	1	2	1	1	1	1	1	3	1	3	2	1	2	2	
Liochlorophis vernalis (smooth green snake)		-1						3	3	3	2	2	1	1	2	1	1	1	1	2	2	3	3	2	2	2	
Ophisaurus attenuatus (slender glass lizard)		-1						3	2	3	3	2	1	1	1	1	1	1	1	2	1	3	2	1	2	2	
Pseudemys concinna (river cooter)		0	SE				delist	2	1	1	2	1	1	1	2	1	1	1	1	1	1	2	2	1	1	1	
Sistrurus catenatus catenatus (eastern massasauga)		-2	SE				delist	3	3	2	2	2	1	2	2	1	1	1	1	2	1	3	3	2	2	3	
Tantilla gracilis (flathead snake)	2 counties	-1	ST				delist	2	1	2	2	1	1	1	1	1	2	1	1	2	1	3	2	1	2	2	

AMPHIBIANS & REPTILES, continued

Resource - Species	Status	Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses		Structures - Infrastructure							
		N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics		Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance
Terrapene omata (ornate box turtle)			0					2	3	2	2	3	1	1	2	1	1	1	1	1	1	1	2	2	2	2	2
Thamnophis sauritus (eastern ribbon snake)			0	ST			delist	2	2	2	2	1	1	1	1	1	1	1	1	1	2	1	2	2	1	1	2
Tropidoclonion lineatum (lined snake)			-1	ST			delist	2	2	2	1	1	1	2	2	1	1	1	1	1	2	2	2	2	1	1	1
<i>Game Species</i>	(harvest)						(harvest)																				
Bullfrog			1					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

¹ *N. E. neglecta* is protected by Illinois Administrative Rule, part 880.70, in 14 southeastern Illinois counties

Completed 23 August 2004 by Scott Ballard, Mike Redmer, with Jeff Walk

Sources consulted:

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APPENDIX II, CONTINUED.

BIRDS Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses				Direct Human Stresses					
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure
<i>Species in Greatest Need of Conservation</i>		since 1985																								
Ammodramus henslowii (Henslow's sparrow)	1,500	-2	ST	3,000	2	delist	3	3	3	3	3	1	1	2	2	1	1	2	1	1	1	2	1	1	2	2
Ammodramus leconteii (LeConte's sparrow) ¹		-1			2		3	2	3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Ammodramus nelsoni (Nelson's sharp-tailed sparrow) ¹		-1			2		3	2	3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Ammodramus savannarum (grasshopper sparrow)	240,000	-2		480,000	2		3	3	2	3	3	1	1	2	2	1	1	2	1	1	1	2	1	1	2	2
Anas rubripes (American black duck) ¹		-2			1		2	2	1	2	2	3	1	2	2	1	3	1	3	1	2	1	1	1	1	
Ardea alba (great egret)		2			1		2	2	2	3	2	3	1	1	1	1	1	1	1	1	2	2	1	2	2	
Asio flammeus (short-eared owl)	<50	0	SE	>50	2	delist	3	3	3	3	3	2	1	1	1	2	1	1	1	1	2	2	1	2	2	
Aythya affinis (lesser scaup)		-2			2		1	1	2	3	2	3	1	1	2	2	1	1	1	1	2	2	1	2	2	
Aythya valisineria (canvasback)		-1			1		1	1	2	3	2	3	1	1	2	2	1	1	1	1	2	2	1	2	2	
Bartramia longicauda (upland sandpiper)	<500	-2	SE	>500	2	delist	3	3	3	3	3	1	1	2	1	1	1	1	1	1	2	2	1	1	2	
Bonasa umbellus (ruffed grouse)		-1			2		2	2	3	3	2	1	1	1	1	1	1	1	1	1	2	2	2	1	1	2
Botaurus lentiginosus (American bittern)	<100	-1	SE	>100	1	delist	3	3	3	3	3	3	1	1	1	2	1	1	1	1	2	2	1	2	2	

IX. Appendices - Appendix II

BIRDS, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses				Direct Human Stresses		Structures - Infrastructure			
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment		Mortality	Killing	Disturbance
Buteo lineatus (red-shouldered hawk)		1					2	2	2	2	2	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1
Buteo platypterus (broad-winged hawk)		-1					3	3	2	1	2	1	1	1	1	2	1	1	1	1	1	2	3	1	1	2
Buteo swainsoni (Swainson's hawk)	<20	-1	SE	>20		2 delist	3	3	2	3	2	3	1	1	1	2	1	1	1	1	2	2	3	1	3	3
Calcarius pictus (Smith's longspur) ¹		-2				2	2	2	3	2	2	1	1	1	1	2	1	1	1	1	1	2	2	1	1	2
Calidris himantopus (stilt sandpiper) ¹		-2				2	3	3	2	3	3	1	1	1	1	2	1	1	1	1	1	2	2	1	2	1
Caprimulgus carolinensis (chuck-will's-widow)		-2				2	2	2	3	3	2	1	1	2	1	1	1	1	1	1	1	2	2	1	1	3
Caprimulgus vociferus (whip-poor-will)	36,000	-2		54,000		2	2	2	3	3	2	1	1	2	1	1	1	1	1	1	1	2	2	1	1	3
Certhia americana (brown creeper)		1				1	2	2	3	2	2	1	1	1	2	1	1	2	1	1	1	2	1	1	1	2
Chaetura pelagica (chimney swift)	800,000	-2		1,200,000		2	2	1	3	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2
Charadrius melodus (piping plover)	0	0	FE SE			2 delist	3	3	3	3	1	3	2	3	1	2	1	1	1	3	2	3	3	1	3	3
Chordeiles minor (common nighthawk)		-1				1	2	1	1	2	1	1	1	1	1	2	1	1	1	1	1	2	2	1	2	2

IX. Appendices - Appendix II

BIRDS, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure
Chlidonias niger (black tern)	<100	-1	SE	>100	2	delist	3	3	3	3	3	3	1	2	1	1	1	1	1	1	1	2	2	1	3	3
Circus cyaneus (northern harrier)	<100	0	SE	>100	2	delist	3	3	3	3	3	2	1	2	1	2	1	1	1	1	1	2	2	1	1	2
Cistothorus palustris (marsh wren)		-2			2		3	2	3	3	3	3	1	1	1	1	1	1	1	1	1	2	2	1	1	2
Cistothorus platensis (sedge wren)	17,000	-1		25,000	1		3	2	3	3	2	1	1	1	1	1	1	1	1	1	1	2	2	1	2	2
Coccyzus americanus (yellow-billed cuckoo)	210,000	-1		320,000	2		2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2
Coccyzus erythrophthalmus (black-billed cuckoo)	6,600	-1		9,900	1		2	2	3	3	1	1	1	2	1	1	1	1	1	1	1	2	2	1	1	2
Colaptes auratus (northern flicker)	150,000	-1		230,000	1		2	1	3	2	1	1	3	1	1	2	1	3	1	1	1	2	2	1	1	2
Colinus virginianus (northern bobwhite)	320,000	-2		640,000	2		3	3	3	3	3	2	1	2	1	2	1	1	1	1	3	3	2	1	1	1
Coturnicops noveboracensis (yellow rail) ¹					2		3	3	3	3	3	3	1	1	1	2	1	1	1	1	1	1	2	1	1	3
Cygnus buccinator (trumpeter swan) ¹		1	XN		2		1	2	2	3	2	2	1	2	1	1	1	1	1	1	1	2	2	1	1	2
Dendroica cerulea (cerulean warbler)	400	-2	ST	800	2	delist	3	3	3	3	2	1	1	2	3	1	1	3	1	1	1	3	2	1	1	2

IX. Appendices - Appendix II

BIRDS, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure
Dendroica discolor (prairie warbler)	8,300	-1		12,000	1		3	2	3	3	2	1	1	2	3	1	1	3	1	1	1	2	2	1	1	2
Dolichonyx oryzivorus (bobolink)		-2			2		3	3	3	3	3	1	1	2	2	1	1	2	1	1	1	3	2	1	1	2
Egretta caerulea (little blue heron)	<5 colonies	-1	SE	>5 colonies	2	delist	3	2	2	3	2	2	1	1	1	2	1	1	1	1	1	2	2	1	2	2
Egretta thula (snowy egret)	<5 colonies	-1	SE	>5 colonies	2	delist	3	2	2	3	2	2	1	1	1	2	1	1	1	1	1	2	2	1	2	2
Empidonax trailli (willow flycatcher)	31,000	-1		47,000	-1		3	2	3	3	3	1	1	1	3	1	1	3	1	1	1	2	2	1	1	2
Empidonax virescens (Acadian flycatcher)	62,000	0		62,000	0		3	3	2	2	2	1	1	3	3	1	1	3	1	1	1	3	2	1	1	2
Euphagus carolinus (rusty blackbird) ¹		-2			2		2	2	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Falco peregrinus (peregrine falcon)	<20	1	ST		1	delist	1	1	2	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	2	1
Gallinula chloropus (common moorhen)	<200	-1	ST	>200	2	delist	3	2	3	3	3	3	1	2	1	2	1	1	1	1	1	2	1	1	1	2
Gallinago delicatata (Wilson's snipe)		0			2		3	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Grus americana (whooping crane) ¹		1	XN		2		3	3	2	2	2	3	1	1	1	1	1	1	1	3	2	3	3	2	3	2

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BIRDS, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses				Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure	
Grus canadensis (sandhill crane)	100-200	2	ST	>200	2	delist	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2
Haliaeetus leucocephalus (bald eagle)	>50	2	FT ST	>20 pairs	0	delist	1	1	2	2	2	2	1	1	2	2	1	1	1	1	1	2	2	1	2	2	
Helmitheros vermiformis (worm-eating warbler)	4,600	-1		6,000	1		3	3	2	2	2	1	1	3	3	1	1	3	1	1	1	3	2	1	1	2	
Hylocichla mustelina (wood thrush)	97,000	-1		150,000	1		3	3	3	3	2	1	1	3	3	1	1	3	1	1	1	3	2	1	1	2	
Icteria virens (yellow-breasted chat)	110,000	-2		110,000	0		3	2	2	3	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	
Ictinia mississippiensis (Mississippi kite)	<500	0	SE	500	1	delist	2	2	2	3	2	3	1	1	1	2	1	1	1	1	1	2	2	1	1	2	
Ixobrychus exilis (least bittern)	<1,000	1	ST	1000	1	delist	3	2	3	3	3	3	1	1	1	2	1	1	1	1	1	2	2	1	1	2	
Lanius ludovicianus (loggerhead shrike)	16,000	-2	ST	32,000	2	delist	3	3	3	3	3	2	2	2	1	2	1	2	1	1	2	3	3	1	1	2	
Laterallus jamaicensis (black rail)	<50		SE	>50	2	delist	3	3	3	3	3	3	1	1	1	2	1	1	1	2	2	3	3	1	1	2	
Limnodromus griseus (short-billed dowitcher) ¹		-2			2		3	2	2	3	3	3	1	1	1	2	1	1	1	1	1	2	2	1	2	1	
Limothlypis swainsonii (Swainson's warbler)	<50	0	SE	>50	2	delist	3	3	3	3	2	1	1	2	2	1	1	2	1	1	2	3	3	1	1	2	
Lophodytes cucullatus (hooded merganser)		0			1		1	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	

IX. Appendices - Appendix II

BIRDS, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure
Melanerpes erythrocephalus (red-headed woodpecker)	180,000	-2		360,000	2		3	2	3	3	3	2	3	2	1	1	1	3	1	1	1	2	2	1	1	2
Nyctanassa violacea (yellow-crowned night-heron)	<100	0	SE	>100	2	delist	3	2	3	3	3	3	1	1	1	2	1	1	1	1	1	2	2	1	1	2
Nycticorax nycticorax (black-crowned night-heron)	<500	0	SE	>500	1	delist	3	2	3	3	3	3	1	1	1	2	1	1	1	1	1	2	2	1	1	2
Oporornis agilis (Connecticut Warbler) ¹					2		2	2	3	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Oporornis formosus (Kentucky warbler)	18,000	-2		27,000	2		3	3	2	2	2	1	1	2	3	1	1	2	1	1	1	3	2	1	1	2
Pandion haliaetus (osprey)	<20	0	SE	>20	2	delist	1	1	3	2	2	2	1	1	2	2	1	1	1	1	1	2	2	1	2	2
Passerculus sandwichensis (savannah sparrow)		-2			2		3	3	3	3	3	1	1	2	2	1	1	1	1	1	1	3	2	1	1	2
Phalaropus tricolor (Wilson's phalarope)	<100	0	SE	>100	2	delist	3	2	3	3	3	3	1	1	1	1	1	1	1	1	1	2	2	1	1	2
Pluvialis dominica (American golden-plover) ¹		-2			2		1	2	2	3	1	3	1	1	2	2	1	1	1	1	1	2	3	1	1	2
Podilymbus podiceps (pied-billed grebe)		1			1		2	2	2	3	3	3	1	1	1	1	1	1	1	1	1	1	2	1	1	2
Rallus elegans (king rail)	<100	-2	SE	>100	2	delist	3	3	3	3	3	3	1	2	1	2	1	1	1	1	2	3	2	1	1	2
Scolopax minor (American woodcock)		-1			2		3	2	3	3	2	1	1	1	1	1	1	1	1	1	1	3	2	1	1	3

IX. Appendices - Appendix II

BIRDS, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure
Seiurus aurocapillus (ovenbird)		-2					3	3	3	2	2	1	1	2	3	1	1	2	1	1	1	3	2	1	1	2
Spiza americana (dickcissel)		-2					3	3	2	3	3	1	1	2	3	1	1	2	1	1	1	3	3	1	1	2
Spizella pusilla (field sparrow)	270,000	-2		540,000			3	2	2	3	2	1	1	3	3	1	1	3	1	1	1	3	2	1	1	2
Sterna antillarum (least tern)	<100	-1	FE SE	>100			3	3	3	3	1	3	1	3	1	2	1	1	1	2	2	3	2	1	3	2
Sterna forsteri (Forster's tern)	<500	0	SE	>500			3	3	3	3	3	1	2	1	2	1	1	1	1	1	1	3	2	1	3	2
Sterna hirundo (common tern)	<500	0	SE	>500			3	3	3	3	3	2	3	1	2	1	1	1	1	1	1	3	2	1	3	3
Thryomanes bewickii (Bewick's wren)	<100	-2	SE	>100			2	2	3	2	2	1	2	1	1	1	1	1	1	2	3	3	2	1	2	2
Tringa melanoleuca (greater yellowlegs) ¹		-2					3	2	2	3	3	1	1	1	2	1	1	1	1	1	1	2	2	1	2	1
Tryngites subruficollis (buff-breasted sandpiper) ¹		-2					3	2	2	3	3	1	1	1	2	1	1	1	1	1	1	2	2	1	2	1
Tympanuchus cupido (greater prairie-chicken)	<400	-2	SE	5,000			3	3	3	3	3	1	2	2	2	2	1	2	1	3	3	3	3	1	2	3
Tyto alba (barn-owl)		-2	SE				2	2	2	2	2	1	2	1	2	1	1	1	1	1	2	3	3	1	1	2
Vermiforma pinus (blue-winged warbler)	1,700	-1		2,600			2	2	2	3	2	1	1	2	3	1	1	3	1	1	1	3	2	1	1	2
Vireo belli (Bell's vireo)	4,000	-1		8,000			3	3	3	3	2	1	1	2	3	1	1	2	1	1	1	3	2	1	1	2
Xanthocephalus xanthocephalus (yellow-headed blackbird)	<500	0	SE	500			3	3	3	3	3	2	2	1	2	1	1	1	1	2	2	2	2	1	2	2

IX. Appendices - Appendix II

BIRDS, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure
<i>Game Species</i>	(harvest)			(harvest)																						
Migratory geese (Anserinae)	108,711	0		150,000	0		2	2	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	2	1
Migratory ducks (Anatinae)	362,385	0		500,000	1		3	2	3	3	3	1	1	2	2	1	1	1	1	1	2	1	1	1	2	2
Resident Canada geese	36,574	1		80,000	0		1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1
	(harvest)			(spring)																						
	93,500																									
	(spring)																									
Nesting ducks (Anatinae)	NA	1			1		2	1	2	2	2	1	2	1	1	1	1	1	1	1	1	2	1	1	2	2
American coots	1,743	-1			0		2	1	2	3	3	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2
rails (sora, Virginia)	1,264	-1			2		3	3	3	3	3	1	2	1	1	1	1	1	1	1	2	2	1	1	2	3
Wilson's snipe	158	0			2		3	3	3	3	3	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2
American woodcock	1,264	-1		10,000	2		3	2	3	2	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	3
Wild turkey	30,965	1		Incr. 20%	1		2	2	2	1	2	1	2	1	1	1	1	1	1	1	2	2	1	1	2	2
Northern bobwhite	233,181	-2		1,000,000	2		3	3	3	3	2	1	2	1	2	1	1	1	1	3	3	2	1	1	1	1
Ring-necked pheasant	142,026	-2		500,000	2		3	3	3	3	1	1	2	1	2	1	1	1	1	1	3	2	1	1	1	1
Gray partridge	0	-2			2		3	3	3	3	1	1	2	2	2	1	1	1	1	1	3	2	1	1	1	1
Mourning dove	1,066,379	0		1,250,000	0		2	1	1	1	2	2	2	1	1	1	2	1	1	1	2	2	1	1	1	2
American crow	60,507	-1			0		1	1	1	1	1	1	1	3	1	1	3	1	1	1	1	3	1	1	1	1

¹ Does not breed in Illinois

*Appendix II (Birds), continued.*Sources consulted:

Rosenberg 2004. Partners in Flight objectives for Illinois.

Illinois Department of Natural Resources, Biotics 4 database (T. Kieninger, manager).

Kleen et al. 2004. The Illinois Breeding Bird Atlas.

Bohlen 1989. Birds of Illinois.

Sauer et al. 2004. The North American Breeding Bird Survey, Results and Analysis 1966 - 2003.

The Meadowlark: a journal of Illinois birds. Vols. 1-13

Walk 2004. Plan for the recovery of the greater prairie-chicken in Illinois.

Harvest Information from:

R. Marshalla, IDNR Migratory Bird Program, pers. comm.

Miller et al. 2004a. 2002-2003 Illinois Hunter Harvest Report.

Miller et al. 2004b. Results of the 2002-2003 Illinois Waterfowl Hunter Survey.

Section completed by J. Walk, July 2004, with M. Ward and S. Bailey

APPENDIX II, CONTINUED.

MAMMALS Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses				Direct Human Stresses					
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure
<i>Species in Greatest Need of Conservation</i>		since 1985																								
Canis lupus (gray wolf) ¹	0		0 FT ST				delist	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	1	1
Corynorhinus rafinesquii (eastern big-eared bat)	3 summer colonies		0 SE				delist	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	2	2	1
Lontra canadensis (river otter)			2					1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Lynx rufus (bobcat)			1					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Microsorex hoyi (pygmy shrew)								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Microtus pinetorum (woodland vole)								1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mustela nivalis (least weasel)								2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Myotis austroriparius (southeastern bat)	4 summer colonies		0 SE				delist	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1
Myotis grisescens (gray bat)	<4 summer colonies		0 FE SE				delist	3	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1
Myotis sodalis (Indiana bat)			1 FE SE				delist	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	2
Neotoma floridana (eastern woodrat) ²	4 colonies + reintroductions		1 SE				delist	2	2	1	1	1	1	2	1	1	1	1	1	2	2	1	1	1	1	1

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MAMMALS, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses						
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures - Infrastructure
Ochrotomys nuttalli (golden mouse)		>0	ST				delist	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Ondatra zibethicus (muskrat)		0						1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Oryzomys palustris (marsh rice rat)		0	ST				delist	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Peromyscus gossypinus (cotton mouse) ³		0						1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1
Spermophilus franklinii (Franklin's ground squirrel)		-1	ST				delist	2	2	2	3	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2
Sylvilagus aquaticus (swamp rabbit)		0						2	2	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1
Tamiasciurus hudsonicus (red squirrel)		0						3	2	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1
Taxidea taxus (American badger)		0						2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1
Urocyon cinereoargenteus (gray fox)		-1						2	2	1	1	1	2	2	1	1	1	1	1	1	1	1	2	1	1	2
<i>Game Species</i>	(harvest)			(harvest)																						
White-tailed Deer	182,78	1		140,000 ⁴				1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
Rabbit (Cottontail & Swamp)	349,614	-2						2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Squirrel	481,213	-1						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Fox Squirrel	444,719	-2						1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

MAMMALS, continued Resource - Species	Status			Objectives			Habitat Stresses					Community Stresses					Population Stresses			Direct Human Stresses		Structures - Infrastructure				
	N	Trend	Listing	N	Trend	Listing	Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	Competitors	Predators	Parasites - Disease	Prey - Food	Hosts	Invasives/Exotics	Other Symbionts	Genetics	Dispersal		Recruitment	Mortality	Killing	Disturbance
Muskrat	50,895						1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Beaver	9,983						1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Woodchuck	8,057						1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1
Opossum	35,621	0					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Striped Skunk	3,281	-1					2	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1
Mink	5,189						1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
American Badger	89						2	2	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
Weasel (Least & Long-tailed)	61						2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Raccoon	330,094	-1					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Coyote	84,141	0					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Fox	1,312	-1					2	1	2	1	1	2	2	2	1	1	1	1	1	1	1	1	2	1	1	2
Red Fox	5,433	-2					2	2	2	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1

¹ Occurs as vagrant only in Illinois

² Reintroduction efforts on-going, may obscure population trend

³ Identification is problematic; may intergrade broadly with other *Peromyscus*

⁴ Annual harvest of 140,000 deer results in a stable population. In the short-term, harvest exceeding current levels will be necessary to reduce the herd to a point where a 140,000-animal harvest maintains a stable population.

Appendix II (Mammals), continued:

Sources consulted:

Illinois Department of Natural Resources, Biotics 4 database (T. Kieninger, manager).

Hoffmeister, D. F. 1989. Mammals of Illinois.

Harvest information from:

Miller et al. 2004a. 2002-2003 Illinois Hunter Harvest Report.

Miller et al. 2003. 2002-2003 Illinois Trapper Survey Report.

Completed by Joyce Hofmann, Ed Heske, 16 August 2004, with Jeff Walk

APPENDIX II, CONTINUED.

HABITATS		Status	Area (acres) ¹	High Quality (acres) ²	Trend (since 1975)	Objectives Area (acres)	Trend	Stresses						
Resource								Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	
Forest	Upland Forest	3,455,241 ³	6,624	1	4,700,000 (all forest)	0	1	2	3	3	3	1		
	Sand Forest	NA ³	146	0			0	1	2	3	3	3	1	
	Floodplain	1,107,038	6,291	0			1	2	2	3	3	3	3	
	Flatwoods	NA ³	887	-1			2	2	2	3	3	3	1	
	Successional	NA ^{3,4}	0	-1			1	2	2	3	3	3	1	
	Coniferous Plantation	80,019	0	0			-1	1	1	2	2	2	1	
Open Woodland, Savanna & Barrens	Savanna	614,919 ⁴	82	-2	1,000,000 (all open woodland)	2	3	2	3	3	3	1		
Sand Savanna	NA ⁴	1,299	-1	1			3	2	3	3	3	1		
Barren	NA ⁴	129	-2	2			3	2	3	3	3	1		
Grassland	Prairie	NA ⁵	702	-1	5,500,000 (all grassland)	2	3	3	3	3	3	1		
	Sand Prairie	NA ⁵	1,226	-1			1	3	3	3	3	3	1	
	Gravel Prairie	NA ⁵	85	-1			1	3	3	3	3	3	1	
	Dolomite Prairie	NA ⁵	40	-1			1	3	3	3	3	3	1	
	Hill Prairie	NA ⁵	448	-1			1	3	2	3	3	3	1	
	Shrub Prairie	NA ⁵	60	-1			1	3	2	3	3	3	1	
	Pasture	4,163,599 ⁵	0	-2			2	2	2	3	3	3	1	
	Idle-introduced	NA ⁵	0	1			2	2	2	3	3	3	1	
	Early successional	NA ⁵	0	-2			2	2	2	2	3	2	1	
	Hay	341,667	0	-2			1	2	2	2	3	2	1	

IX. Appendices - Appendix II

HABITATS, continued		Status	Area (acres) ¹	High Quality (acres) ²	Trend (since 1975)	Objectives	Area (acres)	Trend	Stresses						
Resource									Extent	Fragmentation	Composition-Structure	Disturbance/Hydrology	Invasives/Exotics	Pollutants - Sediment	
Wetland	Marsh		133,786 ⁶	2,384	-2	322,000 (all wetland)			2	3	3	3	3	3	
	Swamp		20,254 ⁶	2,783	-1				1	3	3	2	3	3	3
	Bog		NA ⁶	232	-1				0	3	3	2	3	3	2
	Fen		NA ⁶	358	-1				0	3	3	3	3	3	3
	Sedge Meadow		NA ⁶	797	-1				2	3	3	3	3	3	3
	Panne		NA ⁶	57	-1				0	3	3	3	3	3	3
	Seep & Spring		NA ⁶	189	-1				0	2	3	3	3	3	3
	Vernal Pool or Flat		113,873	0	-1				2	3	3	2	3	2	3
Lake & Pond	Pond		644,349 ⁷	884	1	660,000 (open water category of Land Cover)			1	1	2	3	3	3	
	Lake		NA ⁷	956	1				1	1	2	3	3	3	3
	Lake Michigan		(1,000,000)	163	0				0	1	1	3	3	3	2
	Impoundment		NA ⁷	0	1				1	1	1	3	3	2	3
Stream	Creek		(26,000 miles) ⁷	160	0				0	1	2	3	3	2	3
	River			81	0				0	1	3	3	3	3	3
	Major River			NA	0				0	1	3	3	3	3	3
Primary	Glade		NA	447	-1				1	3	2	3	3	3	1
	Cliff		NA	146	-1				1	3	3	2	2	2	3
Cave	Lake Shore		NA	168	-2				0	3	3	3	3	3	3
	Aquatic		NA	NA	0				0	3	1	3	3	1	3
Cultural	Terrestrial		NA	NA	0				0	3	1	3	3	1	3
	Cropland		23,024,141	NA	1				21,170,000	-1	1	1	3	3	3
	Developed		2,325,924	NA	2	2,675,000	2	1	1	3	3	3	3		

Appendix II (Habitats), continued.

¹ Land Cover of Illinois Statistical Summary 1999-2000. http://www.agr.state.il.us/gis/stats/landcover/mainpages/stats_statewide.htm. Accessed 7 July 2004.

² Illinois Natural Areas Inventory, fide R. Collins, Natural Areas Tracking System, July 04

³ Combined forest types, excluding floodplain forest, coniferous plantation and open woodland/savanna/partial canopy, from Land Cover 1999-2000

⁴ Open woodland/savanna/partial canopy category from Land Cover 1999-2000 likely includes successional areas

⁵ Rural grassland category from Land Cover 1999-2000; an estimated 781,465 acres are enrolled in the Conservation Reserve Program (from grassland conservation practices; <http://www.fs.usda.gov>. Accessed 12 August 2004.).

⁶ Marsh and swamp categories likely include other scarce wetland types

⁷ Open water category from Land Cover 1999-2000 includes ponds, lakes, impoundments and some rivers, but excludes Lake Michigan

NA - not available, not appropriate

APPENDIX III. Stresses addressed, habitats improved, priority locations and performance measures for key conservation actions.					
STREAMS CAMPAIGN					
Actions	Stresses Addressed	Habitats Improved	Priority Locations	Performance Measurement Options	
				Outputs	Outcomes
1. improve H2O draining from ag lands	habitat condition, habitat extent	Streams, lakes & ponds, wetland, cave (riparian forest, grassland)	Statewide	acres of buffers/wetlands, miles of riparian forest, acres farmed below tolerable soil loss, miles of streams protected from grazing,	EPT taxa richness, native fish richness, nutrient load, turbidity, DO, sportfish supplies
2. improve H2O draining from developed lands	habitat condition, habitat extent	Streams, lakes & ponds, wetland, cave (riparian forest, grassland)	Statewide	acres of wetlands, miles of riparian forest, acres of impervious surfaces, volume of treated wastewater	EPT taxa richness, native fish richness, nutrient load, turbidity, DO, sportfish supplies
3. improve near-, in-stream processes	habitat condition	Streams, lakes & ponds, wetland (riparian forest, grassland)	Grnd Prairie, Rock River Hills, NE Moraine, Wabash Border, Sand Areas	acres of wetlands, miles of riparian forest, miles restored/re-meandered, re-established connections (main stem, floodplains),	habitat quality (CTAP), fish biomass, volume/depth of backwaters, lakes and ponds, sportfish supplies
4. restore rare, extirpated populations	varied, all	Streams, wetlands, lakes & ponds, cave	Wabash Border, Grnd Prairie, Shawnee Hills	acres/miles protected, acres/miles enhanced, number of reintroductions	T/E delistings, status changes
5. prevent invasive species	exotic species	Streams, wetlands, lakes & ponds	Lake Michigan, major rivers	biomass removed, acres/ miles treated	nonnative fish biomass, number of new invasions
6. restore, manage high-quality communities	habitat condition	Streams, wetlands, lakes & ponds, cave	Statewide	acres/miles protected, acres/miles enhanced	acres of INAI streams, wetlands, lakes & ponds
7. fill info gaps, develop improved actions	varied, all	Streams, wetlands, lakes & ponds, cave	Statewide	studies funded/ completed	all within campaign
8. coordinate H2O shed, stream conservation	varied, all	Streams, wetlands, lakes & ponds, cave	Statewide	workshops, publications	cost savings, public/ partner satisfaction
9. increase H2O quality education	habitat condition	Streams, wetlands, lakes & ponds, cave	NE Moraine, karst, rapid-development areas	number of persons reached	turbidity, nutrient load, DO, other pollutants

<i>Appendix III, continued: STREAMS CAMPAIGN</i>					
Actions	Stresses Addressed	Habitats Improved	Priority Locations	Performance Measurement Options	
		Primary (Secondary)		Outputs	Outcomes
10. marketing & technical assistance	habitat condition	Streams, wetlands, lakes & ponds, cave	Statewide	workshops (offered, attendance), requests for services (number filled), acres/ miles treated	EPT taxa richness, native fish richness, habitat quality (CTAP),nutrient load, turbidity, DO, sportfish supplies

APPENDIX III. Stresses addressed, habitats improved, priority locations and performance measures for key conservation actions.					
FORESTS CAMPAIGN					
Actions	Stresses Addressed	Habitats Improved	Priority Locations	Performance Measurement Options	
		Primary (Secondary)		Outputs	Outcomes
1. maintain, enhance composition	habitat condition	Forest, open woodland, savanna, barrens, shrub/ successional	Statewide	acres burned, TSI, invasive control; miles of successional borders, acres of restored open woodlands, number of reintroductions	oak, hickory, maple importance values; nonnative ground cover, nonnative shrub density, bird diversity (CTAP), T/E delistings
2. target increased acreage	habitat extent	Forest, open woodland, savanna, barrens, shrub/ successional	riparian corridors, >500- acre patches, Shawnee Hills, Ozark, WI Driftless, lower Kask.R., Pere Marquette, Castle Rock	acres reforested, miles of riparian forest	patch connectivity, fragment size (number >500 acres, >5,000 acres)
3. assist private forest management	habitat condition	Forest, open woodland, savanna, barrens, shrub/ successional	Statewide	acres in FDA, other programs; laws, programs encouraging access	oak, hickory, maple importance values; nonnative ground cover, nonnative shrub density, bird diversity (CTAP), deer population index
4. marketing, tech. assistance, demonstration	habitat condition	Forest, open woodland, savanna, barrens, shrub/ successional	Statewide	workshops (offered, attendance), requests for services (number filled), acres treated	oak, hickory, maple importance values; nonnative ground cover, nonnative shrub density, bird diversity (CTAP)
5. zoning & smart growth	habitat condition, habitat extent	Forest, open woodland, savanna, barrens, shrub/ successional	Statewide	workshops, publications	all within campaign
6. fill info gaps, develop improved actions	varied, all	Forest, open woodland, savanna, barrens, shrub/ successional	Statewide	studies funded/ completed	all within campaign

<i>Appendix III, continued: FORESTS CAMPAIGN</i>					
Actions	Stresses Addressed	Habitats Improved	Priority Locations	Performance Measurement Options	
		Primary (Secondary)		Outputs	Outcomes
7. restore, manage high-quality communities	habitat condition	Forest, open woodland, savanna, barrens, shrub/ successional	Statewide	acres protected, enhanced	acres of INAI forest, savanna, barrens

APPENDIX III. Stresses addressed, habitats improved, priority locations and performance measures for key conservation actions.					
FARMLAND & PRAIRIE CAMPAIGN					
Actions	Stresses Addressed	Habitats Improved	Priority Locations	Performance Measurement Options	
				Outputs	Outcomes
1. use incentives to establish habitat	habitat extent	Grassland, shrub/successional, open woodland, wetland (streams, lakes & ponds)	highly erodible soils, Grnd Prairie, Rock River Hills, So Till Plain, W strn Forest-Prairie, floodplains	acres established	T/E delistings, changes in status; pheasant/ bobwhite indices, grassland/ shrubland bird trends (BBS), patch size
2. use incentives to enhance habitat condition	habitat condition	Grassland, shrub/successional, open woodland, wetland, forest (streams, lakes & ponds)	Statewide	acres enhanced, miles of stream protected or restored	bird diversity (CTAP), plant diversity (CTAP), T/E delistings, changes in status; pheasant/ bobwhite indices, grassland/ shrubland bird trends (BBS)
3. restore rare, extirpated populations	varied, all	Grassland	Grnd Prairie, So Till Plain, NE Moraine, Sand Areas	acres protected, acres enhanced, number of reintroductions	T/E delistings, changes in status, acres INAI prairie, grassland bird trends (BBS)
4. emphasize multiple-benefits	varied, all	Grassland, shrub/successional, open woodland, wetland, forest, streams, lakes & ponds	Statewide	workshops, publications, partnerships	Other benefits in this and other campaigns: carbon sequestration, soil conservation, water quality
5. coordinate agricultural programs	varied, all	Grassland, shrub/successional, open woodland, wetland, forest (streams, lakes & ponds)	Statewide	workshops, publications, partnerships	cost savings, public/ partner satisfaction
6. fill info gaps, develop improved actions	varied, all	Grassland, shrub/successional, open woodland, wetland, forest (streams, lakes & ponds)	Statewide	studies funded/ completed	all within campaign
7. long-term land-use planning	habitat condition, habitat extent	Grassland, shrub/successional, open woodland, wetland, forest, streams, lakes & ponds	Statewide	workshops, publications	all within campaign

<i>Appendix III, continued: FARMLAND & PRAIRIE CAMPAIGN</i>					
Actions	Stresses Addressed	Habitats Improved	Priority Locations	Performance Measurement Options	
		Primary (Secondary)		Outputs	Outcomes
8. limit liability for private and access	varied, all	Grassland, shrub/successional, open woodland, wetland, forest, streams, lakes & ponds	Statewide	laws, programs encouraging access	public/ partner satisfaction, deer population index, game harvest

APPENDIX III. Stresses addressed, habitats improved, priority locations and performance measures for key conservation actions.					
WETLANDS CAMPAIGN					
Actions	Stresses Addressed	Habitats Improved	Priority Locations	Performance Measurement Options	
		Primary (Secondary)		Outputs	Outcomes
1. improve natural, artificial wetland condition	habitat condition	Wetland, lake & pond, streams, cave (grassland, riparian forest)	NE Moraine, bottomland divisions	acres protected, enhanced, restored; number of reintroductions	acres of INAI wetlands, lakes and ponds; plant diversity (CTAP), bird diversity (CTAP); T/E delistings, changes in status; frog/toad abundance, waterfowl use days, sportfish supplies
2. develop add'l wetland habitat	habitat extent	Wetland, lake & pond, streams, cave	NE Moraine, bottomland divisions, Grd Prairie	acres restored, established	T/E delistings, changes in status; frog/toad abundance, waterfowl use days, sportfish supplies
3. fill info gaps, develop improved actions	varied, all	Wetland, lake & pond, streams, cave	Statewide	studies funded/ completed	all within campaign
4. coordinate wetland programs	varied, all	Wetland, lake & pond, streams, cave (grassland, riparian forest)	Statewide	workshops, publications, partnerships	cost savings, public/ partner satisfaction
5. emphasize multiple-benefits	varied, all	Wetland, lake & pond, streams, cave, grassland, riparian forest	Statewide	workshops, publications, partnerships	Other benefits in this and other campaigns: carbon sequestration, water quality, flood protection
6. increase H2O quality education	habitat condition	Wetland, lake & pond, streams, cave	NE Moraine, karst, rapid-development areas	number of persons reached	turbidity, nutrient load, DO, other pollutants

APPENDIX III. Stresses addressed, habitats improved, priority locations and performance measures for key conservation actions.					
EXOTIC SPECIES CAMPAIGN					
Actions	Stresses Addressed	Habitats Improved	Priority Locations	Performance Measurement Options	
		Primary (Secondary)		Outputs	Outcomes
1. comprehensive exotic species strategy	exotic species, habitat condition, community stress	All	Statewide	workshops, publications, partnerships, legal authorities/ controls	number of unintentional introductions; speed and efficacy of response to new invasions; cost savings
2. fill info gaps, develop improved actions	exotic species, habitat condition, community stress	All	Statewide	studies funded/ completed	all within campaign
3. prioritize exotic species control areas	exotic species, habitat condition, community stress	All	High-quality areas, large habitat patches to be determined	acres of invasive species control, biomass removed, workshops, publications, partnerships	speed and efficacy of response to new invasions, acres of INAI communities, stress of exotic species to SGNC
4. marketing, tech. assistance, demonstration	exotic species, habitat condition	All	Statewide	workshops (offered, attendance), requests for services (number filled), acres treated	nonnative plant coverage (ground), density (shrub) and importance (canopy; CTAP)

APPENDIX III. Stresses addressed, habitats improved, priority locations and performance measures for key conservation actions.					
LAND & WATER STEWARDSHIP CAMPAIGN					
Actions	Stresses Addressed	Habitats Improved Primary (Secondary)	Priority Locations	Performance Measurement Options	
				Outputs	Outcomes
1. improve private resource stewardship	habitat condition	All	Private lands statewide	workshops (offered, attendance), requests for services (number filled), acres treated	CTAP habitat quality measures, nongame population trends, sportfish supply, game harvest
2. improve public resource stewardship	habitat condition	All	Public lands statewide	workshops/ staff training, acres managed, partnerships, reserves meeting long-term design criteria	T/E delistings, changes in status; sportfish supply, game harvest, acres of INAI communities
3. ecological, environmental education	All	(All)	Statewide	number of persons reached	participation in conservation activities, wildlife-related recreation
4. marketing, tech. assistance, demonstration	habitat condition	All	Statewide	workshops (offered, attendance), requests for services (number filled), acres treated	CTAP habitat quality measures, public support/ acceptance
5. limit liability for access, stewardship	habitat condition	All	Statewide	acres treated (fire, TSI, others); laws and programs encouraging access	CTAP habitat quality measures, public/ partner satisfaction, deer population index
6. prioritized invasive species control	habitat condition, exotics species	All	High-quality natural areas	acres of invasive species control, biomass removed, workshops, publications, partnerships	speed and efficacy of response to new invasions, acres of INAI communities, stress of exotic species to SGNC

APPENDIX III. Stresses addressed, habitats improved, priority locations and performance measures for key conservation actions.					
GREEN CITIES CAMPAIGN					
Actions	Stresses Addressed	Habitats Improved	Priority Locations	Performance Measurement Options	
				Outputs	Outcomes
1. minimize adverse effects of development	habitat extent, habitat condition	All Primary (Secondary)	NE Moraine, rapid-development areas	workshops, publications, partnerships, acres mitigated	T/E listings, changes in status; development-related stresses to SGNC; flood damage
2. integrate conservation in developed areas	habitat condition	All	NE Moraine, rapid-development areas	workshops, publications, partnerships, Tree City USA communities and grants, requests for services (number filled)	invasions of landscaping plants, wildlife damage, public satisfaction
3. increase H2O quality education	habitat condition	Wetland, lake & pond, streams, cave	NE Moraine, karst, rapid-development areas	number of persons reached	turbidity, nutrient load, DO, other pollutants
4. ecological, environmental education	All	(All)	Statewide	number of persons reached	participation in conservation activities, wildlife-related recreation
5. fill info gaps, develop improved actions	Varied, all	All	Statewide	studies funded/ completed	all within campaign
6. increase land, water access	Varied, all	(All)	Statewide	acres of public land; laws, programs encouraging private land & water access	public/ partner satisfaction, deer population index, game harvests