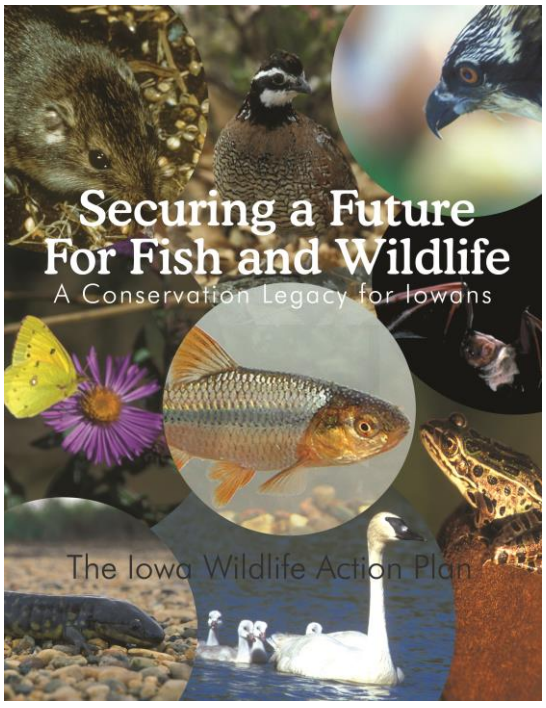
EXECUTIVE SUMMARY

Iowa Wildlife Action Plan

Securing a Future for Fish and Wildlife - A Conservation Legacy for Iowans

Iowa Department of Natural Resources

2015



For the full Plan, please visit: http://www.iowadnr.gov/Conservation/Wildlife-Stewardship/Iowa-Wildlife-Action-Plan

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Current and Future Wildlife Management: New Challenges, Threats, and Expectations

Traditional Funding Model for Wildlife Conservation in the U.S.

Since the development of modern-day wildlife management in the 1930s, the funding model for wildlife conservation in the U.S. has been heavily reliant upon sportsmen and women. This relationship is described by Organ et al. (2012):

> "From the earliest days of active management and enforcement by nascent state fish and wildlife agencies, hunters, anglers, and trappers have funded restoration and conservation initiatives. License and permit fees, a motor boat fuels tax, and excise taxes on hunting, shooting sports, and angling products provide dedicated funding for habitat conservation, harvest management, research, restoration, and monitoring initiatives by state agencies. The excise tax programs have permanent, indefinite appropriation status, which means that the revenues are automatically distributed to the states each year and not subject to congressional whim."

This funding model served wildlife conservation well for many decades and led to the successful restoration of many species of wildlife as well as the habitats upon which they depend. However, as declines in participation in hunting and angling have been observed over the long term, it has become increasingly clear that the reliance upon sportsmen and women for conservation of all wildlife is insufficient and unsustainable. Furthermore, as all wildlife, not just game and sportfish species, are held in the public trust, the fairness of the funding system has been questioned.

Sustainable Funding and Teaming With Wildlife

Since the 1980s, state fish and wildlife agencies have struggled to meet an increasing number of constituent demands while facing larger and more complex threats to the natural world, while relying on a funding model which was developed in large part to restore populations of sportfish and game. As the scientific fields of Wildlife and Fisheries Management, Conservation Biology, Landscape Ecology, Global Change Biology and Human Dimensions of Wildlife Conservation advanced and matured, the complexity of the conservation issues faced by State Fish and Wildlife Agencies was increasingly recognized. The need for management attention to nongame species and to functioning ecosystems became increasingly apparent. In the 1990s, in response to these increased challenges, the Association of Fish and Wildlife Agencies (AFWA) initiated the Teaming With Wildlife (TWW) coalition on behalf of State Fish and Wildlife Agencies. This coalition sought, and still seeks, sustainable, dedicated funding for fish and wildlife conservation at the national level.

State and Tribal Wildlife Grants Program (SWG)

One outcome of the TWW coalition's efforts is a program titled *State and Tribal Wildlife Grants (SWG)*. Appropriations for SWG have been passed annually since 2002, though the program is subject to yearly Congressional debate. The program's annual allocations have averaged approximately $56.7 million. These grants, managed by the U.S. Fish and

Wildlife Service, have required non-federal matching funds that vary from 25% to 50% depending on the year and type of program. Iowa DNR has received approximately $10.6 million in SWG (and, in 2001, from the related Wildlife Conservation and Restoration Program) funds from 2001-2015, with an average annual appropriation of ~$709,000. These funds have been used to implement this Plan through increased research, habitat protection, and management for Species of Greatest Conservation Need designated in the Plan. Iowa must match the SWG income with non-federal funds and many partners have worked together to leverage the federal funds in order to most effectively conserve the species and habitats that were identified as priorities within this Plan. Projects using SWG funds must benefit Species of Greatest Conservation Need identified in a State's Wildlife Action Plan.

State Wildlife Action Plans

In 2003, as a requirement to maintain eligibility for State Wildlife Grant funds, all states, territories and tribes which received SWG appropriations were required by Congress to develop Comprehensive Wildlife Conservation Strategies, now generally referred to as State Wildlife Action Plans (SWAPs). All 50 States and five U.S. territories developed a State Wildlife Action Plan (SWAP) in 2005.

State Wildlife Action Plans outline the steps that are needed to conserve wildlife and habitat before they become too rare or costly to restore. Taken as a whole, these proactive plans present a national action agenda for preventing wildlife from becoming endangered.

State Wildlife Action Plans conserve wildlife and natural places. They assess the health of each state's wildlife and habitats, identify the problems they face, and outline the actions that are needed to conserve them over the long term. To learn more about State Wildlife Action Plans and view links to other states' plans, please visit: www.teaming.com

The Eight Required Elements of a State Wildlife Action Plan

As a condition of receiving SWG funds, Congress mandated that state fish and wildlife agencies develop a *Comprehensive Wildlife Conservation Plan* (State Wildlife Action Plan) by October 1, 2005, and review and revise the plan every 10 years thereafter. Congress directed that the plans must identify and be focused on the species in greatest need of conservation yet address the full array of wildlife and wildlife-related issues. Congress identified eight required elements to be addressed in each State's Plan:

1. Information on the distribution and abundance of wildlife, including low and declining populations as each State Fish and Wildlife agency [DNR] deems to be appropriate, that are indicative of the diversity and health of wildlife of the State. Low and declining populations of fish and wildlife are defined in the Plan as Species of Greatest Conservation Need (SGCN).
2. Locations and relative conditions of key habitats and community types essential to conservation of SGCN.
3. Descriptions of problems which may adversely affect SGCN or their habitats and priority research and survey efforts needed to identify factors that may assist in restoration and improved conservation of SGCN and their habitats.
4. Descriptions of conservation actions necessary to conserve SGCN and their habitats and establish priorities for implementing such actions.

5. Provisions for periodic monitoring of SGCN and their habitats, for monitoring the effectiveness of conservation actions, and for adapting these conservation actions as appropriate to respond to new information or changing conditions.
6. Each State's provisions to review its Strategy [Plan] at intervals not to exceed ten years.
7. Each State's provisions for coordination during the development, implementation, review, and revision of its Strategy [Plan] with Federal, State, and local agencies and Indian Tribes that manage significant areas of land water within the State, or administer programs that significantly affect the conservation of SGCN or their habitats.
8. Each State's provisions to provide the necessary public participation in the development, revision, and implementation of its Strategy [Plan].

The Plan must utilize the best available knowledge on the distribution and abundance of wildlife, historical documentation and other references to identify Iowa's wildlife conservation needs. The Plan must address the needs of all wildlife, but focus primarily on SGCN and their habitats as determined by DNR.

Iowa's Wildlife Action Plan

Iowa's Plan was initially approved in 2006, and subsequently modified in 2012. This version represents the first comprehensive revision of Iowa's Plan.

Framework Outlined in Initial Plan

The Steering Committee which first developed Iowa's Plan made several decisions which have left a lasting imprint upon this first comprehensive revision.

1. The IWAP would be a wildlife plan; plants are not specifically addressed except as an integral component of wildlife habitat.
2. The IWAP would have a 25-year focus. Long-term continuity is needed to accomplish ambitious objectives, but achievements are needed to be accomplished in a time frame that can be appreciated by Plan supporters.
3. The IWAP would be strategic in nature. Operational plans to implement the visions and strategies would be crafted later to fit the unique missions and capabilities of conservation organizations and individuals interested in Plan Implementation.

To assure the Plan would involve a diversity of conservation viewpoints, representatives of 105 conservation, recreation, education and agricultural support organizations were invited to serve on a formal Advisory Group; 93 individuals representing 59 organizations agreed to participate (Appendix 2).

2015 Comprehensive Revision Process

Persons representing much of the ecological and conservation expertise existing in the state were included in various stages of the revision process, either as members of committees or as consultants and reviewers of specific portions of the IWAP.

A variety of efforts were made to ensure that information about the Plan received statewide distribution to the public as well:

- A complete draft of the revised Plan was placed on the DNR's web site with the email address for the Plan Coordinator, who received comments.
- As an alternative to downloading the draft Plan from the website, a CD-ROM containing the draft revised Plan was supplied to individuals upon request.
- Statewide news releases advertised completion of the Draft revised Plan, where it was available and how to comment.
- The public comment period for the draft IWAP revision was held from August 4, 2015 – September 11, 2015. A total of three written comments were received and incorporated in whole or part into the final version of the Plan.

Iowa's Conservation Legacy

Iowans maintain a strong connection to wildlife, and many participate directly in wildlife-associated recreation. The 2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation reported that wildlife-related recreation (hunting, fishing, and wildlife viewing) contributed $1,033,723,000 to Iowa's economy in 2011. Over 1.3 million Iowans age 16 and older participated in these activities in that year.

Moreover, regardless of their participation in wildlife-associated recreation, Iowans strongly favor conservation. In 2013, a non-partisan survey of Iowa's voters found that 97% of respondents agree with the statement "We need to ensure that our children and grandchildren can enjoy Iowa's land, water, wildlife, and natural beauty the same way we do" (Weigel and Metz, 2013).

Preserving all the species that reside in or migrate through the state and their habitats is important to maintaining the health of Iowa's wildlife which contributes not only to the economy, but also to the aesthetic value of the state. Maintaining Iowa's biological diversity will help this natural resource persist for many years into the future and continue to provide nature's benefits that we enjoy through hunting, fishing, wildlife viewing, and other outdoor recreational activities.

History of the Formation and Conservation of Iowa's Natural Communities

Iowa's Physiography

Topography

Iowa is a state of 56,239 square miles (36,016,500 acres) bordered by the Mississippi River on the east, and the Missouri and Big Sioux Rivers on the west. Iowa has a relatively low relief - elevations run from a high of 1,670 feet above mean sea level in Osceola County in northwestern Iowa to 480 feet above mean sea level in Lee County in the southeastern corner of the state.

Climate

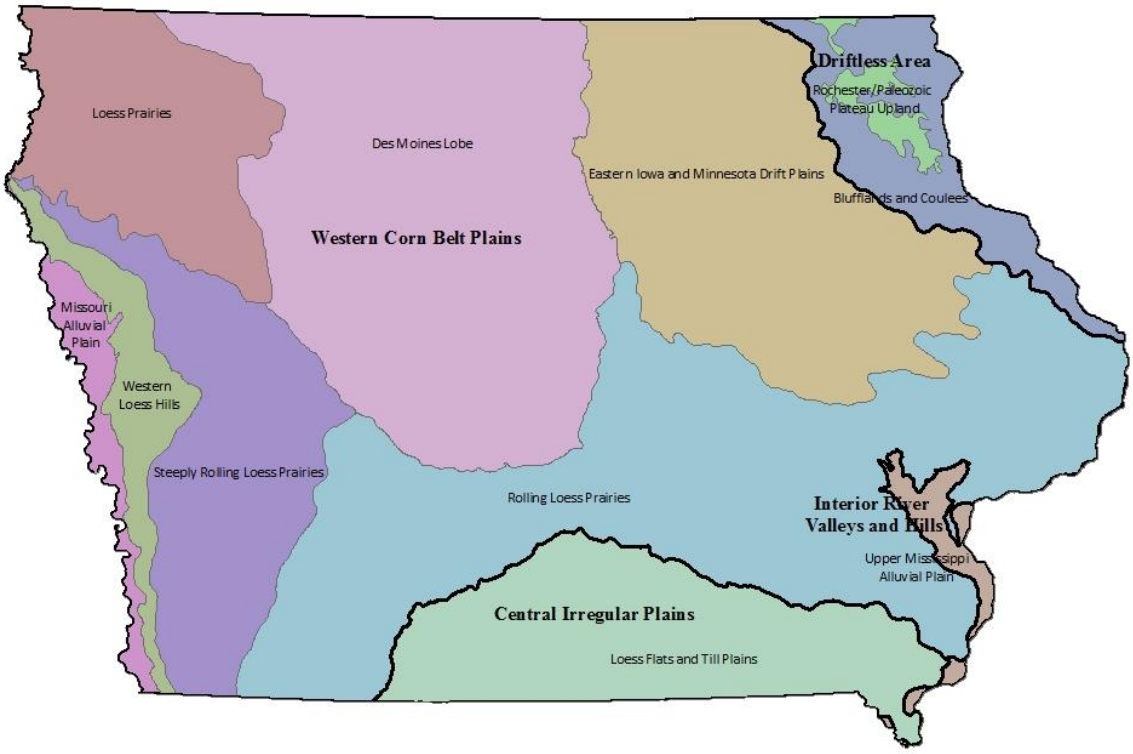
Iowa's climate is classified as humid continental and is characterized by warm summers and cold winters. The average annual temperature is 47.6°F. Average temperature in the summer is 71.5°F. December to February winter temperatures average 21.2° (NOAA 2015) with an average winter difference of 6.5 degrees between north and south. Temperature minimums of -25°F are not uncommon in northern Iowa.

Geology

Iowa's natural communities are as much a result of its recent geologic past as they are a result of climatic conditions (Prior 1991). The boundaries of the ecoregions that resulted from this geologic history coincide well with the boundaries of other habitat based classification systems (Map 1). The names of the ecoregions follow the US EPA (Omernik) Level III and IV Ecoregions. Descriptions of Level III ecoregions are taken from the US Environmental Protection Agency (EPA)'s Descriptions of Level III Ecoregions, accessed on the EPA website: http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm.

Map 1. Level III & IV Ecoregions of Iowa (US EPA – Omernik)

Large font denotes the names of Level III ecoregions and small font, Level IV ecoregions.



Level III Ecoregion Descriptions

The following narrative is organized by EPA Level III ecoregions. Level III ecoregions are relatively homogeneous; in Chapter 2 of the full Plan, tables under each major heading describe subtle differences in landform, geology and native plant communities that characterize the EPA Level IV ecoregions they encompass.

40. The Central Irregular Plains

The Central Irregular Till Plains have a mix of land use and are topographically more irregular than the Western Corn Belt Plains (47) to the north, where most of the land is in crops. The region, however, is less irregular and less forest covered than the ecoregions to the south and east. The potential natural vegetation (PNV) of this ecological region is a grassland/forest mosaic with wider forested strips along the streams than historically found in Ecoregion 47 to the north. The mix of land use activities in the Central Irregular Plains has included mining operations of high-sulfur bituminous coal. The disturbance of these coal strata in southern Iowa has degraded water quality and affected aquatic biota.

47. Western Corn Belt Plains

Once mostly covered with tallgrass prairie (and, in the Des Moines Lobe, interspersed depressional wetlands), over 80 percent of the Western Corn Belt Plains is now used for cropland agriculture and much of the remainder is in forage for livestock. A combination of nearly level to gently rolling glaciated till plains and hilly loess plains, an average annual precipitation of 26 to 37 inches, which occurs mainly in the growing season, and fertile, warm, moist soils make this one of the most productive areas of corn and soybeans in the world. Agricultural practices have contributed to environmental issues, including surface and groundwater contamination from fertilizer and pesticide applications as well as concentrated livestock production.

52. The Driftless Area

The hilly uplands of the Driftless Area easily distinguish it from surrounding ecoregions. Much of the area consists of a deeply dissected, loess-capped, bedrock dominated plateau. The region is also called the Paleozoic Plateau because the landscape's appearance is a result of erosion through rock strata of Paleozoic age rather than glacial or post-glacial deposition. Although there is evidence of glacial drift in the region, its influence on the landscape has been minor compared to adjacent ecoregions. In contrast to adjacent ecoregions, the Driftless Area has few lakes, most of which are reservoirs with generally high trophic states. Livestock and dairy farming are major land uses and have had an impact on stream quality.

72. Interior River Valleys and Hills

The Interior River Lowland is made up of many wide, flat-bottomed terraced valleys, forested valley slopes, and dissected glacial till plains. In contrast to the generally rolling to slightly irregular plains in adjacent ecological regions to the north (54), east (55) and west (40, 47), where most of the land is cultivated for corn and soybeans, a little less than half of this area is in cropland, about 30 percent is in pasture, and the remainder is in forest. Bottomland deciduous forests and swamp forests were common on wet lowland sites, with mixed oak and oak-hickory forests on uplands. Paleozoic sedimentary rock is typical and coal mining occurs in several areas.

Historic Plant Communities

Pre-settlement Iowa lay at a biological crossroads. Hardwood forests dominated the cooler and more humid lands east of the Mississippi River. The warmer, drier mixed grass prairie and prairie potholes of the northern Great Plains lay to the west. To the north, great maple-basswood and pine forests covered the Great Lakes region. To the south,

oak savannas gradually gave way to the vast oak-hickory forests of the Missouri Ozarks. These different ecological regions blended together in Iowa to produce a unique landscape of great biological diversity.

Roughly two-thirds of the state (an estimated 23 million acres) was dominated by lush prairies. Most was tallgrass prairie, although short grasses were present on hot, dry sites. Nearly 7 million acres of forest or forest-prairie savanna covered much of the eastern third of Iowa and followed the river valleys into the prairies to the north and west. Around 4 million acres of prairie pothole marshes dotted recently-glaciated and poorly-drained northcentral and northwest Iowa where larger wetlands and lakes protected oak savannah from prairie fires. Another million acres of backwaters, sloughs and flooded oxbows were found in the floodplains of the Mississippi, Missouri and larger inland rivers.

Impacts of Settlement

Settlement in Iowa progressed roughly southeast to northwest. Most of the south half of the state had been inhabited by the end of the 1840s; northcentral and northwest Iowa were settled in the 1850s; Lyon County in extreme northwest Iowa was the last to be settled, receiving its first homestead family in 1866.

Human population growth was slow at first. By 1840 only 43,000 settlers had braved the prairies. Pressure for cheap land Increased after the Civil War, however, and massive land grants were made to railroad builders to stimulate completion of a trans-continental railroad network. By 1870, Iowa's population had increased to nearly 650,000; by 1900 it had skyrocketed to 2 million.

At the same time Iowa was being settled a revolution was overhauling industry and agriculture. The advent of improved farm implements, coupled with a rapidly expanding population base devoted mostly to agriculture, had a devastating and permanent impact on Iowa's native plant communities.

Forests

Most of the initial forest clearing in Iowa was done to allow conversion of the land to agriculture. Iowa's native hardwoods did not prove valuable as building materials. Most of the lumber that eventually built the farm homes, barns and livestock dwellings that dotted the countryside came from the great pineries of Minnesota and Wisconsin. Starting in the 1850s, however, railroad expansion and the discovery of coal in southern Iowa fueled a demand for oak ties and mine timbers that would last into the early 20th century. By 1875, just one-third of the original 6.7 million acres of primitive forest remained, most on rough land or in floodplains either too steep or too wet to plow.

Prairies

The effect on our extensive prairies and prairie-wetland complexes was even more devastating. Starting in the 1850s, Iowa lost nearly 2 percent of its 25 million acres of native prairie a year, 3 million acres a decade, until less than 30,000 acres (0.1%) remained after 80 years.

Wetlands

The vast prairie-pothole wetlands of northcentral and northwest Iowa took longer to impact. Through the first 20 years of settlement there was plenty of good land available without trying to drain and farm wetlands. In 1850, Congress passed the SwampLand Act. It directed each county to survey all wetlands and sell them at auction for 5 cents an acre, the first of what would become a century-long succession of government-subsidized efforts to drain wetlands. County drainage commissions and drainage districts were soon organized. Eventually pothole soils were discovered to be some of the most productive when dry, further accelerating the demand for drainage.

By 1917 modern clay tiles were used to drain seasonally wet fields into extensive, inter-connected drainage systems that had eliminated all but the largest wetlands. By 1906 just 25 percent of the original 4 million acres of pothole wetlands remained. By 1970 less than 1% of Iowa's historic wetlands remained.

Rivers

Border Rivers - Engineering began on the Mississippi River starting in 1824. In 1907, Congress approved creation of a navigation channel from the Missouri River confluence northward to Minneapolis. In 1935, further legislation provided for a 9-foot navigational channel maintained through a system of locks and dams as well as dredging. Navigation locks and dams result in a series of pools within the river, leading to a change in the fish community within the river towards those preferring more slow-moving water. (Harlan et al. 1987).

Engineering along the Missouri River for flood control and navigation drastically altered the river system. Between 1923 and 1976, the Missouri was corralled from a wide, braided, dynamic river to a single narrow channel. The channel area was reduced by 80%, with ~35,000 acres of this reduction being in Iowa. By the 1980s, sport and commercial fisheries along the Missouri had dwindled to a tiny fraction of their former abundance.

Interior Rivers – Because Iowa has productive, and therefore intensively cultivated, soils, the rivers which run through and drain these areas are subjected to large and sometimes sudden fluctuations. Draining heavily cultivated lands also results in silt loads, leading to sedimentation. This has changed the fish community assemblage, especially in lower, more turbid reaches of streams where the remaining species tend to be tolerant of lower water quality.

Additionally, many low-head dams were constructed across the state, usually for milling or water supply uses. By 1870, more than 1000 low-head dams dotted the state's interior rivers, restricting seasonal movement of fish species, as well as mussel species dependent upon their fish-hosts for dispersal.

Wildlife

Iowa's original wildlife populations suffered a similar fate as its native habitats and plant communities. Species that competed with humans for space, or were particularly useful for food or fiber, or required very specific habitats that were eliminated or drastically reduced did not survive. Others of less importance to humans held on in low numbers wherever suitable habitat remained. Clearing of forests, conversion of native prairies to farm fields and the draining of wetlands eliminated many species of songbirds, reptiles and amphibians. Most of the loss went unnoticed by settlers, and by the time the first naturalists began studying the flora and fauna of Iowa, much change had already occurred and went unrecorded.

Change Continues in the 20th Century

In less than a century the landscape of Iowa was changed more by settlement than that of any other state. In 1900, most of Iowa's 2 million residents lived on small, nearly self-sufficient farms of 100 acres or less. Iowa had been converted from a seemingly limitless prairie-forest-wetland mosaic into a domesticated landscape of small farms, grain fields and pastures. Most of Iowa's native wildlife was either gone or reduced to such low numbers that rabbits, squirrels, quail and the occasional prairie chicken were the only game animals available to most hunters.

The changes in Iowa's landscape in the 20th century were less dramatic but in some ways more devastating. Wildlife and its habitats were impacted by constant improvements in farming technology and the effects of government agricultural policy on farmers' decisions about how their land would be used.

Labor saving devices permitted farmers to handle ever-larger farming operations. Modern tiling machines could mechanically dig and insert underground perforated field tiles to drain even the wettest areas. The use of agricultural chemicals – herbicides, pesticides, and fertilizers – became the norm and weeds and insects were, if not conquered, at least minimized as a threat to crop yields. Farm operations have shifted from diversified agriculture to corn and soybean monocultures. Between 1900 and 2014 row crop acreages increased from 9.1 million acres to 23.4 million acres. Hay and small grain acreage decreased from 6.8 million acres to a current 1.2 million acres (NASS, 2015). Larger farms and field sizes have eliminated fencerows, windbreaks, waterways and other on-farm habitat.

By 2000, the average farm had increased to more than 340 acres. The number of farms in Iowa decreased from 203,000 in 1950 to just 93,000 in 2007 (USDA and Census Bureau - Census of Agriculture). Nearly every rural county in Iowa is experiencing a continuous outmigration, primarily by young people seeking jobs no longer available as farm size and mechanization has increased. Iowa is trending toward a more urban populace. By 2010, the population of Iowa was 64% urban, up from 25.6% in 1900, and 57% in 1970 (U.S. Census Bureau). In 2010, Iowa's population was about 3 million.

Wildlife Conservation

Not all wildlife trends of the past half-century have been negative. The creation of the Iowa State Conservation Commission (now the Iowa Department of Natural Resources or DNR) in 1935, the gradual development of wildlife science and management as professions after World War II, and the formation of DNR's Wildlife Diversity Program in 1981 have returned a portion of Iowa's native wildlife to the state. White-tailed deer, wild turkeys and giant Canada geese are now more abundant than at any time since the late 1800s. Other restoration programs have returned prairie chickens to southern Iowa, river otters to the state's streams, and peregrine falcons, ospreys and trumpeter swans nest again in Iowa. Bald eagles, bobcats and Sandhill cranes have reappeared as a result of successful conservation programs here and elsewhere. Details of these and other wildlife restoration programs are explained in *Trends in Iowa Wildlife Populations and Harvest - 2013.*

DNR has also pursued land acquisition programs to permanently protect and enhance wildlife habitat. Since 1972 Iowa waterfowlers have been required to purchase an Iowa Migratory Game Bird Stamp in addition to the Federal Migratory Bird Hunting and Conservation Stamp ("Duck Stamp"). Since 1979 all hunters have been required to purchase an Iowa Habitat Stamp along with their hunting license. Proceeds from these stamps are dedicated to habitat protection and management. Funds from the State Habitat Stamp are shared equally with Iowa's 99 County Conservation Boards.

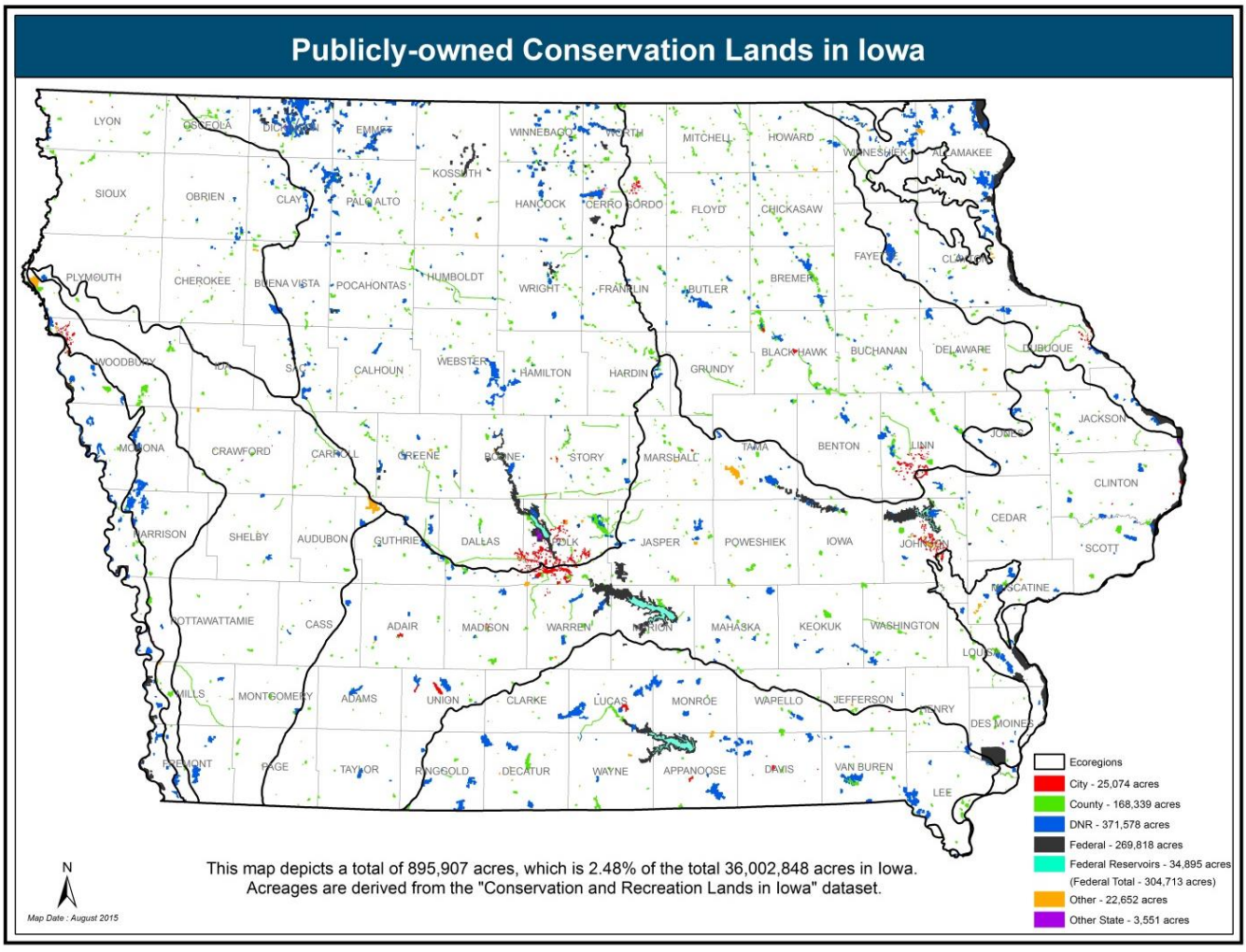
DNR has doggedly sought funds for habitat protection through the North American Waterfowl Management Plan, the North American Wetlands Conservation Act, State Wildlife Grants, the Environmental Protection Agency, Iowa County Conservation Boards and others. DNR also partners with a number of NGOs to extend the reach of state and Federal funds. The Iowa Natural Heritage Foundation, Ducks Unlimited, Pheasants Forever, the National Wild Turkey Federation, and The Nature Conservancy have been major cooperators with DNR's habitat protection programs. Numerous other NGO's and individual private contributors have helped as well.

Iowa remains one of the states with the highest proportion of privately held land. In 2004 as the IWAP was first being developed, public conservation lands accounted for just over 600,000 acres, or just 1.7% of the land area of the state. In 2015, public conservation lands are estimated at 895,924, or 2.48% of land area of the state. Some of this increase is due to land protection over the last decade. However, most of the increase is attributable to an improved estimate

due to technological improvements which allow for increased data sharing between cities, counties, state, and federal entities.

Public lands dedicated to conservation purposes are displayed in Map 2. Unlike most other states across the Midwest and West, Iowa does not have a significant presence of lands owned by the US Forest Service, Bureau of Land Management, or the National Park Service. Therefore, unlike other states which have significantly higher federal land bases, a relatively high proportion of Iowa's habitat base is managed by the Iowa DNR, County Conservation Boards, and of course, private landowners.

Map 2. Publicly-owned Conservation Lands in Iowa



Wildlife habitat on private lands has also received attention from DNR programs for decades. In fact, Farm Game Habitat crews roamed the state in the 1950s and 1960s helping landowners establish habitat on their property. The DNR's current Private Lands Program was formed in 2002 to take better advantage of wildlife-friendly USDA farm programs and other Federal grants like the Landowner Incentive Program (LIP) or Wildlife Habitat Incentive Program (WHIP). Now in its 15th year, the Private Lands Program is successful in Iowa because of its many partnerships including Natural Resources Conservation Service, Farm Service Agency, Pheasants Forever, Fish and Wildlife Service, AmeriCorps, Local Soil and Water Conservation Districts, and most importantly, Iowa's landowners. The Program uses this Plan as strategic guidance, working with any interested landowners but also trying to direct staff and resources to highest priority wildlife conservation issues.

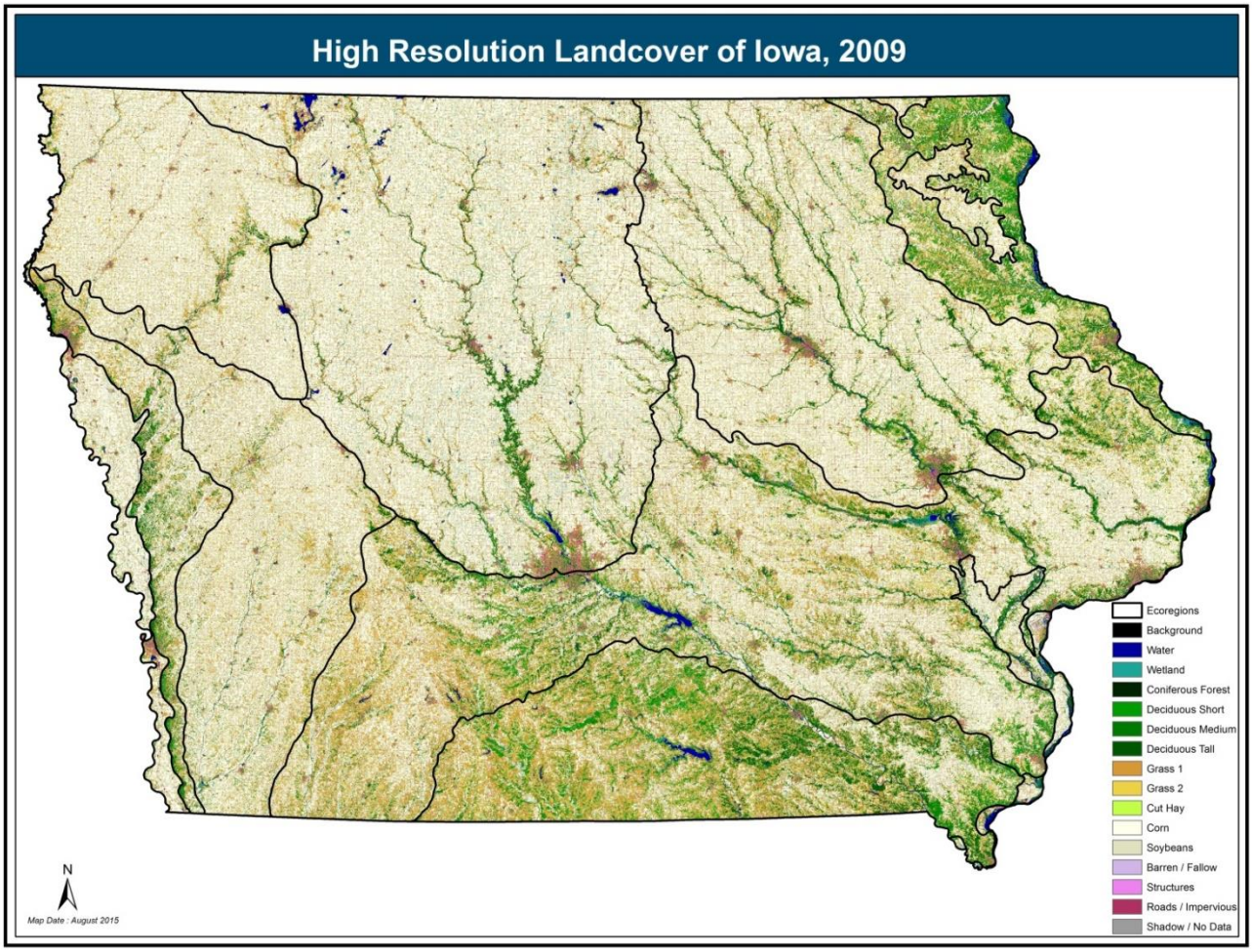
Iowa's Natural Communities Today

The result of a century and a half of change as a result of human intervention on Iowa's landscape has been a shift in the composition of Iowa's plant communities and the wildlife that inhabits them. Few undisturbed natural plant or wildlife communities exist today. Map 3 shows the land cover in Iowa in the year 2009. The majority of the state is covered with row crop, primarily corn and soybeans. Most of the remainder of the state is in grassland, often conservation reserve, road ditches or pasture, with lesser acreages of timber and other habitat types.

Approximate percentage of Iowa's natural communities remaining:

- 0.2% of Iowa's native prairies (47,000 acres including remnant, restored and reconstructed prairies)
- 5% of its wetlands (255,000 acres of wetlands estimate in 2009 HRLC)
- 37% of its forests (2,477,000 acres)

Map 3. Landcover of Iowa in 2009
(DNR High Resolution Land Cover)



Iowa Fish and Wildlife and Species of Greatest Conservation Need

The DNR is the sole agency given the responsibility to manage Iowa's fish and wildlife resources, preserve their habitats (Code of Iowa, Chapter 455A), and establish and protect state-listed endangered or threatened species (chapter 481B.4 and Iowa Administrative Code Chapter 571-77(481B)). Iowa law defines *wildlife* as any species of wild mammal, fish, bird, reptile or amphibian (Code of Iowa sections 456.24, 481A.1, 481A.38, 481A.39, 481A.48). In addition to taxonomic groups designated as *wildlife* in Iowa law, this Plan is intended to guide conservation of all Iowa's native fauna for which an adequate level of information is available to assess the conservation status and needs.

Determining the Species of Greatest Conservation Need

Taxonomic subcommittees of the IWAP Wildlife Working Group evaluated the status of all species considered for their focal group (Table 1). The same status assessment criteria were used for all species which are native to Iowa, not already extirpated from the state, not vagrant or accidental in their occurrence within Iowa, and for which there is adequate information to assess conservation status (Table 2). Until the implementation of the Wildlife Action Plan, Iowa had long lacked a systematic survey to document the distribution and abundance of most wildlife species. Therefore, varying amounts of information were available for subcommittee members to use when assessing taxonomic groups, as a whole, as well as individual species.

Table 1. Number of species evaluated by the IWAP

IWAP taxonomic subcommittees evaluated all species with validated occurrence records for Iowa (includes vagrant species, exotic/introduced species, and those which are now presumed extirpated).

Taxonomic Class	Species	List location
Amphibians	22	Appendix 3
Reptiles	46	Appendix 4
Breeding birds	201	Appendix 5
Non-breeding birds [1]	204	Appendix 6
All birds	*405*	
Butterflies	123	Appendix 7
Crayfish	8	Appendix 8
Dragonflies and Damselflies	114	Appendix 9
Fish	155	Appendix 10
Mammals	83	Appendix 11
Mussels	52	Appendix 12
Terrestrial snails	96	Appendix 13
Total species evaluated	**1,104**	

[1] Species that do not nest in Iowa but migrate through the state

We utilized 8 criteria to assess the conservation status of all native, extant Iowa wildlife species.

1. Global Range Extent (all other criteria are for Iowa only)
2. Area of Occupancy
3. Long-term Trend
4. Short-term Trend
5. Ecological Specialization (Population Concentration)
6. Dietary Specialization
7. General Ecological Specialization
8. Threat Not Addressed Above

The Wildlife Working Group developed a scoring process in which each criterion was weighted according to our understanding of the relative contribution of each factor to a species' overall conservation status. The theoretical potential score for an individual species ranges from 0 - 3.75. Calculated scores ranged from 0.57 (for the Slippershell mussel, which has not been observed in Iowa since 1984) to 3.75 (for several species of low conservation concern that have been expanding their range within Iowa). The cutoff value for SGCN designation was set at <3.0 (a species score of 3.0 or lower gave a species SGCN status). See Appendix 16 for a detailed explanation of the criteria.

Table 2. Proportion of Iowa Species Designated as SGCN.

Taxonomic Group	2012	2015			
	# of SGCN in 2012	# of SGCN in 2015	# Species Evaluated (Valid Iowa Records)	# of Species Assessed (Native Species)	% SGCN of Species Assessed
Amphibians	9	16	22	22	73%
Reptiles	23	40	46	46	87%
Birds – Breeding	67	78	201	195	40%
Birds – Non-breeding	18	34	204	113	30%
Butterflies	38	51	123	110	46%
Crayfish*	N/A	7	8	7	N/A
Dragonflies & Damselflies	28	30	114	106	28%
Fish	74	79	155	146	54%
Mammals	19	22	83	57	39%
Mussels	29	43	52	46	93%
Terrestrial Snails*	8	5	96	5	N/A
Total	**313**	**405**	**1104**	**853**	

*The entire groups of native Terrestrial Snails and Crayfish were not assessed for SGCN status due to lack of sufficient information.

Habitats

Habitat availability, quantity, and quality are primary factors influencing the viability of wildlife populations. To protect and manage for species of greatest conservation need it is essential to identify the distribution of species within the state and the natural resources critical to their survival in and around occupied areas. Categorizing Iowa's habitat types (Tables 3 and 4) and the SGCN species that depend on them will aid the design of effective management practices that will directly benefit Iowa's wildlife.

Terrestrial Habitats

The terrestrial habitat classes used in this plan were modeled after the Iowa 2009 HRLC which is described in Table 3, and provides more recently updated land cover information than those used in previous versions of the IWAP. A primary reason that this Plan utilizes a land cover classification as the basis for terrestrial habitat types is because it provides a means to more closely connect our monitoring framework with the current reality on the ground.

Table 3. Description of the land cover classes mapped in Iowa's 2009 High Resolution Land Cover dataset

Name	Description
Water	Spatial/spectral areas of open water, generally without any vegetation present. This class may occur in areas of shadow, or in recently cultivated bare ground.
Wetland	Spatial/spectral areas that are temporarily flooded or permanently wet. Some areas may be in crops in the summer NAIP imagery. This class generally reflects the presence of both a wetness signature and a vegetation signature.
Coniferous Forest	Spatial/spectral areas of evergreen forest. These areas show clearly as forest in the summer imagery, but are separated from deciduous forest by being very lush in the spring imagery. Late spring imagery, and imagery from certain sensors do not well separate conifers from other vegetation. In the 2007 and 2010 Spring imagery areas, when conifer discrimination is poor, a Landsat classification was used to coarsely separate Coniferous forest from Deciduous forest.
Deciduous Short	Spatial/spectral areas of broadleaf deciduous forest, trees or shrubs less than 3.5 meters (~15 feet) tall. (See Deciduous Tall)
Deciduous Medium	Spatial/spectral areas of broadleaf deciduous forest, or trees more than 3.5 meters (~15 feet) tall and less than 12 meters (~40 feet). (See Deciduous Tall)
Deciduous Tall	Spatial/spectral areas of broadleaf deciduous forest or trees more than 12 meters (~40 feet) tall. Lidar normalized elevation data were used to stratify the deciduous forest class into three height classes, as listed.
Grassland 1	Spatial/spectral areas of grasses. Includes rural road ditch complexes, grassed waterways, some grassland/forest edge areas, and some tracts of grasses that are spectrally separable. This is the catch-all class for grasslands that are not otherwise separable into more detailed classes.
Grassland 2	Spatial/spectral areas of grasslands that exhibit lushness in their spectral signature in the spring image. This spectral response could be indicative of the absence of a heavy layer of senesced grasses, such as in areas grazed in the previous season, or in lawns. It might also be interpreted as representing cool season grasses that are lush in spring. This class includes hay which has not been recently cut.
Cut Hay	Spatial/spectral areas free or nearly free of vegetation in the summer image, and showing lushness in the spring image. This will usually represent alfalfa or hay fields that have been recently mowed, but is sometimes spectrally confused with barren areas, especially fallow fields. Probably the majority of the alfalfa on the landscape is included in the Grass 2 class. It was not readily separable in this product due to lack of spectral content.

Name	Description
Corn	Spatial/spectral areas of row crop planted to corn in 2009. This will include small amounts of spectrally confused areas planted to soybean or other crops. This class probably also includes some areas planted to uncommon classes, such as sorghum, etc.
Soybeans	Spatial/spectral areas of row crop planted to soybeans in 2009. Will include small amounts of spectrally confused areas planted to corn or other row crops.
Barren/Fallow	Spatial/spectral areas that are free or nearly free of vegetation in the summer image, and suggestive of row crop or bare soil in the spring image. Often these areas were characterized by early harvest (or no crop planted), and presented a bare soil aspect in the summer image.
Structures	Spatial/spectral areas that represent buildings, bridges, or other structures, with a minimum elevation of 3 meters (~10 feet).
Roads/Impervious	Spatial/spectral areas that are primarily parts of major roadways, rural asphalt or crushed rock roads, paved city streets and parking areas. This class may also occur in quarries and other areas of exposed rock, and in dry barren agricultural areas, as well as in sandbars.
Shadow/No Data	Spatial/spectral areas usually representing shadow from trees or buildings. Includes areas of missing data, usually due to the presence of cloud or shadows in the imagery. Often shadow pixels, especially those from buildings, are inseparable from water bodies, and are originally assigned there by the interpreter.

Aquatic Habitats

The aquatic habitat types chosen for use in the IWAP are displayed in Table 4. In the natural world, there is no clear delineation between these aquatic habitat classes. Defining aquatic habitat classes helps describe the ecological need of aquatic species in a way that allows conservationists to focus on undertaking conservation actions in the right places for the right species. In addition, the following classes are all able to be mapped and therefore these classifications can be used to stratify the survey designs for aquatic organisms.

Table 4. Aquatic Habitat Classes Used in the IWAP

Aquatic Habitat	Description
River	Large flowing bodies of water. Third order and larger. The Mississippi is a 10th order river.
Stream **A. Warm Water** **B. Cold Water**	Smaller flowing bodies of water that serve as tributaries to rivers. The stream class includes first and second order streams. Also referred to as headwater streams.
On-stream Impoundment	Slowly flowing bodies of water formed from artificial damming of a river, or stream, generally less than 500 acres in size and having a watershed to lake ratio >80:1.
Federal Flood Control Reservoirs	Iowa has 4 federal flood control reservoirs: Saylorville, Red Rock, Coralville, and Rathbun.
Mississippi River Pools	Pools on the Mississippi River caused by the construction of the lock and dam system.
Backwater	Slow flowing bodies of water associated with larger river systems. Back-channel low-lying areas filled with water during high flow events but may be completely isolated from the river during low flow and may exhibit no flow during these periods. They are especially prevalent on the Mississippi River.
Oxbow	A sub-class of backwaters, they are water bodies formed in old river channels that are now cut off from the main channel and flow of a river.

Aquatic Habitat	Description
Lake **A. Natural** **B. Constructed**	Large bodies of water exhibiting little or no flow with emergent vegetation over less than 25% of the surface area. "Publicly owned lake" means any constructed or natural lake having a watershed acreage-to-lake surface area ratio of less than 80 to 1 and owned by an Iowa county or municipal government or by the state of Iowa. (IAC 571 Chapter 31)
Shallow lake	Open freshwater systems where maximum depth is less than 10 feet. Normally in a permanent open water state due to the altered hydrology of watersheds and unmanaged outlet structures that maintain artificially high water levels. May be fringed by a border of emergent vegetation in water depths less than 6 feet. When clear, they are dominated by emergent and submergent vegetation.
Pond	Smaller standing body of water, less than 10 acres in size.
Surface Mines	Surface mines are artificial water bodies in excavated basins, often the result of sand and gravel mining operations, or resulting from excavations to provide fill materials for roadway construction like overpass ramps on major highways.

Habitat Preferences of SGCN

The Wildlife Working Groups' Taxonomic Subcommittees assigned each SGCN to a habitat class or classes (summarized in Table 5.) Habitats preferences are taken from the existing literature and do not necessarily include all of the terrestrial and aquatic habitat classes listed in this Plan. Habitat preferences for individual SGCN are found in Appendix 18. Appendix 19 displays SGCN with common habitat preferences grouped into the habitat classes used in this Plan. Species with more than one preferred habitat were listed in each class. Groupings of SGCN by habitat class give a very general overview useful for identifying habitat protection or restoration priorities at the landscape level. Detailed habitat management plans for SGCN must consider their entire individual habitat needs.

Flowing water aquatic habitats had the greatest number of SGCN of any habitat class, followed by wetlands (Table 5). The number of aquatic SGCN nearly equals the number of terrestrial species, yet surface water covers just 1% of Iowa. Aquatic and semi-aquatic taxa had the highest percentage of their species listed as SGCN.

Table 5. Summary of Habitat Preferences of SGCN by Habitat Class.

Individual species are assigned to more than one habitat type if appropriate, so the total number of species exceeds the total number of SCCN.

Habitat Class	Amphibians	Reptiles	Birds	Butterflies	Crayfish	Dragonflies & Damselflies	Fish	Mammals	Mussels	Terrestrial Snails	Total
Terrestrial Habitat Classes	**28**	**55**	**149**	**56**	**2**	**8**	**2**	**35**	**0**	**5**	**340**
Forests	7	10	29	11	-	-	-	12	-	5	74
Shrubland	1	3	14	-	-	-	-	2	-	-	20
Grasslands	8	21	34	26	1	-	-	11	-	-	101
Wetlands	8	13	47	13	1	8	2	6	-	-	98
Agricultural Lands	4	8	25	6	-	-	-	4	-	-	47
Aquatic Habitat Classes	**23**	**47**	**88**	**5**	**9**	**46**	**126**	**10**	**54**	**0**	**408**
River	4	13	34	-	3	9	48	5	34	-	150
Stream	5	10	29	5	5	17	38	5	14	-	128
Lake, Reservoir, Impoundment	6	8	23	-	-	6	18	-	2	-	63
Backwater/Oxbow	2	7	-	-	-	1	16	-	-	-	26
Pond	6	9	2	-	1	13	6	-	4	-	41
Total	**51**	**102**	**237**	**61**	**11**	**54**	**128**	**45**	**54**	**5**	**748**

Priorities for Habitat Protection

Given the lack of natural areas remaining in Iowa, general strategies for prioritization of habitat protection tend to focus on enlarging the size of habitat complexes, reducing fragmentation, and increasing connectivity between larger areas of habitat. However, there are many species that have very specific habitat requirements, and some of those specialist species require habitats that are rare in Iowa or particularly sensitive to human disturbance. Thus, conservation of wildlife will require an approach that addresses both coarse-scale as well as fine-scale habitat needs.

Landscape-Scale Prioritization

Land protection not only provides habitat for wildlife and recreational opportunities for people, but also offers opportunities to maintain and restore ecosystem functions such as water filtration, flood abatement, carbon storage, etc. Intact ecosystems tend to provide more benefits and are more resilient to outside stressors. Therefore, land protection efforts in Iowa should continue to focus on the following principles:

1. Development of functional landscapes – adding parcels to existing protected areas to create core areas of fish and wildlife habitat.
2. Decreasing fragmentation – using land protection to decrease the number of edges between habitat and non-habitat areas.
3. Increasing connectivity – protecting and/or managing for wildlife use of areas between existing habitat core areas to facilitate movement between these areas.

4. Protection of native sod – protecting and/or managing for remnant prairies or other areas which have not been previously plowed. (See Iowa Tallgrass Prairie Working Group, 2013 for more information on this principle and how it's applied.)

Rare and Sensitive Communities

Land protection and management efforts in Iowa should also continue to focus on preservation of rare and/or sensitive ecological communities, which in turn support rare wildlife species. Some of Iowa's unique landforms or natural communities are of global significance. For example, the Loess Hills of western Iowa comprise one of the most extensive Loess deposits in the world. Important rare and sensitive communities in Iowa are listed below. For descriptions of these communities, see Chapter 4.

1. Sand Prairies
2. Fens
3. Algific Talus Slopes
4. Goat Prairies
5. Prairie Remnants
6. Prairie Potholes
7. Oak Savannas

Conservation Challenges Facing Iowa's Wildlife and Habitats

Standard Lexicon for Threats and Conservation Actions

In 2002, a coalition of global conservation practitioners joined together and formed the Conservation Measures Partnership (CMP). In 2004, CMP developed the first edition of the "Open Standards for the Practice of Conservation" which has since been updated in 2007 and 2013. One outcome of this partnership that is also a building block for increasing collaboration is the development of a "standard lexicon" for conservation, including a taxonomy, or hierarchy, of threats and conservation actions (Salafsky et al. 2008). Adopting the use of the standard terminology allows conservationists operating at any spatial scale to share information and experiences, facilitating learning and improvement among conservation practitioners. The 2015 revision of the IWAP makes use of this standard lexicon for the classification of threats and actions in order to increase the ability of our threats and actions to be compared across state lines or other political boundaries. This helps make clear how the IWAP fits in as one piece of regional, national, or even global efforts to conserve wildlife.

The items on the list represent *potential* threats, which require interpretation based on the biology of the species or habitats being evaluated. The list of threats should not be interpreted as a list of things that are bad for wildlife. Rather, it is a framework from which to evaluate potential threats, stresses, or conservation challenges for wildlife for the purpose of identifying the most effective means of conserving healthy wildlife populations.

DNR fisheries and wildlife biologists, and Implementation Committee and Working Group members that had the appropriate expertise and experience identified and evaluated the most important problems facing Iowa's wildlife today. Four threat impact levels – Low, Medium, High, or Very High – were used to evaluate the relative importance of each threat, taking into account both the scope and the severity of each threat. Table 6 summarizes threat impacts for Iowa's terrestrial wildlife and Table 7 summarizes threat impacts for Iowa's aquatic wildlife.

Table 6. Threats to Terrestrial Wildlife (including all habitat classes).

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level I Threats	Amphibians	Birds	Butterflies	Land Snails	Mammals	Reptiles
1. Residential & Commercial Development	H	H	M	M	M	H
2. Agriculture & Aquaculture	VH	VH	VH	M	VH	VH
3. Energy Production & Mining	L	H	L	L	M	M
4. Transportation & Service Corridors	H	VH	M	M	H	VH
5. Biological Resource Use	M	H	L	H	H-L	VH
6. Human Intrusions & Disturbance	VH	H	M	L	H	VH
7. Natural Systems Modification	VH	VH	VH	M	VH	VH
8. Invasive & Other Problematic Species & Genes	VH	VH	H	M	H	VH
9. Pollution	H	VH	H	L	VH	VH
10. Geological Events	-	-	-	-	-	-
11. Climate Change & Severe Weather	VH	VH	VH	H	H	H

Table 7. Threats to Aquatic Wildlife (including all habitat classes)

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level I Threats	Crayfish	Dragonflies & Damselflies	Fish	Mussels
1. Residential & Commercial Development	M	H	H	M
2. Agriculture & Aquaculture	M	VH	H	VH
3. Energy Production & Mining	L	M	M	L
4. Transportation & Service Corridors	L	M	L	H
5. Biological Resource Use	L	L	L	M
6. Human Intrusions & Disturbance	-	L	-	M
7. Natural Systems Modification	VH	VH	VH	VH
8. Invasive & Other Problematic Species & Genes	H	M	H	M
9. Pollution	M	VH	M	H
10. Geological Events	-	-	-	-
11. Climate Change & Severe Weather	H-M	VH	H	H

A Vision for the Future

To establish a focus for future wildlife conservation activities, the Advisory Committee to the original Iowa Wildlife Action Plan – a group of fish and wildlife professionals, educators, researchers, private conservation organizations, concerned citizens and representatives of the agricultural community - developed a vision for the status of Iowa's wildlife in 25 years. The vision statement has six elements that include benefits to fish and wildlife, the citizens who enjoy and support them, and the private landowners who must embrace them if the vision is to be realized. With each vision element the Advisory Committee developed specific conservation actions that need to be implemented to reach the Plan's goals in a 25-year framework. When the comprehensive review and revision process began, the Implementation Committee identified that the six vision elements that were initially identified by the Advisory Committee should remain in place as the cornerstone of the Plan's conservation strategy. Progress on implementation of the Visions over the first 10 years of the Plan is discussed in Chapter 11.

These vision elements, conservation strategies and conservation actions are not specifically designed to be implemented by DNR. They are designed to provide a broad framework of actions that can be undertaken by conservationists at all levels of government, by private conservation organizations and by private citizens. The conservation actions identified in the following pages will require a broad array of funding sources, skills and expertise. Extensive coordination will continue to be necessary between these stakeholders to make the vision a reality.

A Vision for Iowa's Wildlife

By 2030 Iowa will have viable wildlife populations that are compatible with modern landscapes and human social tolerance.

Goals:

- Common species will continue to be common.
- Populations of species of greatest conservation need will increase to viable (self-sustaining) levels.
- The abundance and distribution of wildlife will be balanced with its impact on the economic livelihood and social tolerance of Iowans.

A Vision for Wildlife Habitats

By 2030 Iowa will have healthy ecosystems that incorporate diverse, native habitats capable of sustaining viable wildlife populations.

Goals:

- The amount of permanently protected wildlife habitat in Iowa will be doubled to 4% of the state's land area.
- Protected habitats will be diverse, representative, native plant communities in large and small blocks on public and privately owned land and waters.

A Vision for Wildlife Management

Diverse wildlife communities will be developed on public and private lands and waters through the use of adaptive ecological management principles.

Goal:

- Wildlife and fisheries management will be based on science.

A Vision for Wildlife-Associated Recreation

More Iowans will participate in wildlife-associated recreation, and all Iowans will have access to publicly owned recreation areas to enjoy wildlife in its many forms.

Goals:

- The number of Iowans participating in wildlife-associated recreation (wildlife viewing, photography, hiking, outdoor classrooms, hunting, fishing etc.) should increase 50 percent by 2030;
- Wildlife-associated recreation will be available to all Iowans on public lands near their home.

A Vision for Wildlife Education

Iowans will respect wildlife for its many values and they will advocate effectively for conservation of wildlife and wildlife habitats.

Goal:

- Iowans will understand the relationships of:
    1. land use, and its impacts on wildlife diversity & abundance
    2. land use, and its impacts on quality of life for all citizens
    3. land use, and its impacts on Iowa's economic sectors related to wildlife recreation
    4. wildlife diversity & abundance, and its impacts on quality of life in Iowa
    5. wildlife diversity & abundance, and its impacts on Iowa's economy
    6. quality of life for all citizens, and its impacts on Iowa's economy
    7. Iowa's economic decisions and their impacts on wildlife-based contributions to quality of life for all citizens

A Vision to Fund Wildlife Conservation

Stable, permanent funding will be dedicated to the management of wildlife at a level adequate to achieve the visions of this plan.

Goals:

- Government (Federal, state, and county) and private conservation spending will be increased so that the goals of this Plan are reached by 2030.
- Funding will be dependable, secure, and appreciated as a powerful economic and social investment.

Monitoring

The lack of species-specific information on the abundance and distribution of SGCN was one of the greatest challenges faced when initially developing this Plan. In some cases species were added to the list simply because information was outdated or unavailable. This continues to occur today despite much progress being made over the past decade, which is why this 2015 version of the Plan identifies Data Deficient species. Because of the dearth of information for the majority of Iowa species, inventory and monitoring for fish and wildlife species became the top priority for implementation of this Plan.

On the other hand, Iowa is fortunate to have a strong spatial data program. The amount and distribution of potential wildlife habitat is comparatively well known. As we continue to implement this Plan, and have more wildlife data to relate to our spatial datasets, we will become better equipped to identify qualitative differences among habitats and track qualitative changes over time.

Statewide Wildlife Inventory – Iowa's Multiple Species Inventory and Monitoring Program

When this Plan was initially developed in 2005, the Steering Committee and the Monitoring Working Group sub-committee agreed that the first priority for monitoring and research was to inventory Iowa's permanently protected wildlife habitats and a sample of habitat on private lands within the state. In addition, virtually all wildlife specialists involved in developing this Plan agreed that inventories, surveys, and monitoring of SGCN to guide habitat and population conservation actions was an essential component for managing Iowa's wildlife into the future. Therefore, in order to meet these needs, the Multiple Species Inventory and Monitoring Program (MSIM) was established in a partnership between Iowa DNR and Iowa State University (ISU). This program, which was launched in 2006, incorporates permanent sampling sites situated on public (federal, state, and county owned) as well as private lands. The design of this program is based on the US Forest Service's "Multiple Species Inventory and Monitoring Guide" (Manley et al. 2005).

Long Term Effectiveness Monitoring of Conservation Actions

In addition to biological monitoring, monitoring the effectiveness of conservation strategies described within the Plan is an important component of implementation. Tracking the accomplishments of the IWAP so that political and financial support can be maintained over the 25-year implementation period is a priority of the Plan. A system for tracking accomplishments has been developed by DNR. In addition, for Plan Implementation projects funded through the Wildlife and Sportfish Restoration Program, Iowa has begun tracking programmatic accomplishments through the USFWS's system, called Tracking and Reporting Actions for the Conservation of Species (TRACS). It is our current understanding that the TRACS system will continue to maintain a public viewer online for stakeholder review and use.

Having information about what has been accomplished is important, but only one component of effectiveness monitoring. A working group formed by The Association of Fish and Wildlife Agencies developed an Effectiveness Measures Framework, which was designed specifically for effectiveness monitoring of projects funded through the State and Tribal Wildlife Grants (SWG) Program. The Effectiveness Measures Framework serves as a very helpful basis for tracking the effectiveness of all activities undertaken in support of SWAPs. The theoretical basis for the framework lies in the Open Standards for the Practice of Conservation, developed by the Conservation Measures Partnership.

The Effectiveness Measures Framework makes use of *results chains* to display the *theory of change* which links conservation actions through outcomes to ultimate impacts (Figure 1). Clearly identifying the theory of change for

conservation actions is the key to measuring effectiveness. This is a key component of the Adaptive Resource Management cycle as explained above.

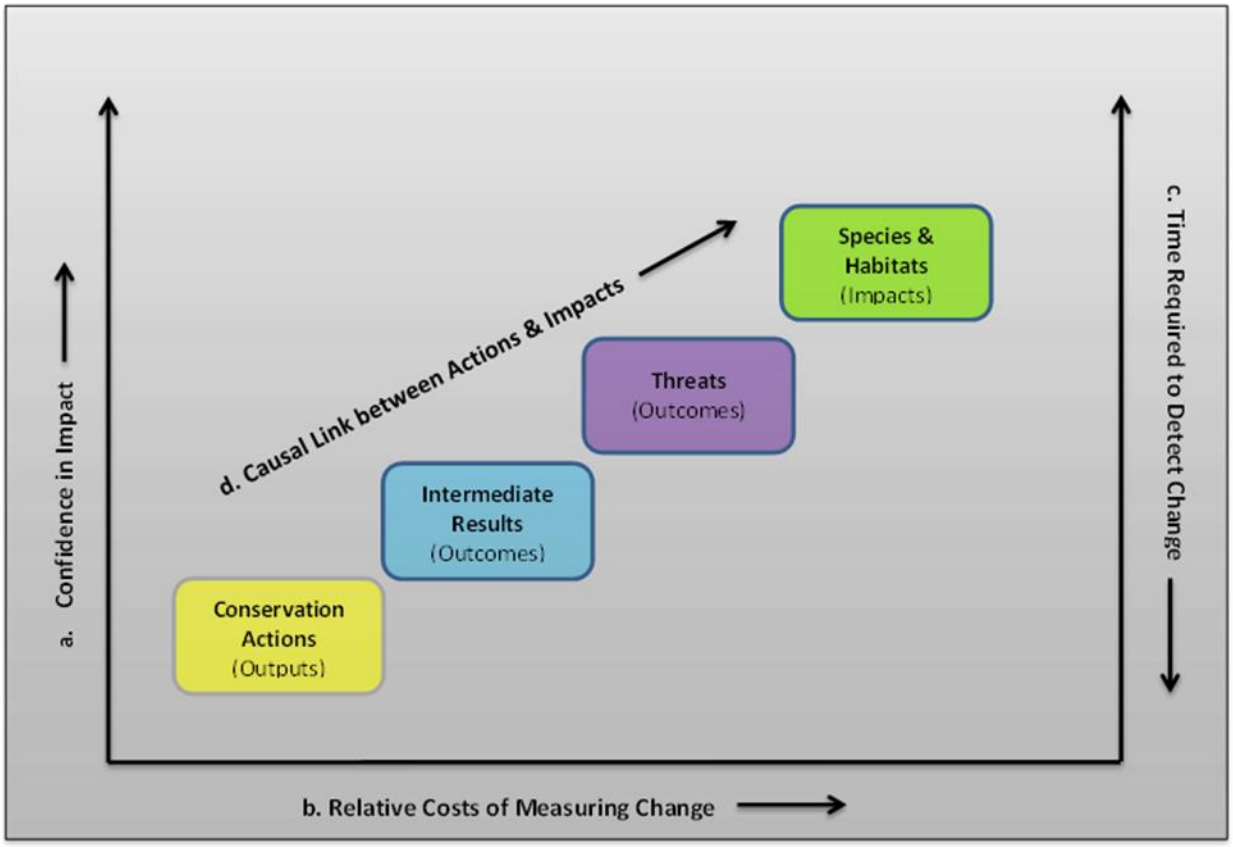


Figure 1. Adapted from AFWA (2011) and the 2008 version of the Open Standards for the Practice of Conservation. This diagram illustrates the *theory of change* which links conservation actions to impacts.

Table 8. Research Needs for implementation of Iowa's Wildlife Action Plan

Topic	Further Description
Taxa-Specific	**Life history information, occurrence within Iowa, population trends, habitat associations for species**
Examples:	- Crayfish, terrestrial snails, dragonflies & damselflies o These taxa need more initial survey work to complete an inventory and establish basic distributions of species within Iowa o These taxa also need more research to inform population assessment, status, and habitat use of SGCN
	- Data Deficient Species o Species listed as Data Deficient in all taxonomic groups need initial survey work to complete an inventory and establish basic distributions of species within Iowa o Population assessment, status, and habitat use information for all Data Deficient Species
	- All SGCN o Identifying habitat requirements, limiting factors, effective conservation strategies

Topic	Further Description

	- Taxonomic Groups to Potentially Add to IWAP
	  o Basic information is needed for several taxonomic groups of conservation concern (e.g., bees, moths, aquatic snails, etc.)
	  o Within a given taxa, more initial survey work is needed to complete an inventory and establish basic distributions of species within Iowa

Issue-Specific	**Effects of the following items on species occurrence, density, or reproductive success or other demographic factors**

Examples:	- Habitat Management
	  o Methods or techniques
	  o Management regimes (i.e., timing, duration, or frequency)

	- Habitat Restoration or New Habitat Projects
	  o Pre-and-post effects of restoration
	  o Feasibility assessments for species re-introductions or re-locations

	- Landscape Ecology
	  o Evaluating connectivity between core habitat areas
	  o Evaluating landscape permeability
	  o Quantifying ecosystem functioning

	- Land Use
	  o Renewable energy development
	  o Farming practices
	  o Effects of urbanization on species

	- Climate Change
	- Invasive species
	- Farm Bill Programs
	- Wildlife diseases
	- Environmental contaminants
Area-Specific	**Research or monitoring projects which rely on spatial datasets**
Examples:	- Identifying critical habitat components o Landscape factors affecting species of greatest conservation need (structural features, landscape configurations, and amounts of habitat)

	- GIS and landscape modeling
	  o Continued development of the Bird Conservation Area and Amphibian and Reptile Conservation Area models to identify geographic focus areas for habitat protection, restoration, and management
	  o Continued predicted species distribution map development
	  o Assessments of land use and/or land cover change
	  o Monitoring amount, location, and quality of habitat

Human Dimensions	**Sociological research relating to wildlife and wildlife habitat**

Topic	Further Description
Examples:	- Sociological research to evaluate Iowan's values, behaviors, or attitudes with regards to wildlife conservation programs - Studies to enhance understanding of patterns of participation in wildlife-associated recreation (e.g., barriers or opportunities to overcome barriers to participation) - Development and improvement of methods for stakeholder engagement

Priorities

This Plan was developed to be a 25-year strategic plan. Specific operational priorities are beyond the scope of this Plan. Operational plans that identify shorter-term (1-5 year) priorities for implementing the conservation actions identified in Chapter 6 may be developed by individual entities contributing to the plan, or by IWAP Implementation Committee or its Working Groups or Subcommittees.

The geographic priorities of this plan culminate in Map 4 "High Opportunity Areas for Cooperative Conservation." Iowa needs to build a diverse, resilient habitat base to support sustainable wildlife populations. When the IWAP was originally developed, it established habitat protection, restoration and enhancement as the foundation for improving the status of SGCN. At the time, the Plan stressed that at least three general approaches need to be taken:

1) **Protect and enhance existing habitats that benefit SGCN**. This approach gives priority to areas of the state with existing habitat for SGCN or that can be suitable with habitat enhancements. Areas with the greatest existing species diversity should be targeted, land acquired or permanent conservation easements developed, and the appropriate management plans implemented. This approach is the most cost-effective way to benefit the most species in the short term. But SGCN are declining with the amount of existing habitat available today. Enhancing these habitats may slow the decline in local populations, but in the Steering Committee's view will not by itself reverse statewide or regional declines.

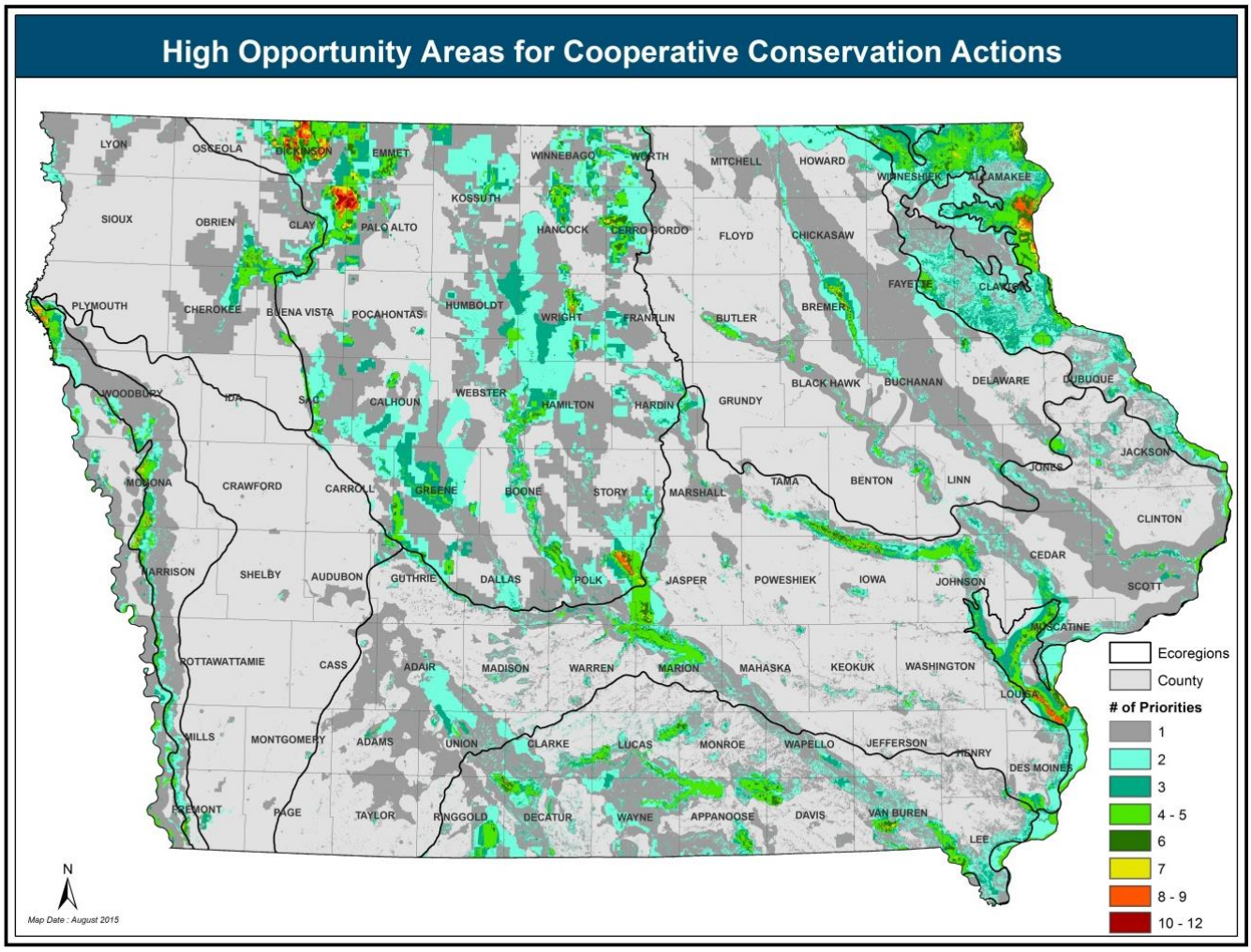
2) **Develop new habitats for SGCN in areas where these habitats do not exist**. This approach would provide new habitat for SGCN but at a higher cost. Establishing new habitats and restoring populations will extend the range of these species, provide the potential for greater genetic diversity and interaction between populations, and reduce the chances of local population extinctions if travel corridors are also provided. It will also be necessary to meet the recreation goals (50% increase in wildlife-associated recreation in areas near home).

3**) Improving the status of aquatic SGCN will require a more broadly-applied conservation effort**. Habitat in rivers, streams, lakes, impoundments and wetlands can be improved only if soil erosion, siltation and all the associated problems are reduced (Chapter 5). Targeting areas to protect and restore habitats for terrestrial SGCN will help with this process but will not protect enough land by itself to help all aquatic systems. Vegetative cover must be returned to more of the landscape to hold soil in place. Existing soil-retention programs like terracing, buffer strips and no-till agriculture need to be expanded and new approaches explored to make soil conservation more widely acceptable and financially attractive to the farming community.

A blend of all three approaches will continue to be necessary to accomplish all the goals of the IWAP. The plight of all SGCN in Iowa is caused by the loss of native vegetation from the landscape that provided wildlife habitat and kept soil and associated products out of the waters. Protecting existing habitats is a good strategy to prevent further losses, but it alone will not return SGCN to their former range or raise populations to a viable level. Habitats for SGCN need to be restored in socially acceptable places. Widespread conservation practices will be needed to address water quality issues and are best approached on a watershed basis.

Map 4. High Opportunity Areas for Cooperative Conservation Actions

Map 8 -2 through Map 8 – 24 were combined to identify priority areas for conservation actions. The shaded areas on the map indicate areas identified as a priority for action by one or more of the plans referenced above. Darker shading indicates areas where progressively more of the plans have overlapping priorities and indicate where partnering to maximize the effect of resources should be possible.



Coordination, Implementation, and Review

No single entity – government conservation agency, private conservation organization or research institution – can implement all conservation actions in this Plan even if full funding is achieved. To access all the energy, expertise and enthusiasm that will be needed, an IWAP Implementation Committee with representatives from all stakeholder organizations was formed. The mission of this Committee is to identify common priorities and interests, solidify working agreements, and focus members on conservation actions that meet the goals of the IWAP in a financially efficient and timely manner. The Committee and its Working Groups also review progress toward IWAP visions, goals, and actions, identify barriers to progress, and seek solutions that cross agency and organization lines.

Working Groups and their Subcommittees provide the level of deliberation and expertise necessary to develop operational plans to fulfill the goals and visions of the IWAP. Members should continue to include wildlife, recreation and outdoor education scientists; land and water managers, and experts in implementing programs in these fields. Working Group members should continue to have the technical expertise to:

- Review and explore program and planning options;
- Develop conceptual operational plans for conservation agencies, NGOs and private citizens to participate in;
- Develop and critically review technical proposals;
- Provide peer review for cooperating agencies operating plans;
- Develop conservation action and funding priorities for the Implementation Committee to consider;
- Identify strategic and operational plan shortcomings and recommend improvements.

Interagency Cooperation

Cooperation between agencies and organizations that manage public conservation lands in Iowa is essential to the successful implementation of IWAP. Federal, State, and local agencies which manage significant conservation land and water areas within Iowa include DNR, Iowa County Conservation Boards (CCBs), US Army Corps of Engineers (USACOE), and U.S. Fish Wildlife Service (USFWS). All have working relationships at both the state and local levels.

Many of the recommended conservation actions must be carried out on private land. The US Department of Agriculture (USDA) provides funding and technical assistance to landowners for land conservation projects through its Natural Resource Conservation Service (NRCS) and Farm Services Agency (FSA). Farm conservation programs and projects in Iowa are often delivered through partnerships involving agencies such as USDA, DNR, Iowa Department of Agriculture and Land Stewardship (IDALS), Soil and Water Conservation Districts (SWCDs), as well as non-profit organizations such as Pheasants Forever. DNR has permanent positions on Iowa's USDA State Technical Committee and subcommittees that provide input into wildlife-friendly programs like WRE, CRP, and EQIP. Traditionally, NRCS and DNR have jointly funded DNR's Private Lands Program, which uses USDA funding to establish wildlife habitat on private land. DNR Private Lands Wildlife Biologists are co-located in NRCS offices to promote close interaction between the DNR, USDA staff and private landowners. All of these avenues should continue to be utilized to promote the concepts and management recommendations identified in this Plan.

Wildlife Action Plan Review and Revision

Comprehensive review/revision is required at least every ten years. In addition, more frequent and/or less comprehensive revisions can be conducted at any time. Too-frequent revision cycles can stress the capacity of the Implementation Committee and its working groups, but changing conditions may necessitate updates to the Plan at points between required ten-year revisions.

The Costs and Benefits of Sustaining Iowa's Biodiversity

The costs of reaching the goals outlined in this Plan exceed the historic levels of conservation funding in Iowa. Hunters and anglers have funded most wildlife conservation. National and state trends indicate that the number of participants in hunting and fishing is declining. To reach the goals established in this Plan a broader spectrum of Iowans must invest in conservation. Supporting the Wildlife Action Plan will benefit the health of wildlife and people. Investing in cost-effective conservation will safeguard Iowa's natural resources for the generations to follow.

Annual Costs

The annual cost to double the amount of permanently protected acres to 4% of Iowa by 2030 is estimated to be $88 million (Table 9). Costs to implement the habitat management, research and surveys and other activities needed to implement the Plan are listed in Chapter Ten. Combining habitat protection, habitat management, survey and research costs brings the total funding needed annually for implementation of this Plan to approximately $133 million. The annual funding shortfall for implementation of this Plan is about $104 million (Table 9).

Table 9. Estimated funding needs over next 15 years (2015-2030) for full implementation of Plan.

Combined Annual Costs	Dollar Amounts
Needs – Land Protection	$88,000,000
Needs – Habitat Management & Science	$45,000,000
Annual Needs Combined	$133,000,000
Funds Available – Land Protection	$18,640,000
Funds Available – Habitat Management & Science	$10,500,000
Annual Funds Available Combined	$29,140,000
Annual Shortfall – Land Protection	$69,360,000
Annual Shortfall – Habitat Management & Science	$34,500,000
New Funds Needed Annually:	
Total	$103,860,000

Benefits of Sustaining Biodiversity in Iowa

Economic Benefits

Outdoor recreation opportunities are important to Iowans. Iowa State Parks receive over 25 million visits annually, and County Parks are estimated to receive a comparable number of visits (Otto et al. 2007). Outdoor recreation is also an important economic sector. A report that includes a wide variety of outdoor recreation types, compiled by the Outdoor Industry Association, estimates that outdoor recreation generates $6.1 billion in consumer spending in Iowa, supports 75,000 jobs, generates $1.7 billion in salaries and wages, and $433 million in state and local tax revenues (OIA 2012).

A 2013 analysis conducted by Southwick & Associates called "The Conservation Economy in America" estimated the total direct investment in fish and wildlife conservation, and the resulting economic contributions for each state in the nation. Based on 2010 spending levels, this report estimated Iowa's total direct investment to be $534.6 million (which includes all fish and wildlife conservation-related expenditures by federal state and local governments and private organizations). Iowa's economic output was estimated to be $689 million. In other words, a dollar spent on fish and wildlife conservation in Iowa yielded $1.29 in economic activity. In addition, an estimated $62 million in tax revenues to local, state, and federal coffers resulted from economic activity generated by the initial investment.

Whether the analysis focuses on fish and wildlife expenditures or outdoor recreation more broadly, the resulting message is consistent: conservation is a solid investment in Iowa.

Other Benefits

Nature provides many benefits and services to people (clean air, clean water, food, crop pollination, medicine, aesthetics, relaxation, recreation, etc.), some of which cannot easily be translated into monetary values.

These benefits are sometimes referred to as "ecosystem services." The values of ecosystem services are not regularly captured in monetary terms. Hopefully, future analyses of the return on investment for conservation expenditures will incorporate more ecosystem services, in order to more accurately capture the costs and benefits of conservation investments.

Conclusion

Iowa citizens are strongly in favor of investments in conservation. In a 2013 bipartisan, statewide survey of voters, 97% of respondents agreed (76% strongly agreed) with the following statement (Weigel and Metz, 2013):
"We need to ensure that our children and grandchildren can enjoy Iowa's land, water, wildlife and natural beauty the same way we do."

Plan Implementation – Example Projects

The ultimate purpose of this Plan is to improve the status of wildlife populations and their habitats, allowing people to continue enjoying Iowa's natural resources for years to come. This effort requires cooperation between many stakeholders, including private land owners, conservation entities, educators, policy makers, and more.

The Multiple Species Inventory and Monitoring Program

The largest effort directed towards increasing knowledge about the status of Iowa's non-game wildlife is the Multiple Species Inventory and Monitoring (MSIM) program. Seasonal field technicians are employed each year through a partnership between Iowa State University and the Iowa Department of Natural Resources to survey for fish, mussels, crayfish, amphibians, reptiles, dragonflies, damselflies, birds, butterflies, and mammals, as well as to conduct habitat assessments across the state (see Chapter 7 for a more detailed description of the program). The MSIM program has produced 10 years of data thus far, and continues to inform wildlife experts on the status of Iowa's wildlife populations. This information helps ensure that conservation management is appropriate and effective.

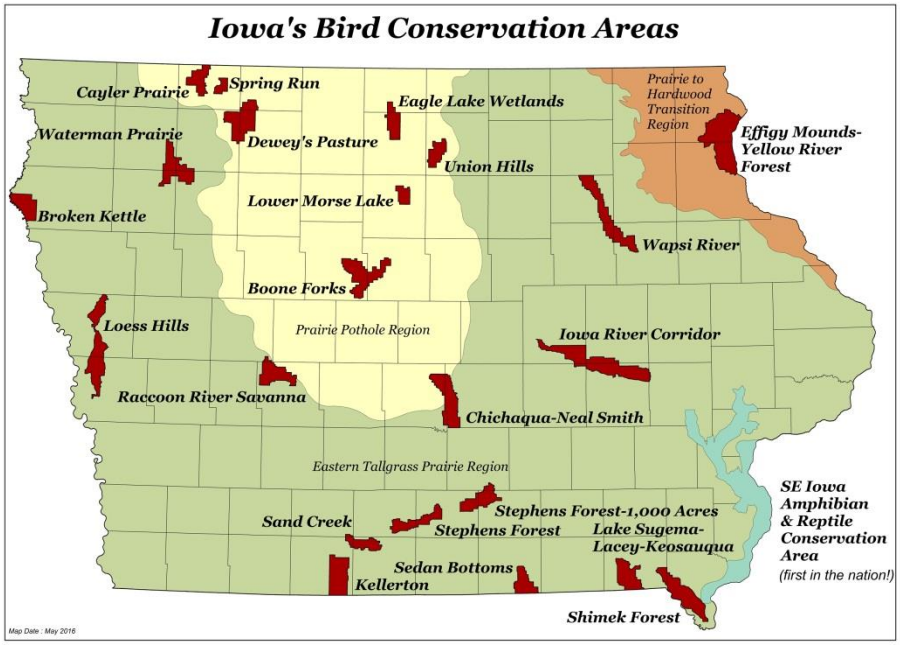
Citizen Science: The Volunteer Wildlife Monitoring Program

A second way that wildlife is being monitored in the state is through the Volunteer Wildlife Monitoring Program. This program gets citizens who are interested in Iowa's wildlife involved in the monitoring effort and makes it possible to track a larger number of species than the DNR would be able to keep up with on its own.

Iowa's Bird Conservation Areas

The Bird Conservation Area (BCA) program (see Map 5) was established in 2001 by the Wildlife Diversity Program of the DNR as part of the North American Bird Conservation Initiative (NABCI). NABCI is a broad collective of national and international bird conservation efforts directed towards reducing the serious declines in North American avian species that have been observed over the last two decades. Although the BCA program was established before the Plan was written, it has been an exemplary mode of Plan implementation, serving to achieve multiple Plan goals.

Map 5. Iowa's Bird Conservation Areas



There are no legal regulations that come with establishment of a BCA. Rather, these places serve to encourage and focus protection in areas where birds and other wildlife are most likely to benefit. The BCA model was adapted from the Wisconsin Department of Natural Resources and Midwest Partners-In-Flight Working Group large-scale landscape recommendations. This model is based on research suggesting that viable bird populations require habitat spread across a large landscape. Under this model a BCA must be at least 10,000 acres in size, with a minimum area of 2,000 acres at the core being permanently protected. In addition to the core area, blocks of habitat greater than 40 acres need to be scattered throughout the complex.

Cooperation with private land owners is an important part of successful wildlife conservation. Public education and assistance efforts are often conducted in high priority areas in order to help interested individuals increase the quality of wildlife habitat on their land. These education efforts are conducted by a variety of conservation entities.

Wildlife Viewing

The Education and Recreation working group of the IWAP Implementation Committee was established to help achieve visions four and five. Working group member Jim Pease, retired Iowa State University Extension Wildlife Specialist, participates in a radio show called Wildlife Day hosted on Iowa Public Radio that shares interesting facts about a wide variety of wildlife species in Iowa. While appealing to naturalists and outdoor recreationists alike, this radio show also reaches those who may not be able to participate in outdoor recreation. Working group member Pat Schlarbaum, a staff member in the DNR's Wildlife Diversity Program, has helped get viewing platforms installed at bird conservation areas to help draw people to watch wildlife in the area (Figures 2 & 3). As of 2015 there were six platforms in existence or being built. The view from the platforms also fosters an appreciation for the landscape within wildlife management areas. These platforms are constructed through cooperation with various conservation partners.

Figure 2. One of the most popular viewing platforms is at the Kellerton Wildlife Management Area, in the Kellerton BCA. Here, people gather to hear Greater Prairie-chickens booming in the early mornings of the springtime mating season.

Figure 3. The viewing platform at Otter Creek Marsh was built in the shape of a soaring eagle.

Although Iowa is an agricultural state, it also hosts thousands of vertebrate and invertebrate species. Continuing to develop a diverse base of native habitats and movement corridors for wildlife is essential for the preservation of Iowa's wildlife populations. Maintaining Iowa's rich natural resource legacy also creates a wide variety of enjoyable recreational opportunities for Iowans and visitors alike, thereby improving public health and contributing to the state's economy. This chapter highlights just a few of the many projects that are being conducted across the state to preserve and restore Iowa's natural resources as well as provide opportunities for people to enjoy them. As implementation of the Iowa Wildlife Action Plan continues, more benefits will be seen across the state for wildlife as well as for the people who enjoy outdoor recreation and who value wildlife and wild spaces.

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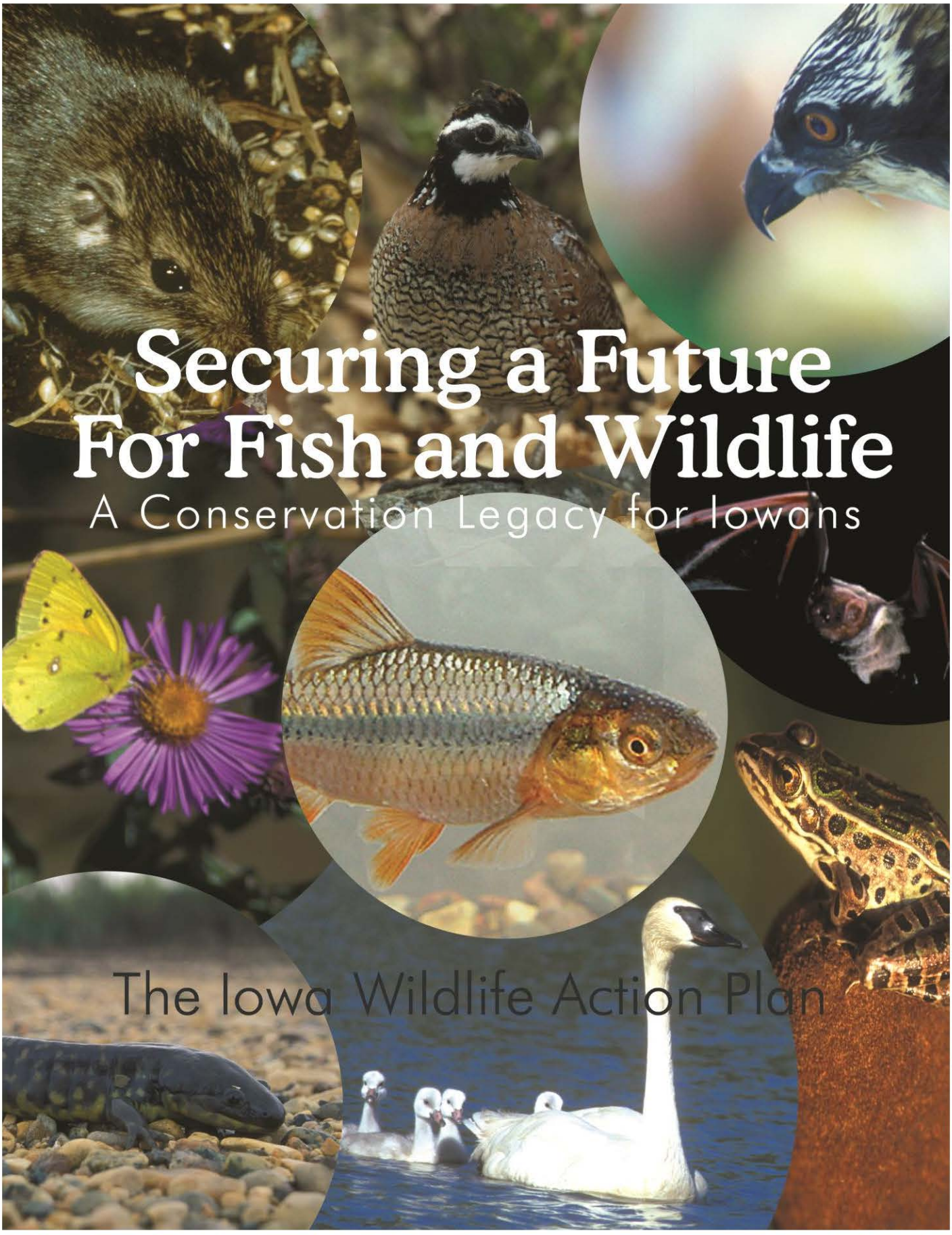

Securing a Future For Fish and Wildlife

A Conservation Legacy for Iowans

The Iowa Wildlife Action Plan

Securing a Future for Fish and Wildlife

A Conservation Legacy for Iowans

The Iowa Wildlife Action Plan

2015

Iowa Department of Natural Resources

The conservation of natural resources is the fundamental problem. Unless we solve that problem it will avail us little to solve all others.

— Theodore Roosevelt
In 'Our National Inland Waterways Policy,'
Address to the Deep Waterway Convention,
Memphis, Tennessee, 4 Oct 1907. In American
Waterways (1908)

Iowa Wildlife Action Plan
First Edition - May 2006
Author: James J. Zohrer, E Resources Group
Editors: Dr. Terry W. Little, Iowa DNR Wildlife Research Supervisor, and
Douglas C. Harr, Iowa DNR Wildlife Diversity Program Coordinator

Second Edition - August 2012 (Major Revision)
Editor: Katy Reeder, Iowa DNR Wildlife Action Plan Manager

Third Edition – 2015 (Comprehensive Review and Revision)
Editors: Katy Reeder, Iowa DNR Wildlife Action Plan Manager, and
Julia Clymer, Wildlife Action Plan Outreach Assistant

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2015 Edition:
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I thank those that put the wheels of this Plan in motion; they are identified in the 2006 Edition's acknowledgements. I am also grateful to the citizens of Iowa, whom this Plan was developed by and whom this Plan belongs to. Their collective "Vision for Iowa in 2030" is an inspiration.

Katy Reeder
Iowa Wildlife Action Plan Manager, 2015

2006 Edition:
This Plan could not have been completed without the assistance of dozens of individuals that provided advice, data, coordination, writing skills and review of the Plan in its many stages. Special recognition is due the members of the Plan Steering Committee and others without whose leadership, guidance and hard work completion of the Plan would not have been possible: Don Brazelton (Iowa Association of County Conservation Boards), David DeGeus (The Nature Conservancy), Marlene Ehresman (Iowa Natural Heritage Foundation), Dr. Ervin Klaas and Dr. James Dinsmore (Iowa State University, retired). Terry VanDeWalle (EarthTech, Inc.), Ric Zarwell (Iowa Audubon), and Department of Natural Resource employees Richard Bishop, Dr. Terry Little, Dr. Dale Garner, Douglas Harr, Todd Bishop, Kim Bogenschutz, Bruce Ehresman, Angi Bruce, Daryl Howell, and Monica Ulman.

In addition, 93 individuals representing 59 government or private conservation organizations, educational institutions, agricultural support groups and private wildlife-associated enterprises served on the Plan Advisory Committee. The Advisory Committee developed the Plan's vision and strategies and provided comments on draft versions.

Twenty-six other individuals served on 13 Working Groups that did the extensive resource reviews and discussions necessary to determine the Species of Greatest Conservation Need.

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Former DNR employee Kerri Wells designed the cover.
Dr. Terry Little and Doug Harr edited and compiled the final document.

James Zohrer
2006 Edition Plan Author, E Resources Group

Table of Contents

Chapter One

A Need for Comprehensive Wildlife Conservation

Required Element #8: Each State's provisions to provide the necessary public participation in the development, revision, and implementation of its Strategy.

Background

The North American Model of Wildlife Conservation

Wildlife conservation frameworks in the United States and Canada share several distinct features and were developed as a result of the unique circumstances of the establishment of these nations. Collectively these frameworks are referred to as the *North American Model of Wildlife Conservation* (hereafter referred to as the Model). The democratic principles that shaped the US also extended to the realm of wildlife ownership and management as the European notion of a landowner also owning the wildlife inhabiting the land was discarded in favor of a belief that wildlife are held in the public trust. The history, foundational principles, challenges to, and future of the Model are thoughtfully presented in a technical review developed by The Wildlife Society and the Boone and Crockett Club (Organ et al. 2012). The Model is founded upon seven principles, or pillars (see Box 1.1). The underlying foundation of the Model is the Public Trust Doctrine.

The Public Trust Doctrine

The Public Trust Doctrine asserts the idea that certain resources, including wildlife, are owned by no one and are held in trust by the government for the benefit of present and future generations. This doctrine is at the root of this Plan. The Public Trust Doctrine stems from early Greek and Roman law, was reaffirmed by the English Magna Carta in 1215, and later redefined in English common law in 1641, which was subsequently applied to the 13 British Colonies (Batcheller et al. 2010). After US independence, the Doctrine was first upheld by the US Supreme Court in "Martin v. Waddell," an 1842 decision that declared that the public held a common right to certain resources. More recent case law has upheld and expanded the reach of the Doctrine, although its extent varies among states. For a review of the Public Trust Doctrine as it relates to wildlife conservation and management, see Batcheller et al. (2010).

In the US, fish and wildlife management responsibility is shared by the Federal government and State, Tribal, and Territorial governments. Through the Public Trust Doctrine, states are trustees of wildlife except in instances where the Constitution provided for federal oversight.

Traditional Funding Model for Wildlife Conservation in the US

Since the development of modern-day wildlife management in the 1930s, the funding model for wildlife conservation in the US has been heavily reliant upon sportsmen and women. This relationship is described by Organ et al. (2012):

> "From the earliest days of active management and enforcement by nascent state fish and wildlife agencies, hunters, anglers, and trappers have funded restoration and conservation initiatives. License and permit fees, a motor boat fuels tax, and excise taxes on hunting, shooting sports, and angling products provide dedicated funding for habitat conservation, harvest management, research, restoration, and monitoring initiatives by state agencies. The excise tax programs have permanent, indefinite appropriation status, which means that the revenues are automatically distributed to the states each year and not subject to congressional whim."

Current and Future Wildlife Management: New Challenges, Threats, and Expectations

This funding model served wildlife conservation well for many decades and led to the successful restoration of many species of wildlife as well as the habitats upon which they depend. However, as participation in hunting and angling declines have been observed over the long term, it has become increasingly clear that the reliance upon sportsmen and women for conservation of all wildlife is insufficient and unsustainable. Furthermore, as all wildlife, not just game and sportfish species, are held in the public trust, the fairness of the funding system has been questioned.

Box 1.1

Pillars of the North American Model of Wildlife Conservation

1. *Wildlife Resources are a Public Trust*
2. *Markets for game are eliminated*
3. *Allocation of wildlife is by law*
4. *Wildlife can be killed only for a legitimate purpose*
5. *Wildlife is considered an international resource*
6. *Science is the proper tool to discharge wildlife policy*
7. *Democracy of hunting is standard*

Sustainable Funding and Teaming With Wildlife

Since the 1980s, state fish and wildlife agencies have struggled to meet an increasing number of constituent demands while facing larger and more complex threats to the natural world, while relying on a funding model which was developed in large part to restore populations of sportfish and game. As the scientific fields of Wildlife and Fisheries Management, Conservation Biology, Landscape Ecology, Global Change Biology and Human Dimensions of Wildlife Conservation advanced and matured, the complexity of the conservation issues faced by State Fish and Wildlife Agencies was increasingly recognized. The need for management attention to nongame species and to functioning ecosystems became increasingly apparent. In the 1990s, in response to these increased challenges, the Association of Fish and Wildlife Agencies (AFWA) initiated the Teaming With Wildlife (TWW) coalition on behalf of State Fish and Wildlife Agencies. This coalition sought, and still seeks, sustainable, dedicated funding for fish and wildlife conservation at the national level. In the 1990s, the coalition focused on the creation of an excise tax on birding, hiking, camping, and other recreational equipment, one that would mirror and build from the success of long established excise taxes for hunting, shooting sports, and angling equipment. However, some members of the outdoor recreation industry opposed the effort and it failed to gain support in Congress.

In 1996, the TWW coalition made a second large-scale attempt to find dedicated funding for all wildlife, this time based on the use of offshore oil and gas lease funds. The Conservation and Reinvestment Act (CARA) would have generated $350 million annually for wildlife conservation nationwide; approximately $4.5 million would have been Iowa's share. In 2001, CARA was passed in the House and had widespread support in the Senate. Ultimately, however, the measure failed. Instead, a vastly smaller, one-time appropriation for state wildlife diversity programs was enacted, called the Wildlife Conservation and Restoration Program (WCRP). Beginning in 2002, a similar program was enacted, called State and Tribal Wildlife Grants, which has received annual appropriations ever since.

State and Tribal Wildlife Grants Program (SWG)

Appropriations titled *State and Tribal Wildlife Grants (SWG)* have been passed annually since then, though the program is subject to yearly Congressional debate. The program's annual allocations have averaged approximately $58.6 million. These grants, managed by the US Fish and Wildlife Service, have required non-federal matching funds that vary from 25% to 50% depending on the year and type of program. Iowa DNR has received approximately $10 million in WCRP and SWG funds from 2001-2014, with an average annual appropriation of ~$720,000. These funds have been used to implement this Plan through increased research, habitat protection, and management for Species of Greatest Conservation Need designated in the Plan. Iowa must match the SWG income with non-federal funds and many partners have worked together to leverage the federal funds in order to most effectively conserve the species and habitats that were identified as priorities within this Plan. Projects using SWG funds must benefit Species of Greatest Conservation Need identified in a State's Wildlife Action Plan.

Other Funding Initiatives

In an effort to diversify and strengthen the funding needed to carry out wildlife conservation, States have attempted to direct funding to wildlife conservation from a variety of sources, such as lottery funds, general fund appropriations, special license plates, and tax checkoffs. A few state fish and wildlife agencies, including Minnesota, Missouri and Arkansas, have obtained broad-based funding to augment their traditional funding sources. In 2010, Iowa voters approved the creation of the Natural Resources and Outdoor Recreation Trust Fund, to be funded through a portion of the next sales tax increase. However, in 2015, Iowa still awaits the sales tax increase necessary to supply the Trust Fund with money.

In Iowa other efforts to diversify funding sources have been successful, but remain at levels vastly outmatched by the need. For example, Iowa's Chickadee Check-off program currently generates approximately $130,000 annually. The Resource Enhancement and Protection (REAP) Natural Resource License Plate funds have also provided a boost to DNR's ability to conserve a diverse array of wildlife, providing roughly $500,000/year. When compared to roughly $30 million generated by hunters and anglers, these funding sources are relatively small. When this Plan was initially developed in 2005, it was estimated (see Table 10.1) that the annual shortfall in funds needed for implementation was $39,375,000. Thus, despite several successful efforts to increase funds dedicated to wildlife conservation, the existing funding remains far short of the need.

State Wildlife Action Plans

In 2003, as a requirement to maintain eligibility for State Wildlife Grant funds, all states, territories and tribes which received SWG appropriations were required by Congress to develop Comprehensive Wildlife Conservation Strategies, now generally referred to as State Wildlife Action Plans (SWAPs). All 50 States and five US territories developed a State Wildlife Action Plan (SWAP) in 2005.

State Wildlife Action Plans outline the steps that are needed to conserve wildlife and habitat before they become too rare or costly to restore. Taken as a whole, these proactive plans present a national action agenda for preventing wildlife from becoming endangered.

State Wildlife Action Plans conserve wildlife and natural places. They assess the health of each state's wildlife and habitats, identify the problems they face, and outline the actions that are needed to conserve them over the long term. To learn more about State Wildlife Action Plans and view links to other states' plans, please visit: www.teaming.com

The Eight Required Elements of a State Wildlife Action Plan

As a condition of receiving SWG funds, Congress mandated that state fish and wildlife agencies develop a *Comprehensive Wildlife Conservation Plan* (State Wildlife Action Plan) by October 1, 2005, and review and revise the plan every 10 years thereafter. Congress directed that the plans must identify and be focused on the species in greatest need of conservation yet address the full array of wildlife and wildlife-related issues. Congress identified eight required elements to be addressed in each State's Plan:

1. Information on the distribution and abundance of wildlife, including low and declining populations as each State Fish and Wildlife agency [DNR] deems to be appropriate, that are indicative of the diversity and health of wildlife of the State. Low and declining populations of fish and wildlife are defined in the Plan as Species of Greatest Conservation Need (SGCN).

2. Locations and relative conditions of key habitats and community types essential to conservation of SGCN.

3. Descriptions of problems which may adversely affect SGCN or their habitats and priority research and survey efforts needed to identify factors that may assist in restoration and improved conservation of SGCN and their habitats.

4. Descriptions of conservation actions necessary to conserve SGCN and their habitats and establish priorities for implementing such actions.

5. Provisions for periodic monitoring of SGCN and their habitats, for monitoring the effectiveness of conservation actions, and for adapting these conservation actions as appropriate to respond to new information or changing conditions.

6. Each State's provisions to review its Strategy [Plan] at intervals not to exceed ten years.

7. Each State's provisions for coordination during the development, implementation, review, and revision of its Strategy [Plan] with Federal, State, and local agencies and Indian Tribes that manage significant areas of land water within the State, or administer programs that significantly affect the conservation of SGCN or their habitats.

8. Each State's provisions to provide the necessary public participation in the development, revision, and implementation of its Strategy [Plan].

The Plan must utilize the best available knowledge on the distribution and abundance of wildlife, historical documentation and other references to identify Iowa's wildlife conservation needs. The Plan must address the needs of all wildlife, but focus primarily on SGCN and their habitats as determined by DNR.

Iowa's Wildlife Action Plan

Iowa's Plan was initially approved in 2006, and subsequently modified in 2012. This version represents the first comprehensive revision of Iowa's Plan.

Framework Outlined in Initial Plan

The Steering Committee which first developed Iowa's Plan made several decisions which have left a lasting imprint upon this first comprehensive revision.

1. The IWAP would be a wildlife plan; plants are not specifically addressed except as an integral component of wildlife habitat.
2. The IWAP would have a 25-year focus. Long-term continuity is needed to accomplish ambitious objectives, but achievements are needed to be accomplished in a time frame that can be appreciated by Plan supporters.
3. The IWAP would be strategic in nature. Operational plans to implement the visions and strategies would be crafted later to fit the unique missions and capabilities of conservation organizations and individuals interested in Plan Implementation.

To assure the Plan would involve a diversity of conservation viewpoints, representatives of 105 conservation, recreation, education and agricultural support organizations were invited to serve on a formal Advisory Group; 93 individuals representing 59 organizations agreed to participate (Appendix 2).

The Advisory Group met in Des Moines on July 17, 2004. The purpose of the meeting was to develop a vision for the IWAP and strategies for attaining that vision by the year 2030. The Advisory Group was updated on the planning process and the status of wildlife and their habitats in Iowa. The large group then broke into eight focus groups and developed vision elements and conservation actions. When condensed by the steering committee, these vision elements and conservation actions form the basis for the strategies and priorities outlined in Chapters 6-10.

One of the key factors identified during the process of determining the SGCN was the lack of current, credible information on the distribution and abundance of many nongame species. For this reason, the Multiple Species Inventory and Monitoring Program has been a signature aspect in the implementation of this Plan.

2012 Modification

In 2012, an update to certain portions of the Iowa Wildlife Action Plan was completed and approved. That modification was focused primarily on adding and removing several species from the list of SGCN, as well as editing the map of High Opportunity Areas for Collaborative Conservation in order to more fully represent the priorities of conservation entities within the state.

During the public comment period for the 2012 modification, comments were received from eight people (3 DNR employees and 5 non-employees). To the extent that integration of these comments was feasible and within the scope of this modification, the comments were all integrated. Those who submitted comments that addressed broader issues of the scope, priorities, or format of the IWAP were informed that their comments had been compiled and would be addressed in the full review/revision of the IWAP

2015 Comprehensive Revision Process

Persons representing much of the ecological and conservation expertise existing in the state were included in various stages of the revision process, either as members of committees or as consultants and reviewers of specific portions of the IWAP.

A variety of efforts were made to ensure that information about the Plan received statewide distribution to the public as well:

- A complete draft of the revised Plan was placed on the DNR's web site with the email address for the Plan Coordinator, who received comments.
- As an alternative to downloading the draft Plan from the website, a CD-ROM containing the draft revised Plan was supplied to individuals upon request.
- Statewide news releases advertised completion of the Draft revised Plan, where it was available and how to comment.
- The public comment period for the draft IWAP revision was held from August 4, 2015 – September 11, 2015. A total of three written comments were received and incorporated in whole or part into the final version of the Plan.

Iowa's Conservation Legacy

Iowa has a long and important role in the advancement of fish and wildlife conservation. Some of the most prominent figures in the nation's history of conservation have roots in Iowa:

- Iowa Congressman John Lacey brought us the Lacey Act, which was passed in 1900. This Act essentially brought the era of market hunting to a close. The Act prohibits interstate transport or export of illegally harvested species.
- Aldo Leopold, author of "Game Management" and "A Sand County Almanac" (among many other works) was a conservationist, philosopher, author, forester, hunter, and educator. Leopold, commonly viewed as the father of wildlife management, was born and raised in Burlington, Iowa. In addition to serving as the nation's first Chair of Game Management (at UW-Madison), he helped found The Wilderness Society and The Wildlife Society.
- Jay N. "Ding" Darling, was a Pulitzer Prize-winning editorial cartoonist for the Des Moines Register. Darling was instrumental in the development of the Federal Duck Stamp Program and designed its first stamp. He was also involved in founding the National Wildlife Society.
- Paul Errington was a professor of Zoology and led the nation's first Cooperative Fish and Wildlife Research Unit at Iowa State College (now Iowa State University).

Today, Iowans maintain a strong connection to wildlife, and many participate directly in wildlife-associated recreation. The 2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation reported that wildlife-related recreation (hunting, fishing, and wildlife viewing) contributed $1,033,723,000 to Iowa's economy in 2011. Over 1.3 million Iowans age 16 and older participated in these activities in that year.

Moreover, regardless of their participation in wildlife-associated recreation, Iowans strongly favor conservation. In 2013, a non-partisan survey of Iowa's voters found that 97% of respondents agree with the statement "We need to ensure that our children and grandchildren can enjoy Iowa's land, water, wildlife, and natural beauty the same way we do" (Weigel and Metz, 2013).

Preserving all the species that reside in or migrate through the state and their habitats is important to maintaining the health of Iowa's wildlife which contributes not only to the economy, but also to the aesthetic value of the state. Maintaining Iowa's biological diversity will help this natural resource persist for many years into the future and continue to provide nature's benefits that we enjoy through hunting, fishing, wildlife viewing, and other outdoor recreational activities.

While a large number of individuals contributed in some manner to the IWAP, ultimate responsibility for its content lies with the Implementation Committee and the Iowa Department of Natural Resources.

Box 1.2

The ABCs of Wildlife Action Plans

SWAP and SWG and SGCN (oh my!)

*SWAP = **S**tate **W**ildlife **A**ction **P**lan*
*SWG = **S**tate and Tribal **W**ildlife **G**rant Program*
*SGCN = **S**pecies of **G**reatest **C**onservation **N**eed*

These 3 acronyms are used often in reference to wildlife diversity conservation. The use of so many acronyms can lead to confusion about how they relate.

SWAPs are comprehensive conservation strategies developed by each state, 5 territories, and numerous tribes. These documents identify **SGCN** which are indicative of the diversity and health of the state's wildlife. Development of **SWAPs** was required by Congress in order for states, tribes, and territories to remain eligible for federal funding provided through the **SWG** program.

The **SWG** program is the only funding source dedicated solely to implementation of **SWAPs**. Conservation of **SGCN** is a requirement of projects funded by the program. However, the **SWAPs** are meant to be *comprehensive strategies,* rather than just spending plans for **SWG**. Together, the **SWAPs** have created a national blueprint for the future of fish and wildlife conservation.

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Chapter Two

History of the Formation and Conservation of Iowa's Natural Communities

Required Element #2: Descriptions of the extent and condition of habitats and community types essential to conservation of species identified in Element 1.

Physiography

Topography

Iowa is a state of 56,239 square miles (36,016,500 acres) bordered by the Mississippi River on the east, and the Missouri and Big Sioux Rivers on the west. Iowa has a relatively low relief - elevations run from a high of 1,670 feet above mean sea level in Osceola County in northwestern Iowa to 480 feet above mean sea level in Lee County in the southeastern corner of the state.

Climate

Iowa's climate is classified as humid continental and is characterized by warm summers and cold winters. The average annual temperature is 47.6^{o}F. Average temperature in the summer is 71.5^{o}F. December to February winter temperatures average 21.2^{o} (NOAA 2015) with an average winter difference of 6.5 degrees between north and south. Temperature minimums of -25^{o}F are not uncommon in northern Iowa.

Iowa's temperature has been gradually increasing (see Figure 2-1). Average annual temperature has increased 0.1^{o}F per decade since 1895. Much of this increase has occurred during the winter months; 3-month averages during the period of December-February have increased 0.2^{o}F per decade since 1895. Iowa's three-month averages during June-August remained stable in that time period (NOAA 2015).

The long-term (1901-2000) statewide average annual precipitation is 32.09 inches (NOAA 2015). A shorter-term average used to estimate "normal" rainfall amounts (1981-2010) is 34.76 inches. The trend in average annual precipitation since the 1870s has been an increase of 0.36 inches per decade (Takle 2011). The northwest part of the state is the driest with an annual precipitation of 30.12 inches (1980-2010 average) while the southeast is the wettest with an annual precipitation of 37.68 inches (1980-2010 average) (Midwestern Regional Climate Center 2015).

Iowa often experiences seasonal extremes and frequent local, rapid weather changes due to the convergence of cold, dry Arctic air, moist maritime air from the Gulf of Mexico, and dry Pacific air masses. Like most states, periods of severe drought and periods of excessive precipitation can have a dramatic impact on terrestrial and aquatic vegetation as well as their associated fish and wildlife species.

Statewide winter snowfall averages 32 inches. Northern Iowa (north of US Highway 30) receives frequent snow often associated with strong winds, blowing and drifting. Southern Iowa may experience substantial snowfall as well as more frequent ice storms. This results in a snow cover that is often covered by a surface crust of ice or hard snow. Harsh conditions seldom last for more than a few weeks in most of the state, even less in the south half.

These climatic factors combine to influence the length of the growing season across the state. Late frosts in the spring and early freezes in the fall result in a reduced growing season of 135 days in northeastern and northwestern

Iowa. The longest growing season is in southeastern Iowa, with an average of 175 days. The statewide average growing season is 158 days long.

Iowa now has a statewide average of five more frost-free days per year than 50 years ago, and 8 to 9 more than at the beginning of the 20th century. This provides Iowa with a longer growing season, earlier seasonal snowmelt, and longer ice-free period on lakes and streams (Takle, 2011).

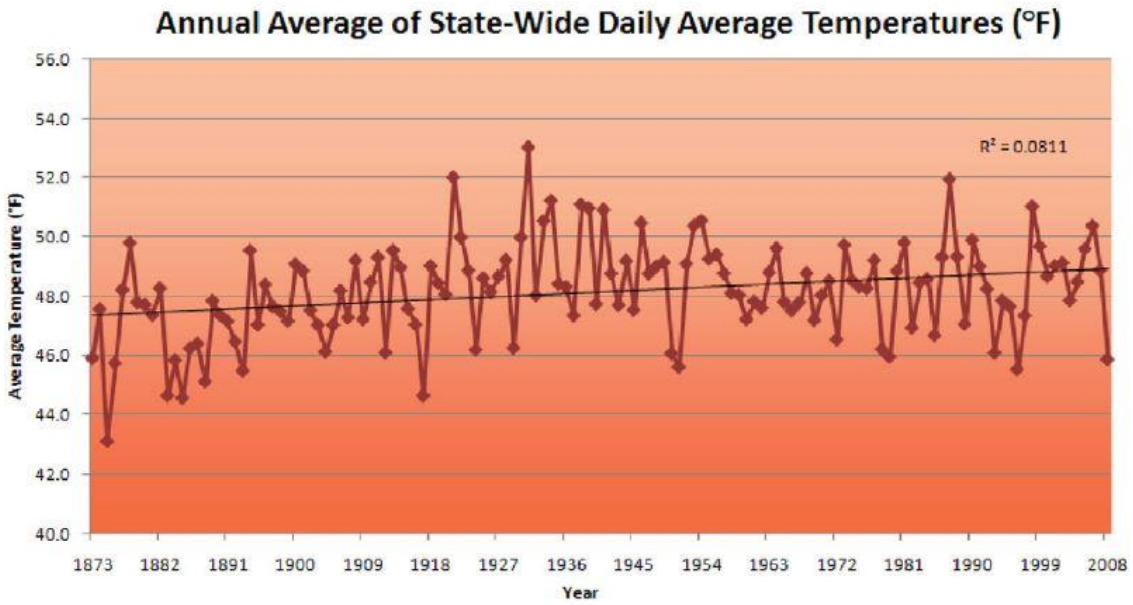
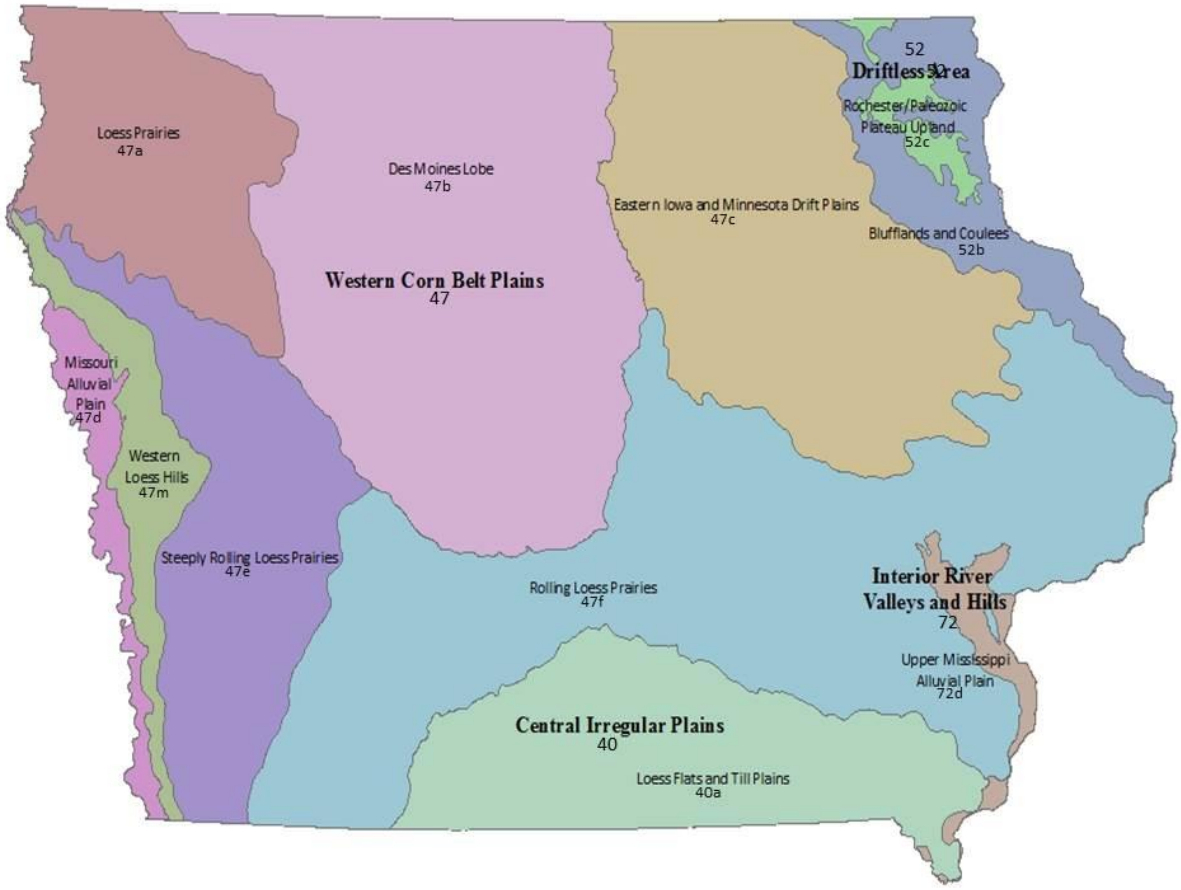


Figure 2- 1. Iowa's average annual temperature has increased 0.1oF per decade since 1895. From Takle (2011).

Geology

Iowa's natural communities are as much a result of its recent geologic past as they are a result of climatic conditions (Prior 1991). The boundaries of the ecoregions that resulted from this geologic history coincide well with the boundaries of other habitat based classification systems (See Map 2- 1). The names of the ecoregions follow the US EPA (Omernik) Level III and IV Ecoregions. The numbers and descriptions of each Level IV ecoregion are taken from Chapman et al. (2002). Descriptions of Level III ecoregions are taken from the US Environmental Protection Agency (EPA)'s Descriptions of Level III Ecoregions, accessed on the EPA website: http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm.

Map 2- 1. Level III & IV Ecoregions of Iowa (US EPA – Omernik)
Large font denotes the names of Level III ecoregions and small font, Level IV ecoregions.



Level III Ecoregion Descriptions

The following narrative is organized by EPA Level III ecoregions. Although Level III ecoregions are relatively homogeneous, tables under each major heading describe subtle differences in landform, geology and native plant communities that characterize the EPA Level IV ecoregions they encompass.

40. The Central Irregular Plains

The Central Irregular Till Plains have a mix of land use and are topographically more irregular than the Western Corn Belt Plains (47) to the north, where most of the land is in crops. The region, however, is less irregular and less forest covered than the ecoregions to the south and east. The potential natural vegetation (PNV) of this ecological region is a grassland/forest mosaic with wider forested strips along the streams than historically found in Ecoregion 47 to the north. The mix of land use activities in the Central Irregular Plains includes mining operations of high-sulfur bituminous coal. The disturbance of these coal strata in southern Iowa has degraded water quality and affected aquatic biota.

Table 2- 1. Characteristics of Level IV Ecoregions within the Central Irregular Plains

Level IV Ecoregion Name	Physiography	Geology	Potential Natural Vegetation
40a. Loess Flats and Till Plains	Glaciated. Low hills and smooth plains. Perennial streams with many channelized.	Moderate loess over loamy till and clay loam till. Pennsylvanian sandstone, limestone, shale. Also Mississippian limestone in Iowa.	Mosaic of Little Bluestem-Sideoats Grama prairie, Bur Oak woodland, and Chinkapin Oak woodland.

47. Western Corn Belt Plains

Once mostly covered with tallgrass prairie, over 80 percent of the Western Corn Belt Plains is now used for cropland agriculture and much of the remainder is in forage for livestock. A combination of nearly level to gently rolling glaciated till plains and hilly loess plains, an average annual precipitation of 26 to 37 inches, which occurs mainly in the growing season, and fertile, warm, moist soils make this on of the most productive areas of corn and soybeans in the world. Agricultural practices have contributed to environmental issues, including surface and groundwater contamination from fertilizer and pesticide applications as well as concentrated livestock production.

Table 2- 2. Characteristics of Level IV Ecoregions within the Western Corn Belt Plains

Level IV Ecoregion Name	Physiography	Geology	Potential Natural Vegetation
47a. Northwest Iowa Loess Prairies	Irregular plains. Dendridic streams.	Moderate to thick loess over clay-loam till. Cretacious shale, sandstone, and limestone, some Precambrian Sioux Quartzite.	Big Bluestem-Indiangrass prairie, Little Bluestem-Indiangrass prairie, limited areas of Bur Oak woodland.
47b. Des Moines Lobe	Smooth to irregular plains. Dendridic streams and drained depressional wetlands.	Loamy till with no loess cover. Ground, stagnation and end moraines.	Big Bluestem-Indiangrass prairie, Cordgrass wet prairie, limited areas of Bur Oak woodland.
47c. Eastern Iowa and Minnesota Drift Plains	Irregular to smooth plains. Low gradient streams.	Thin loess cover over loamy till. Devonian and Silurian limestone and dolomite.	Big Bluestem-Indiangrass prairie, areas of Bur Oak mixed savanna and woodlands.
47d. Missouri Alluvial Plain	Smooth to irregular alluvial plain. Channelized streams.	Alluvium over Pennsylvanian and Cretacious shale, sandstone and limestone.	Northern floodplain forest, pin oak forest, and cordgrass wet prairie.
47e. Steeply Rolling Loess Prairies	Open low hills. Intermittent and perennial streams, many channelized.	Moderate to thick loess, 25-50 feet, over clay loam till. Pennsylvanian shale, sandstone and limestone.	Big Bluestem-Indiangrass prairie, and White Oak-Red Oak Woodland, Bur Oak mixed woodland.
47f. Rolling Loess Prairies	Irregular plains to open low hills. Intermittent and perennial streams, many channelized.	Moderate to thick loess, generally less than 25 feet, over clay loam till. Pennsylvanian and Cretacious shale, sandstone and limestone.	Mosaic of Big Bluestem-Indiangrass prairie, and Bur Oak woodland.
47m. Western Loess Hills	Open hills and bluffs. Intermittent and perennial streams.	Thick loess, 60-150 feet over clay-loam till. Pennsylvanian shale, sandstone and limestone in southern half of region; Cretacious shale, sandstone and limestone in the northern half.	Mosaic of Bur Oak woodland and Big Bluestem-Indiangrass prairie.

52. The Driftless Area

The hilly uplands of the Driftless Area easily distinguish it from surrounding ecoregions. Much of the area consists of a deeply dissected, loess-capped, bedrock dominated plateau. The region is also called the Paleozoic Plateau because the landscape's appearance is a result of erosion through rock strata of Paleozoic age rather than glacial or post-glacial deposition. Although there is evidence of glacial drift in the region, its influence on the landscape has been minor compared to adjacent ecoregions. In contrast to adjacent ecoregions, the Driftless Area has few lakes, most of which are reservoirs with generally high trophic states. Livestock and dairy farming are major land uses and have had a major impact on stream quality.

Table 2- 3. Characteristics of Level IV Ecoregions within the Driftless Area

Level IV Ecoregion Name	Physiography	Geology	Potential Natural Vegetation
52b. Paleozoic Plateau/ Coulee Section	Dissected hills, rolling to steep-sided valleys. Perennial streams.	Thin loess and patches of glacial drift over Silurian, Ordovician and Cambrian dolomite, shale, sandstone, and limestone.	Mosaic Little Bluestem-Indian grass prairie, Bur Oak and White Oak forests, and areas of Maple-Basswood forests.
52c. Rochester/ Paleozoic Plateau Upland	Rugged region of bluffs and valleys cut by tributaries of the Mississippi River.	Thinly deposited loess and pre-Wisconsin glacial till over an eroded Paleozoic sedimentary plateau. Pre-Wisconsin till exposed mainly in the west where loess deposits are thin and discontinuous	Mosaic Little Bluestem-Indian grass prairie on flat, fire-prone remnants of the plateau, with oak forests developing downslope. Mesic forest of basswood and sugar maple on north and east-facing slopes with wet mesic forests on silty bottomlands.

72. Interior River Valleys and Hills

The Interior River Lowland is made up of many wide, flat-bottomed terraced valleys, forested valley slopes, and dissected glacial till plains. In contrast to the generally rolling to slightly irregular plains in adjacent ecological regions to the north (54), east (55) and west (40, 47), where most of the land is cultivated for corn and soybeans, a little less than half of this area is in cropland, about 30 percent is in pasture, and the remainder is in forest. Bottomland deciduous forests and swamp forests were common on wet lowland sites, with mixed oak and oak-hickory forests on uplands. Paleozoic sedimentary rock is typical and coal mining occurs in several areas.

Table 2- 4. Characteristics of Level IV Ecoregions within the Interior River Valleys and Hills

Level IV Ecoregion Name	Physiography	Geology	Potential Natural Vegetation
72d. Upper Mississippi Alluvial Plain	Smooth to irregular alluvial plains. Channelized streams.	Alluvium. Brown to gray silt, clay, sand, and gravel. Thickness of alluvial and older fluvial deposits > 100 feet.	Cottonwood-willow riparian forest, Pin Oak forest, Cordgrass wet prairie.

The glacial history and topography of each landform affect the type and distribution of current wildlife habitats and agricultural land use. These land uses are displayed in Map 4-3. Present-day land uses and habitats are discussed further in Chapter 4.

Historic Plant Communities

Pre-settlement Iowa lay at a biological crossroads. Hardwood forests dominated the cooler and more humid lands east of the Mississippi River. The warmer, drier mixed grass prairie and prairie potholes of the northern Great Plains lay to the west. To the north, great maple-basswood and pine forests covered the Great Lakes region. To the south, oak savannas gradually gave way to the vast oak-hickory forests of the Missouri Ozarks. These different ecological regions blended together in Iowa to produce a unique landscape of great biological diversity (Map 2- 2).

Roughly two-thirds of the state (an estimated 23 million acres) was dominated by lush prairies. Most was tallgrass prairie, although short grasses were present on hot, dry sites. Nearly 7 million acres of forest or forest-prairie savanna covered much of the eastern third of Iowa and followed the river valleys into the prairies to the north and west. Around 4 million acres of prairie pothole marshes dotted recently-glaciated and poorly-drained northcentral and northwest Iowa where larger wetlands and lakes protected oak savannah from prairie fires. Another million acres of backwaters, sloughs and flooded oxbows were found in the floodplains of the Mississippi, Missouri and larger inland rivers.

Prairies

The prairie was more than just a monolithic sea of grass. Prairie plants are adapted to subtle changes in moisture and soils that occur along a gradient from lowlands to drier prairie ridges. Poorly drained wetlands and wetland margins supported rank growths of sedges, cord grass, bluejoint, prairie muhly grass, and panic grass, with common forbs such as gayfeather, prairie dock, Turk's-cap lily and New England aster. Better-drained loamy soils on slopes and broad ridges were covered with more moderate stands of switchgrass, big bluestem, Indian grass and forbs like compass plant, rattlesnake master, smooth aster, wild indigo and goldenrod. Drier sites on gravel and sand ridges or steep slopes supported shorter and more open stands of little bluestem, side-oats grama, and needlegrass, with forbs like pasque flower, silky aster, yellow pucoon and common milkweed.

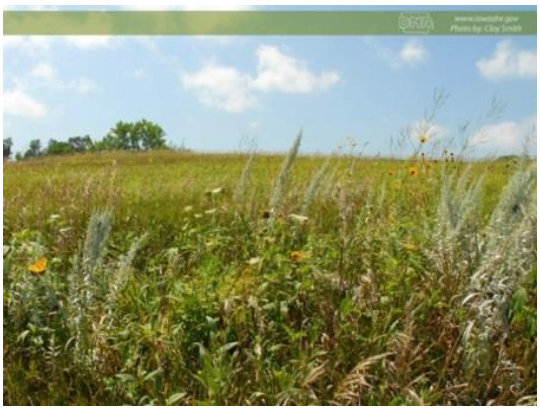


Photo Credit: Iowa DNR, Clay Smith

Forests

Closed-canopy mature forests as we know them today existed only on the floodplains where fire could not routinely penetrate. Silver maple, American elm, and swamp white oak dominated the wettest sites, with hickories, hackberry, black walnut, white ash, red oak, basswood and slippery elm on lower slopes. Shrubs were not abundant and were primarily young silver maples and hackberry with catbriar, poison ivy and grape.

Map 2- 2. Landcover of Iowa in the 1850s

(from Government Land Office original public land survey of Iowa). Prairie ~23,300,000 acres (65%); Wetlands/ prairie pothole marshes ~4,000,000 acres (11%); Forest ~6,700,000 acres (19%); Water, floodplains, and backwaters ~1,800,000 acres (5%).

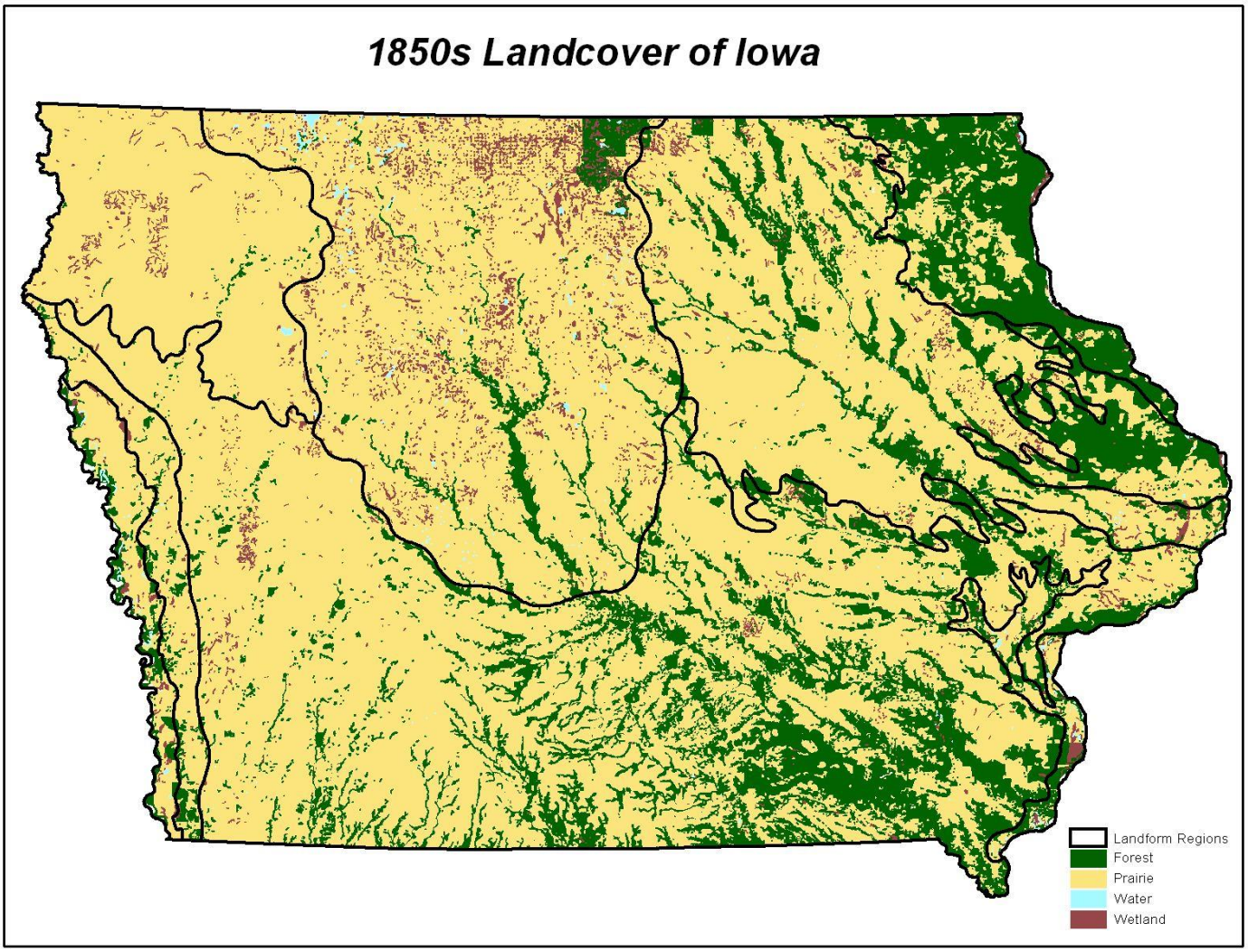


Photo Credit: Iowa DNR, Lowell Washburn

Forests on drier slopes and uplands were primarily oak openings or savannas - scattered old oak trees or small clumps of oaks with an understory of prairie or mixed prairie-forest shrubs and herbs. Burr oak, with its thick, fire-retardant bark dominated with some red and white oaks on moister sites. The understory was primarily prairie grasses and forbs but hazel, coralberry, sumac and grape occurred where fire was less common.

The heaviest concentrations of timber were in the cooler and moister eastern third of the state. In the west only the floodplains and the coolest sites on north and east facing slopes in the deepest river valleys were timbered. Because of the many river systems that penetrated the prairies to the north and west at least some timber and shrub lands were found across most of the state.

Fire and grazing

Drought, fire and grazing combined to make Iowa's prairie-wetland-forest communities dynamic ecosystems. In wet years, water levels were high, and multiple years of high water levels caused wetland vegetation to gradually die out, and marshes began to look like ponds or small lakes. But dry weather runs in approximately 10 to 15-year cycles on the prairies, with severe drought at roughly 20-year intervals. Drought caused wetland basins to temporarily de-water. Seeds buried in moist wetland soils were able to germinate once again and dense stands of emergent vegetation were reestablished and accumulated plant material decomposed in the aerobic sediments liberating nutrients. Thus regenerated wetlands awaited only the end of drought to return them to their former productive condition.

In wet years fire was less prevalent on the prairie. Without burning the dead stems and leaves of grasses and forbs accumulated on the ground and this litter created a cooler, moister environment. In some cases sun tolerant trees, and coralberry and other shrubs were able to survive and spread from forest edges farther into the grasslands. During drought fire burned off large areas of prairie and forest, killed invading shrubs and trees, eliminated the litter, returned nutrients to the soil and allowed grasses to regain their dominance. Thus the boundary between forest and prairie ecosystems was a dynamic back and forth movement. Fire also allowed annual plants like ragweed, fleabane, thistle and primrose to take a temporary foothold before the longer-lived grasses and forbs recovered and choked them out.

Although fires were common, it is impossible to say how much and how frequently the prairies burned. Weather is seldom in complete synchrony over all of Iowa. Local dry spells undoubtedly created mini-droughts that lowered wetlands and produced frequent fires, while just a few miles away precipitation was normal. Even in normal years a

dry late summer could result in a partial drawdown of marshes and occasional fires. The network of wetlands, creeks and rivers probably stopped smaller fires from expanding too greatly.

Grazers and browsers like bison, wapiti and deer relied on this mosaic of habitat condition and also contributed to it. They suppressed trees and shrubs and slowed the growth of tall grasses where they fed intensively. Wapiti and bison created wallows - sandy areas where they rolled in the loose earth to remove hair and dislodge insects. Prairie dogs, though not common in Iowa, kept the vegetation around their towns clipped short. Even plains pocket gophers created small openings over their mounds where annual plants could gain a foothold.

The result of all this variety in soils, topography, weather, fire and animal activity was a great patchwork of plant communities in both time and space. On some sites 250 species of plants could be found. Not only were prairies, forest and wetlands in close proximity, but at any given location plant communities were in a state of growth, retrenchment or suppression depending on their local history.

Historic Wildlife Communities

Game Animals

The great diversity of plant communities that covered pre-settlement Iowa also supported a diversity and abundance of wildlife that was foreign to settlers from the East. Iowa native Aldo Leopold, writing in 1931 in his *Game Survey of the North Central States*, said, "*…no region in the world was originally more richly endowed with game than this one, quantity and quality both considered. Contrary to common belief, the cream of its game country was the prairie type…*" Prairie animals like wapiti were common, and bison, pronghorn, prairie chickens and sharp-tailed grouse penetrated the tallgrass prairies from the west. White-tailed deer, wild turkeys, passenger pigeons, northern bobwhite quail, ruffed grouse and woodcock followed the deciduous woodlands and river valleys into the prairie from the East.

Waterbirds

The prairie pothole and riverine wetlands provided excellent nesting habitat and attractive resting and feeding stops for millions of migrating waterfowl between their nesting and wintering grounds. Giant Canada geese, trumpeter swans and over a dozen species of ducks nested in Iowa, mainly blue-winged teal, mallards, redheads, and wood ducks. Between 3-4 million ducks may have been raised annually.

Photo Credit: USDA NRCS, Tim McCabe

Other waterbirds were also plentiful. White pelicans migrated along corridors of major rivers and lakes and used some large marshes and lakes for breeding. Sandhill cranes were abundant during migration and nested here occasionally. Whooping cranes were less numerous, but nested frequently in the marshes of northcentral and northwest Iowa. More than 30 species of shorebirds migrated through Iowa. Of these, long-billed curlew, marbled

godwit and upland sandpiper nested here, and the American golden-plover, Eskimo curlew and common snipe were abundant during migration. Sora was an extremely common marsh rail.

Furbearers

Beaver, muskrat and river otters were found throughout Iowa, associated entirely with marshes, streams and rivers. Muskrat were most abundant in the prairie marshes of northcentral Iowa and maintained very high numbers. Beaver and river otters were associated more with riparian habitats. Mink, badger, and striped skunks were not highly sought after, but each must have been abundant. Many farm boys made pocket change by trapping highly abundant spotted skunks, locally known as civet cats and until recently thought to be extirpated from the state. Raccoon and opossum, two of the most abundant furbearers today, may have spread westward onto the prairie in association with the spread of agriculture and farmsteads.

Photo Credit: Iowa DNR

Canids and other Large Predators

Carnivorous and omnivorous furbearers fed on the diversity of small mammals, birds and their nests and other prey. Although descriptions of canid communities are often confusing and varied over time as settlement progressed, it seems that two subspecies of gray wolves occurred in Iowa – the smaller Great Plains wolf that followed the bison and wapiti herds and was most common in the western two-thirds of the state, and the eastern timber wolf, a slightly larger and often darker subspecies, inhabited the forested eastern third, mostly in the northeast corner of the state. Coyotes were found statewide, living between wolf packs and perhaps becoming more common as wolves were extirpated. Red foxes were found in the prairies and at the prairie-forest border in northern Iowa. Since in some parts of their range red foxes are actively excluded, even killed by coyotes, they may have become common after wolves were exterminated and predator control began to focus on coyotes. The gray fox, more omnivorous than other canids, seemed to occupy a niche that enabled it to co-exist with them and was found primarily in the eastern third of the state, perhaps because of its tendency to climb trees for fruit and bird eggs. Bobcats were numerous, occurring statewide in a variety of forested and shrubby habitats. Mountain lions, or cougars, were scattered across the state, but reports are few, perhaps because of their secretive nature. The lynx, a larger version of the bobcat which principally inhabited the coniferous forests of the Great Lakes states and Canada, was at least occasionally found here.

The Black Bear was the largest predator in pre-settlement Iowa. Although their preferred habitat was woodlands, they occasionally wandered into the prairies, usually along river corridors. Reports of Black Bears originate from 48 counties fairly uniformly scattered across the state but they were almost certainly most common in eastern Iowa.

Fish and Mussels

The historical baseline for Iowa fishes is based on the work conducted in the middle and late 1880s by Seth Meek for the United States Fish Commission while he was a professor at Coe College in Cedar Rapids. Meek surveyed streams and natural lakes in most major river basins in Iowa, and his survey was published in 1892. Even though his surveys were conducted approximately 50 years after urban and agricultural development of the state began, Meek's surveys suggest an exceptionally diverse pre-settlement fish community in Iowa's streams, rivers, and natural lakes and suggest considerably different and higher quality aquatic ecosystems than exist today.

Roughly 145 fish species are considered native to Iowa, with five of these species now considered extirpated. In the 2012 version of this Plan, 49% of fish species were listed as SGCN, comprising 24% of all Iowa SGCN. The most significant declines appear to be in fish species that require vegetated backwater habitat in which to spawn. In addition, lowered levels of water quality and decline of aquatic habitat quality has either eliminated or caused reductions in the Iowa distributions of some Iowa fishes.

Historically, Iowa's rivers and streams hosted huge mussel beds. Burial mounds along the Mississippi River provided evidence that the Mississippi River provided abundant food supplies of freshwater fishes and mussels to pre-historic Native American tribes (Harlan et al. 1987).

Today, 54 mussel species are considered native to Iowa (including 3 that are now considered extirpated from Iowa). In the 2012 version of this Plan, 53% of mussel species were listed as SGCN, comprising 9% of all Iowa SGCN.

Nongame Species

Records of the un-hunted fauna that inhabited Iowa are largely nonexistent. The early explorers and settlers were concerned mostly with wildlife as a source of food, hides or feathers, or as perceived threats to livestock and crops. But of 440 species of birds and mammals that resided here or migrated through Iowa, less than 15 percent were ever hunted or trapped. Serious scientific efforts to describe Iowa's wildlife did not begin until nearly 40 years after settlement and by then significant changes had already occurred.

Birds and Mammals

In all, more than 180 species of birds nested in Iowa. Abundant wetlands were habitat for countless yellow-headed blackbirds, marsh wrens, American and least bitterns, black and Forster's terns, black-crowned night-herons, rails and dozens of other species. Wetland-prairie margins were nesting sites for song sparrows, sedge wrens and northern harriers. Wooded wetlands and floodplain forests were the favored habitat of colonies of nesting herons and egrets as well as Carolina parakeets, an abundant species that flocked in the hundreds. Native parakeets were extinct in Iowa by the 1870s due to deforestation, hunting for feathers to adorn women's hats and possibly due to competition with introduced European honey bees that competed for tree cavity nest sites. To see one today would indeed make our remaining most colorful species look drab by comparison.

Where shrubby, early successional stages of forest pushed into the prairies cardinals, yellowthroats, spotted towhees and rose-breasted grosbeaks and other forest edge species were abundant, as well as ruffed grouse. Larger stands of mature forests provided nesting sites for interior forest species like cerulean warblers, ovenbirds, scarlet tanagers, wood thrushes, pileated woodpeckers, and passenger pigeons. Riparian woodlands would have been habitat for black-billed cuckoos, red-headed woodpeckers,

belted kingfishers and northern flickers. Red-headed woodpeckers would have been especially abundant in oak savannah. Each forest type had its own unique assemblage of small mammals as well.

Grasshopper and vesper sparrows would have nested in recently burned prairies. A year or two after burning or intensive grazing, regenerating prairie would have provided nesting cover for bobolinks and dickcissels. Henslow's sparrows, savanna sparrows and upland sandpipers would have nested in oldest and rankest prairies with dense ground litter. Loggerhead shrikes and mourning doves would have sought out grasslands with a shrub component.

Reptiles, Amphibians, and Invertebrates

Even less is known of the historic reptiles, amphibians and invertebrates of Iowa. More than 60 species of reptiles and amphibians were eventually found in Iowa. Prairie and prairie potholes, riverine wetlands, prairies and woodlands provided homes for a diversity of lizards like the great plains skink and six-lined racerunner, common turtles like the ornate box and painted turtles, snakes like the timber and massasauga rattlesnakes and frogs like the green and gray tree frogs and leopard frogs which erupted in incredible numbers in wet prairie during wet years.

Impacts of Settlement

Settlement in Iowa progressed roughly southeast to northwest. Most of the south half of the state had been inhabited by the end of the 1840s; northcentral and northwest Iowa were settled in the 1850s; Lyon County in extreme northwest Iowa was the last to be settled, receiving its first homestead family in 1866.

Human population growth was slow at first. By 1840 only 43,000 settlers had braved the prairies. Pressure for cheap land Increased after the Civil War, however, and massive land grants were made to railroad builders to stimulate completion of a trans-continental railroad network. By 1870, Iowa's population had increased to nearly 650,000; by 1900 it had skyrocketed to 2 million.

At the same time Iowa was being settled a revolution was overhauling industry and agriculture. The advent of improved farm implements, coupled with a rapidly expanding population base devoted mostly to agriculture, had a devastating and permanent impact on Iowa's native plant communities.

Forests

Woodlands were the first to go. Early pioneers, emerging from the eastern deciduous forest, often likened tallgrass prairie to an ocean of grass, with scattered savanna or woodlands along streams like a distant shoreline on the horizon. Some found the light and openness of the prairie invigorating, others found it oppressive, accustomed as they were to woodlands, where trees were a symbol of soil fertility. Some early settlers preferred farming woodlands rather than open prairie, fearing that land too poor to grow trees would not grow crops either. While experience would quickly prove that wrong, forests felt the bite of the pioneer's axe early in our history.

Early farmers tended to settle close to timber for building materials and fuel. By 1875 when most of the Iowa prairie had been settled, woodland acres sold for $35/ac while prairie land, thought to be less fertile, went for $5/acre (ac). As late as 1867, in Marshall County Iowa, good timbered land was selling for up to $50/ac while prairie brought a paltry $3/ac (Madson 1995).

Most of the initial forest clearing in Iowa was done to allow conversion of the land to agriculture. Iowa's native hardwoods did not prove valuable as building materials. Most of the lumber that eventually built the farm homes,

barns and livestock dwellings that dotted the countryside came from the great pineries of Minnesota and Wisconsin. Starting in the 1850s, however, railroad expansion and the discovery of coal in southern Iowa fueled a demand for oak ties and mine timbers that would last into the early 20th century. By 1875, just one-third of the original 6.7 million acres of primitive forest remained, most on rough land or in floodplains either too steep or too wet to plow.

Prairies

The effect on our extensive prairies and prairie-wetland complexes was even more devastating. When pulled by up to 5 teams of horses or yokes of oxen a steel *breaking plow* could shear through and break up 2 acres a day of the foot-thick sod with its intricately intertwined root systems. On the open prairie, huge breaking plows and teams of oxen were required to prepare the land for farming, requiring a major capital investment. If a farmer lacked such equipment he had to hire it done for as much as $600/quarter section, a staggering sum. The newly exposed soil was so fertile that a crop, first wheat and later corn, was planted directly on the overturned furrows. The next year a second plowing would complete the conversion of prairie to a field tillable by conventional methods. Starting in the 1850s, Iowa lost nearly 2 percent of its 25 million acres of native prairie a year, 3 million acres a decade, until less than 30,000 acres (0.1%) remained after 80 years.

Wetlands

The vast prairie-pothole wetlands of northcentral and northwest Iowa took longer to impact. Through the first 20 years of settlement there was plenty of good land available without trying to drain and farm wetlands. In 1850, Congress passed the SwampLand Act. It directed each county to survey all wetlands and sell them at auction for 5 cents an acre, the first of what would become a century-long succession of government-subsidized efforts to drain wetlands. County drainage commissions and drainage districts were soon organized. Eventually pothole soils were discovered to be some of the most productive when dry, further accelerating the demand for drainage.

The first drainage attempts were with hand-dug, open ditches that drained small, shallow wetlands. This reasonably ineffective approach was quickly replaced by massive teams of oxen pulling breaking plow that created a furrow through and beyond a wetland to a stream that received the water. Steam dredges did not replace manual labor until nearly 1900 and this was the era of draining lakes and large marshes into excavated ditches (bull ditches) that led to streams. Underground ceramic tiles were developed to drain smaller potholes into ditches as early as 1858. By 1917 modern clay tiles were used to drain seasonally wet fields into extensive, inter-connected drainage systems that had eliminated all but the largest wetlands. By 1906 just 25 percent of the original 4 million acres of pothole wetlands remained. By 1970 less than 1% of Iowa's historic wetlands remained.

Rivers

Even in the late 1800s, Meek noticed and reported impacts to the state's streams and fish communities:

> *The prairie was originally covered with a dense growth of prairie grass and herbaceous plants, which tended to produce a stiff sod. During heavy rains this sod absorbed the water, preventing its direct flow into the rivers, and it reached the latter chiefly by slowly filtering through the soil. The streams were thus relieved from overflow, and were kept from drying up during the summers. I have been informed that many streams, formerly deep and narrow, and abounding in pickerel, bass, and catfishes, have since grown wide and shallow, while the volume of water in them varies greatly in the different seasons, and they are now inhabited only by bullheads, suckers, and a few minnows. The breaking of the native sod for agricultural purposes has especially affected the smaller streams in this respect, while the construction of ditches and the practice of underdraining have had their effects upon the larger ones. Moreover, the constant loosening of the soil, in farming, tends to*

reduce it to that condition in which it is readily transported by the heavy rains to produce muddy currents.

Border Rivers - Engineering began on the Mississippi River starting in 1824. Initially, this consisted mainly of snag removal. An act of Congress in 1907 approved creation of a 6-foot navigation channel from the Missouri River northward to Minneapolis. In 1935, further legislation provided for a 9-foot navigational channel maintained through a system of locks and dams as well as dredging. Navigation locks and dams result in a series of pools within the river, leading to a change in the fish community within the river towards those preferring more slow-moving water. (Harlan et al. 1987).

Engineering along the Missouri River for flood control and navigation drastically altered the river system. Between 1923 and 1976, the Missouri was corralled from a wide, braided, dynamic river to a single narrow channel. The channel area was reduced by 80%, with ~35,000 acres of this reduction being in Iowa. By the 1980s, sport and commercial fisheries along the Missouri had dwindled to a tiny fraction of their former abundance.

Interior Rivers – Because Iowa has productive, and therefore intensively cultivated, soils, the rivers which run through and drain these areas are subjected to large and sometimes sudden fluctuations. Draining heavily cultivated lands also results in silt loads, leading to sedimentation. This has changed the fish community assemblage, especially in lower, more turbid reaches of streams where the remaining species tend to be tolerant of lower water quality.

Additionally, many low-head dams were constructed across the state, usually for milling or water supply uses. By 1870, more than 1000 low-head dams dotted the state's interior rivers, restricting seasonal movement of fish species, as well as mussel species dependent upon their fish-hosts for dispersal.

Wildlife

Iowa's original wildlife populations suffered a similar fate as its native habitats and plant communities. Species that competed with humans for space, or were particularly useful for food or fiber, or required very specific habitats that were eliminated or drastically reduced did not survive. Others of less importance to humans held on in low numbers wherever suitable habitat remained. Those species that could adapt to or favored agricultural environments thrived, at least until agriculture became too pervasive.

By 1900 the large game animals and the predators that lived on them were gone (bison, black bear, bobcats, gray wolves, mountain lions, wapiti, and white-tailed deer). Smaller predators like coyotes and red and gray fox were more adaptable, fed on a wider range of smaller prey animals, and were able to survive in Iowa into the 20th century. Economically important furbearers like river otter and beaver were also essentially gone by 1900.

Wild turkeys, passenger pigeons, prairie chickens and waterfowl all fed occasionally on settler's crops and were considered pests, and all were valuable as table fare or to sell at local and big city markets like Chicago. The spread of railroads into the Midwest in the 1860s and 1870s allowed hunters to reach the best hunting grounds and permitted shipping frozen game to markets in Chicago, Milwaukee and as far as New York City. Game was served as a delicacy in many eastern restaurants in the late 19th century. As city dwellers developed more leisure time in the 1880s, hunting for sport or recreation also became more popular.

The take of game birds was enormous. A single net could capture 1,500 passenger pigeons. Entire flocks of turkeys could be pot shot from the roost on cold winter nights. Hunters could occasionally take 100 or more prairie chickens

in a day (seasonal takes of 900 or more chickens were recorded). Sport hunters were able to take up to 100 ducks in a single day. The best market hunters could take up to 3,000 ducks in a season. One group of 7 hunters shipped 14,000 ducks east in a single year. A careful hunter willing to pick his shots could take a half dozen mallards or 8 or 9 prairie chickens with a single shot. Avid woodcock hunters could take 40 birds a day; one market hunter took up to 3,000 woodcock a year in northeast Iowa. A hunter could easily take several ruffed grouse in a day but apparently few were ever sold at market. A variety of shorebirds – snipe, long-billed and Eskimo curlews, marbled godwits, upland and golden plovers were frequently hunted and at least some sold at market. Whooping and sandhill cranes were also hunted for the table and because they were a pest in grain fields.

But as hunting pressure increased in the 1870s and 1880s, habitat loss was also accelerating. Iowa was becoming settled. Nearly every square mile of land had several farm families living on it. New farmers looked to more ways to create tillable land. Much of the forested land that remained into the 1870s was turned into pasture. Cattle, sheep and hogs destroyed the undergrowth and competed with wildlife for acorns and other native food. A variety of species that so far had been able to withstand the hunting pressure alone began to be affected by the increasing fragmentation and elimination of their habitats. Whatever the reason - unregulated hunting, habitat loss, or more likely a combination of both - much of the wildlife that had existed here for centuries was in severe decline by the late 1870s.

Ever smaller flights of passenger pigeons continued into the mid-1870s, dwindled more into the 1880s and 90s and were gone by 1900. Wild turkeys were gone from northeast Iowa by 1854, from most of central Iowa by the 1870s, and disappeared from southern Iowa by 1910. Ruffed grouse were able to hold on into the 20th century only in the most heavily forested counties of northeast Iowa.

Prairie chickens and bobwhite quail fared somewhat better. Opening the prairies to grain farming provided an alternate winter food supply in grain stubble. More reliable foods allowed their numbers to increase and their range to expand as long as there was enough prairie remaining for nesting and winter cover. Prairie chicken numbers may have peaked in the 1870s. After that prairie chickens and quail began declining as too much prairie was converted to crop fields. Both hung on at lower numbers well into the 20th century.

Waterfowl and shorebirds continued to migrate in large numbers through Iowa until the end of the 19th century. Fewer were produced here as prairies were turned over and wetlands drained, but spectacular migrations from the breeding grounds on the prairies to the north undoubtedly softened the blow of local habitat loss. By the 1890s, however, the loss of wetlands was taking a toll and by 1900 market hunting was a thing of the past. The last Sandhill and Whooping crane nests were found in Hancock County in 1894, the last long-billed curlew nest in 1890, and the last giant Canada goose nest in 1910.

Clearing of forests, conversion of native prairies to farm fields and the draining of wetlands eliminated many species of songbirds, reptiles and amphibians. Most of the loss went unnoticed by settlers, and by the time the first naturalists began studying the flora and fauna of Iowa, much change had already occurred and went unrecorded.

Species	Suspected Extirpated from Iowa
American Bison	1870
Black Bear	1876
Bobcat	About 1900

Carolina Parakeet	1870s
Eskimo Curlew	1901
Giant Canada Goose	1930s
Greater Prairie-chicken	1955
Long-billed Curlew	1890
Mountain Lion	1867
Passenger Pigeon	1896
Sandhill Crane	1894
Trumpeter Swan	1883
Wapiti (Elk)	1871
White-tailed deer	Prior to 1885
Whooping Crane	1894
Wild Turkey	1913
Wolf	Prior to 1910

Laws enacted to protect declining species generally addressed harvest levels but did not provide mechanisms for preventing habitat loss. For most of Iowa's early history harvest activity was totally unregulated. Seasons, bag limits, shooting hours and restrictions on weapons effectively did not exist or were not enforced. Settlers shot game for the table year around as they could find it. Sport and market hunters were active primarily in fall and spring to exploit concentrations of migratory birds. By the 1870s market hunters were building freezers to prolong their ability to market their products. Nesting birds suffered the additional indignity of having their eggs collected for food or by egg collectors, a common hobby in the later 1800s. There seemed to be no need for regulation - the game seemed limitless, far more than anyone could possibly use.

Fish

Since the time of settlement by Europeans in the early to mid-19th century, the natural resources of the state of Iowa have undergone extensive changes. The development of Iowa for the agricultural, industrial, and urban-residential uses that exist today has caused several types of changes to the aquatic resources of Iowa. Extensive agricultural use of the landscape increased the levels of sediment and the turbidity in Iowa's lakes and flowing waters. The straightening of once-meandered stream and river channels reduced both the amount and quality of the habitats available for Iowa's aquatic life. The more rapid movement of water from the altered landscape increased the magnitude of flood flows in Iowa streams and rivers, thus causing erosion of stream banks and lowering (degradation) of the channels of streams and rivers. As part of channel straightening, the natural vegetation bordering stream channels, including trees, was removed. An additional threat to Iowa's native fishes is the introduction of non-native invasive fishes. Such impacts began almost 140 years ago with the intentional introduction of the Common Carp to Iowa waters in the early 1880s. Invasive species continue to be a concern such as the late 20th century arrival of the Bighead Carp and Silver Carp in the state's waters.

The types of aquatic life that inhabit a stream, river, or lake reflect the physical and chemical quality of the aquatic environment. Changes in distributions of Iowa's fishes closely reflect the changes that have occurred over the approximately 180 years of agricultural, industrial, and municipal development in the state. Several fish species that were unable to adapt to the changed aquatic environments have been eliminated from the state's waters. Another group of fishes continues to exist in the state but occur in an increasingly smaller number of areas with some limited to a single stream segment. The status of several species remains poorly-known. The majority of Iowa fishes,

however, appears to have adapted to the changed conditions in the aquatic habitats and continue to thrive in the state.

Freshwater mussels

Mussels were a seemingly inexhaustible resource in Iowa's rivers and streams. Freshwater mussels were collected for use in a variety of industries, but primarily for use in the manufacture of pearl buttons. Use of freshwater mussels for the pearl button industry began in 1891. In three years alone (1912-14), it is estimated that 672 tons of mussels were taken from Iowa's interior rivers (Coker 1919). As Coker (1919) described:

> *"It was the custom of the early shellers, as now, to gather the river-run of mussels and cook out the meats of all, but the shells of only two or three species were saved, while the others were thrown away as worthless. The shellers cooked out the entire lot of mussels in the hope of finding additional pearls and slugs. The shelling and the button industries, therefore, have a history similar to many other American industries in that the pioneers wasted large quantities of good material through lack of knowledge and experience and while secure in the thought that the supply was inexhaustible."*

Shell button factories in Mississippi River towns began with the first big pearl strike on the Iowa reach of the Mississippi in 1889 and the beginning of the pearl button industry in 1891. Between 1898 and 1916 there were 300 professional "clammers" working the Mississippi between Burlington and Clinton, Iowa. However, in response to over- harvesting and pollution, large-scale clamming with dredges was outlawed in Wisconsin in 1915, and by 1946 it was outlawed altogether below Muscatine, Iowa.

It may be the entire historic mussel community in Iowa will remain unknown. What is known is that Iowa's rivers and lakes have changed radically over the last 150 years. The Big Sioux River in northwest Iowa was once known as the "Silvery Sioux" for its clear water flowing over a gravel bottom. Iowa's rivers today have been altered by channelization and levees that isolate them from their floodplains, sediment accumulation from uplands and incised banks covering their historic gravel beds, nutrient enrichment leading to low oxygen levels, higher high flows due to drainage in their watersheds, lower summer flows due to lowered water tables, dams that obstruct fish passage and a host of other factors related to fish and mussel habitat.

Change Continues in the 20th Century

In less than a century the landscape of Iowa was changed more by settlement than that of any other state. In 1900, most of Iowa's 2 million residents lived on small, nearly self-sufficient farms of 100 acres or less. They subsisted on corn, wheat, oats, hay and a variety of livestock. Iowa had been converted from a seemingly limitless prairie-forest-wetland mosaic into a domesticated landscape of small farms, grain fields and pastures. There were still undrained sloughs and wet pastures on many farms and tracts of prairie could still be found to remind farmers of vintage Iowa, but these native areas were scattered and becoming ever smaller. In the early 20th century they were still looked on as waste areas needing conversion to a more productive use. Most of Iowa's native wildlife was either gone or reduced to such low numbers that rabbits, squirrels, quail and the occasional prairie chicken were the only game animals available to most hunters.

The changes in Iowa's landscape in the 20th century were less dramatic but in some ways more devastating. Wildlife and its habitats were impacted by constant improvements in farming technology and the effects of government agricultural policy on farmers' decisions about how their land would be used.

Improved farming technology

Change was slow at first. Much of northern Iowa was too wet to permit iron-wheeled tractors to function so gasoline-powered equipment did not replace horses on a large scale until rubber balloon tires became available in the late 1930s. Hybrid seed corn was introduced in the 1930s to improve yields; for the first time more crop could consistently be raised than was needed for use on the farm. Farming ever so gradually became less a way of life and more of a business.

Industrial technology developed during World War II rapidly accelerated the pace of change. By mid-century mechanical planters, harvesters (hay balers, corn pickers and grain combines) and grain handling equipment were reducing the need for hand labor. Repeated field cultivation for weed control was the norm, but control in cultivated fields was a constant and frequently unsuccessful battle for farmers. Inefficient harvesting equipment often left a substantial part of the crop in the field.

Labor saving devices permitted farmers to handle ever-larger farming operations. In the 1950s the average northern Iowa farm had grown to 250 acres but was still a diverse operation of livestock, small grains, hay and corn. Foxtail-choked cornfields with plenty of waste grain were a pheasant hunter's delight and a source of food and cover for a variety of other game and nongame wildlife.

The last half of the century brought even more change. Modern tiling machines could mechanically dig and insert underground perforated field tiles to drain even the wettest areas. The use of agricultural chemicals – herbicides, pesticides, and fertilizers – became the norm and weeds and insects were, if not conquered, at least minimized as a threat to crop yields. The first pesticides were organochlorines -DDT and its derivatives- that had devastating long-term effects on bird populations that led to the ban on their use in the 1970s. Soybeans were introduced as a cash crop and genetically modified crops with built-in pesticide resistance were developed. Livestock operations shifted from on-the-farm to confinement operations and the need for extensive livestock forage (hay and small grains) was reduced. Crop rotations eventually were simplified to continuous corn or soybeans or corn-soybean rotations over most of the state. Planting and harvesting equipment and the tractors to pull them became ever larger. Modern grain combines became so efficient that little waste grain or crop residue was left in the fields for wildlife food or cover.

By 2000, the average farm had increased to more than 340 acres (see **Figure 2- 2**). The number of farms in Iowa decreased from 203,000 in 1950 to just 93,000 in 2007 (USDA and Census Bureau - Census of Agriculture). Nearly every rural county in Iowa is experiencing a continuous outmigration, primarily by young people seeking jobs no longer available as farm size and mechanization has increased. Iowa is trending toward a more urban populace. By 2010, the population of Iowa was 64% urban, up from 25.6% in 1900, and 57% in 1970 (US Census Bureau). In 2010, Iowa's population was about 3 million.

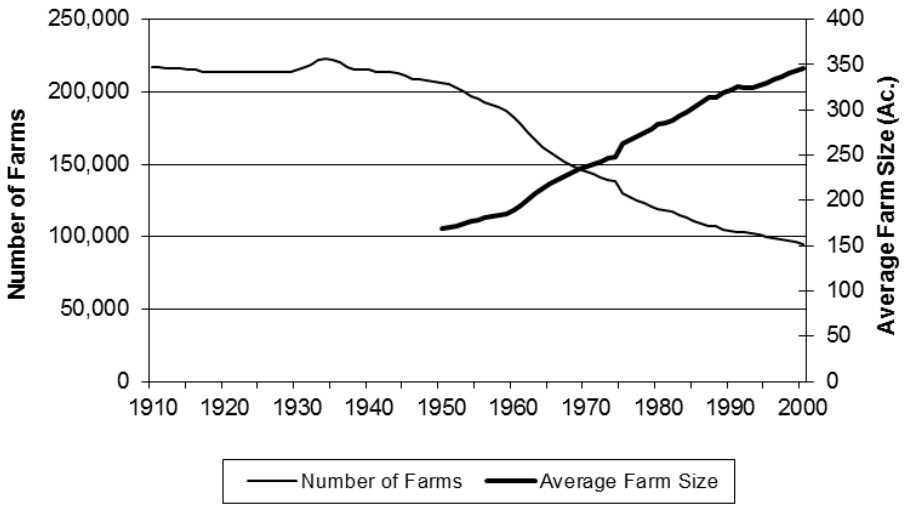


Figure 2- 2. Trends in number and average size of Iowa farms.

USDA farm policies

Government farm policy also played a role in accelerating these changes. Congress passed the first of several programs to retire crop land and spur agricultural income in the depth of the depression in the 1930s. Farm policy shifted to all-out production during World War II. By the mid-1950s farm prices were again depressed and a second, 10-year land retirement program (the Soil Bank) was implemented. Pheasants, bobolinks and other grassland birds responded to the increased habitat until the program ended in 1965.

For the next 20 years USDA required farmers to set aside up to 10 percent of their crop land in order to participate in subsidy programs. These set-aside acres were rotated annually and never developed permanent wildlife cover. Their value to wildlife was limited - some biologists claimed they had a net negative affect on pheasants and other ground-nesting birds because set-aside acres had to be mowed for weed control just at the time birds were nesting.

In the early 1970s grain export quotas were removed to open up international markets. Row crops in Iowa grew by more than 3 million acres at the expense of hay and pasture (**Figure 2- 3**), most in the southern third of Iowa. The distribution of the ring-necked pheasant nearly reversed itself as a result. The new croplands in southern Iowa allowed pheasants to flourish where the bobwhite quail had been the dominant game bird. The added pressure to raise row crops eliminated most of the remaining wildlife habitat in northern Iowa, however, and pheasant populations there plummeted.

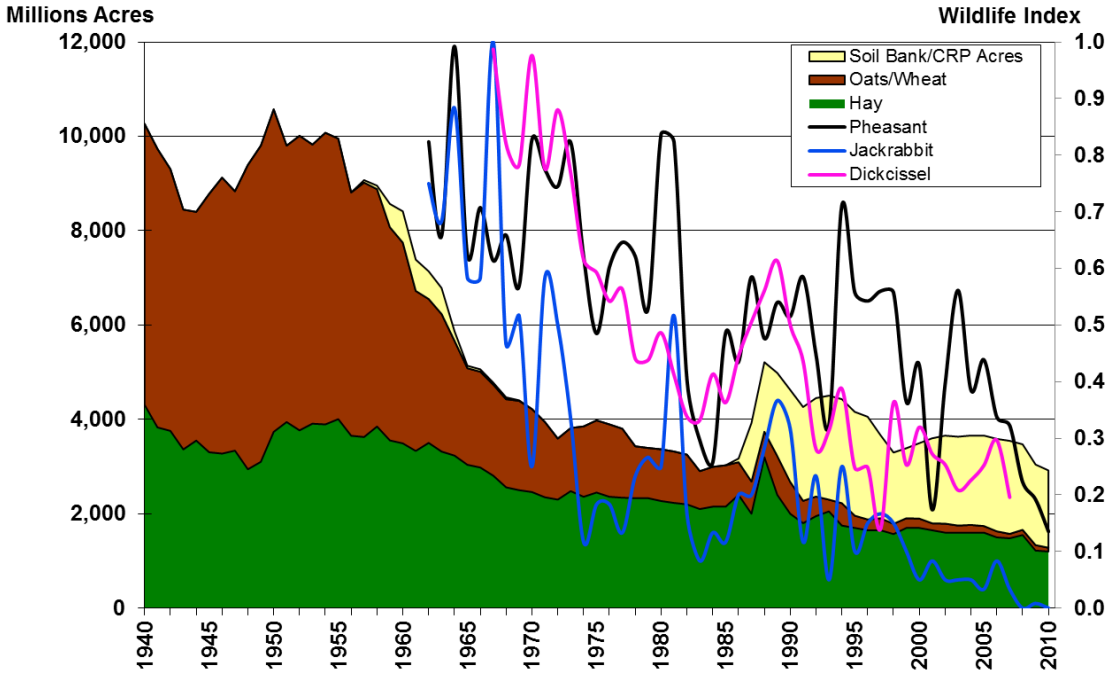


Figure 2- 3. Changes in Cropping Patterns and Representative Grassland Wildlife.

The increased row crop acreage also put added pressure on Iowa's remnant forests. Pasture that was converted to row crops had to be replaced, so bulldozing timber to create new pasture became a popular practice. Iowa's forestlands hit their all-time low - 1.5 million acres - during the US Forest Service's 1974 inventory of forestlands.

In the midst of another farm economic crisis in the 1980s a third 10-year land retirement program – the Conservation Reserve Program (CRP) – was introduced to supplement farm income. CRP fields were mostly planted to cool season grasses like smooth brome that provided valuable nesting cover for grassland wildlife. Iowa's pheasant populations and harvest, both in the midst of a 20-year decline, rebounded quickly (**Figure 2- 4**). In northern Iowa, pheasant numbers increased wherever CRP fields were planted and increases were also recorded in the southern half of the state. But, as the initial 10-year contracts matured, the benefits to game birds in southern Iowa declined. Brome developed a thick sod and annual weeds (important foods for birds) were eliminated. Southern Iowa counties that had the maximum of 25 percent of their cropland enrolled in CRP saw declines in pheasants and quail.

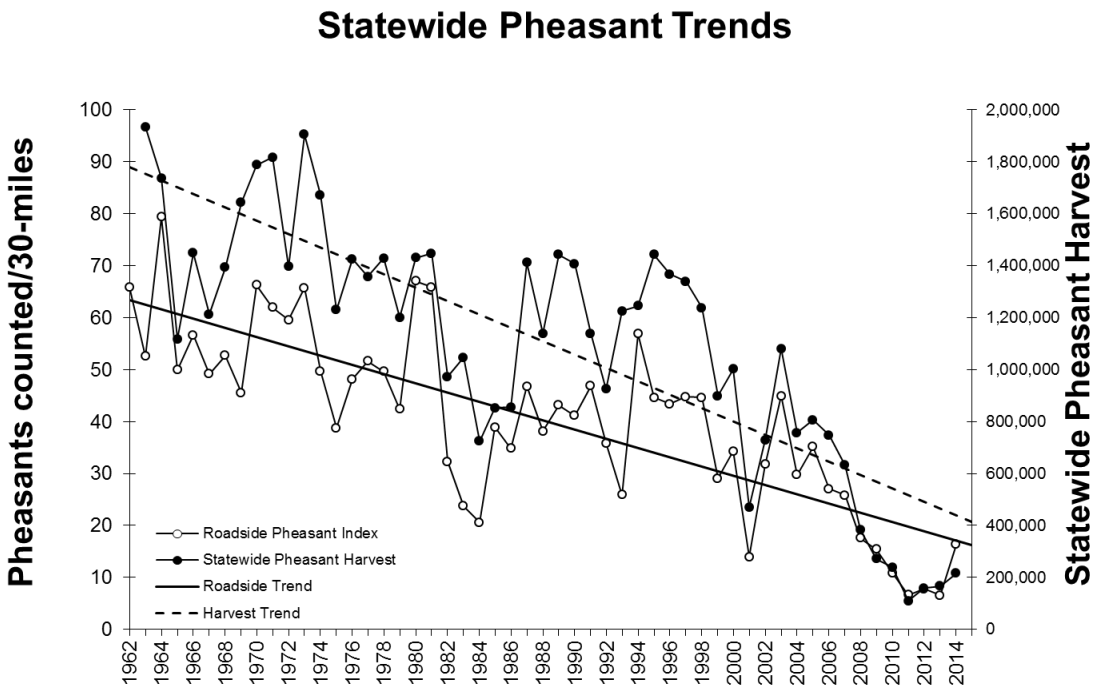


Figure 2- 4. Mean number of pheasants counted in 30-mile August roadside survey routes, statewide, 1962-2014, compared to statewide pheasant harvest.

DNR-sponsored research would eventually find that some nongame birds like Henslow's sparrows that nested in mature grasslands would respond to the habitat provided by older CRP fields. Small mammals and the avian and mammalian predators that fed on them would increase also. The return of the bobcat to Iowa is at least partly explained by the prey provided in CRP fields.

CRP acreages in whole fields peaked at 2.2 million acres, but modifications in the late 1990s and early 21st century reduced whole-field enrollments to 694,000 acres by 2014. Originally the program was capped at nearly 40 million acres nationwide, but by 2017 the cap will be 22.5 million acres. Recent farm bills have included a number of permanent and short-term programs designed to provide soil and wildlife conservation benefits as well as subsidize the production of commodity crops. The Continuous CRP (buffer strips), Wetland Reserve Program (WRP), Wildlife Habitat Incentive Program (WHIP), Farmed Wetland Program (FWP) and others have been beneficial, but most have been implemented on smaller parcels than the original CRP fields. Potential problems with habitat fragmentation, connectivity between habitat blocks and their value to area-sensitive species is not well understood. These programs change with different iterations of the farm bill. As a result, conservation agencies must be aware of changes and be flexible in order to ensure that wildlife benefit from these programs.

Summary

The result of this improved technology and the flurry of often-conflicting farm legislation has been a gradual and long-term decline in wildlife habitat on private agricultural lands and a decline in rural communities. Farm operations have shifted from diversified agriculture to corn and soybean monocultures. Between 1900 and 2014 row crop acreages increased from 9.1 million acres to 23.4 million acres. Hay and small grain acreage decreased from 6.8 million acres to a current 1.2 million acres (NASS, 2015). Larger farms and field sizes have eliminated fencerows, windbreaks, waterways and other on-farm habitat. The nearly exclusive use of farm chemicals for weed and insect control has eliminated food and cover for songbirds and other wildlife. Conservation practices subsidized by various

titles of recent farm legislation have helped slow this trend, but the funding available to implement them has never equaled the amount USDA has spent subsidizing commodity crops that encourages increased production.

The impact on of these trends on wildlife that utilize agricultural lands has been slowly devastating and is the subject of much of the remainder of this Plan. The loss of grasslands to row crop agriculture has resulted in substantial declines most native grassland wildlife, e.g., dickcissels and white-tailed jackrabbits (**Figure 2- 2**). Even the popular ring-necked pheasant, until recently the state's most well-known game animal (**Figure 2- 3**) is in the midst of a 50-year decline in numbers. Other examples can be found in *Trends in Iowa Wildlife Populations and Harvest* (2013 and earlier years) published by DNR and available for download on the DNR website.

These landscape changes have impacted aquatic wildlife as well, although they are not as well documented. Advertisements to attract settlers to Iowa in the 1850s stressed the vast acreages of fertile soils, abundant wildlife and sparking clean waters teeming with game fish.

By the early 20th century, however, conservationists Aldo Leopold and Jay N. "Ding" Darling were decrying the excessive erosion of soils that had been denuded of their vegetative cover and the excessive siltation of Iowa's waters that resulted. Loss of vegetative cover, excessive grazing, channelization of streams, and shoreline alterations led to accelerated siltation and the transport of pesticides and fertilizers into aquatic systems from agricultural fields. Heavy silt loads altered water turbidity and temperature regimes. Streambed degradation and the loss of submersed and emergent plants frequently followed. As the silt settles it can cover existing bottom substrates and alter the entire natural community.

All of these alterations to native habitats, aquatic plant communities and wildlife increase the opportunities for invasive exotic species to supplant native wildlife. Alien species like carp further increased water turbidity and in many cases made smaller water bodies unsuitable for native fish.

Wildlife Conservation

Wildlife Restoration

Not all wildlife trends of the past half-century have been negative. The creation of the Iowa State Conservation Commission (now the Iowa Department of Natural Resources or DNR) in 1935, the gradual development of wildlife science and management as professions after World War II, and the formation of DNR's Wildlife Diversity Program in 1981 have returned a portion of Iowa's native wildlife to the state. White-tailed deer, wild turkeys and giant Canada geese are now more abundant than at any time since the late 1800s. Other restoration programs have returned prairie chickens to southern Iowa, river otters to the state's streams, and peregrine falcons, ospreys and trumpeter swans nest again in Iowa. Bald eagles, bobcats and Sandhill cranes have reappeared as a result of successful conservation programs here and elsewhere. Details of these and other wildlife restoration programs are explained in *Trends in Iowa Wildlife Populations and Harvest - 2013.*

Land acquisition

DNR has also pursued land acquisition programs to permanently protect and enhance wildlife habitat. Since 1972 Iowa waterfowlers have been required to purchase an Iowa Migratory Game Bird Stamp in addition to the Federal Migratory Bird Hunting and Conservation Stamp ("Duck Stamp"). Since 1979 all hunters have been required to purchase an Iowa Habitat Stamp along with their hunting license. Proceeds from these stamps are dedicated to

habitat protection and management. Funds from the State Habitat Stamp are shared equally with Iowa's 99 County Conservation Boards.

DNR has doggedly sought funds for habitat protection through the North American Waterfowl Management Plan, the North American Wetlands Conservation Act, State Wildlife Grants, the Environmental Protection Agency, Iowa County Conservation Boards and others. DNR also partners with a number of NGOs to extend the reach of state and Federal funds. The Iowa Natural Heritage Foundation, Ducks Unlimited, Pheasants Forever, the National Wild Turkey Federation, and The Nature Conservancy have been major cooperators with DNR's habitat protection programs. Numerous other NGO's and individual private contributors have helped as well.

In spite of the aggressive efforts to protect wildlife habitat, Iowa remains one of the states with the highest proportion of privately held land (Map 2- 3). In 2004 as the IWAP was first being developed, public conservation lands accounted for just over 600,000 acres, or just 1.7% of the land area of the state (Iowa GAP). In 2015, public conservation lands are estimated at 895,924, or 2.48% of land area of the state. Some of this increase is due to land protection over the last decade. However, most of the increase is attributable to an improved estimate due to technological improvements which allow for increased data sharing between cities, counties, state, and federal entities.

The DNR owns nearly half of the public conservation lands (371,578 acres), including wildlife management areas, state parks, and state forests. Federal land ownership accounts for 269,818 acres (0.75% of Iowa's land area). Primary federal land management agencies in Iowa include the Army Corps of Engineers, with 34,895 acres in four flood control reservoirs, and US Fish and Wildlife Service with its 5 national wildlife refuges in the State. DNR has land management agreements on portions of the reservoirs but little control over water levels. County Conservation Boards own 168,339 acres. (This accounting does not include the Road Rights of Way owned and managed by the US or Iowa Departments of Transportation.)

Unlike most other states across the Midwest and West, Iowa does not have a significant presence of lands owned by the US Forest Service, Bureau of Land Management, or the National Park Service (**Table 2- 5**). Therefore, unlike other states which have significantly higher federal land bases, a relatively high proportion of Iowa's habitat base is managed by the Iowa DNR, County Conservation Boards, and of course, private landowners.

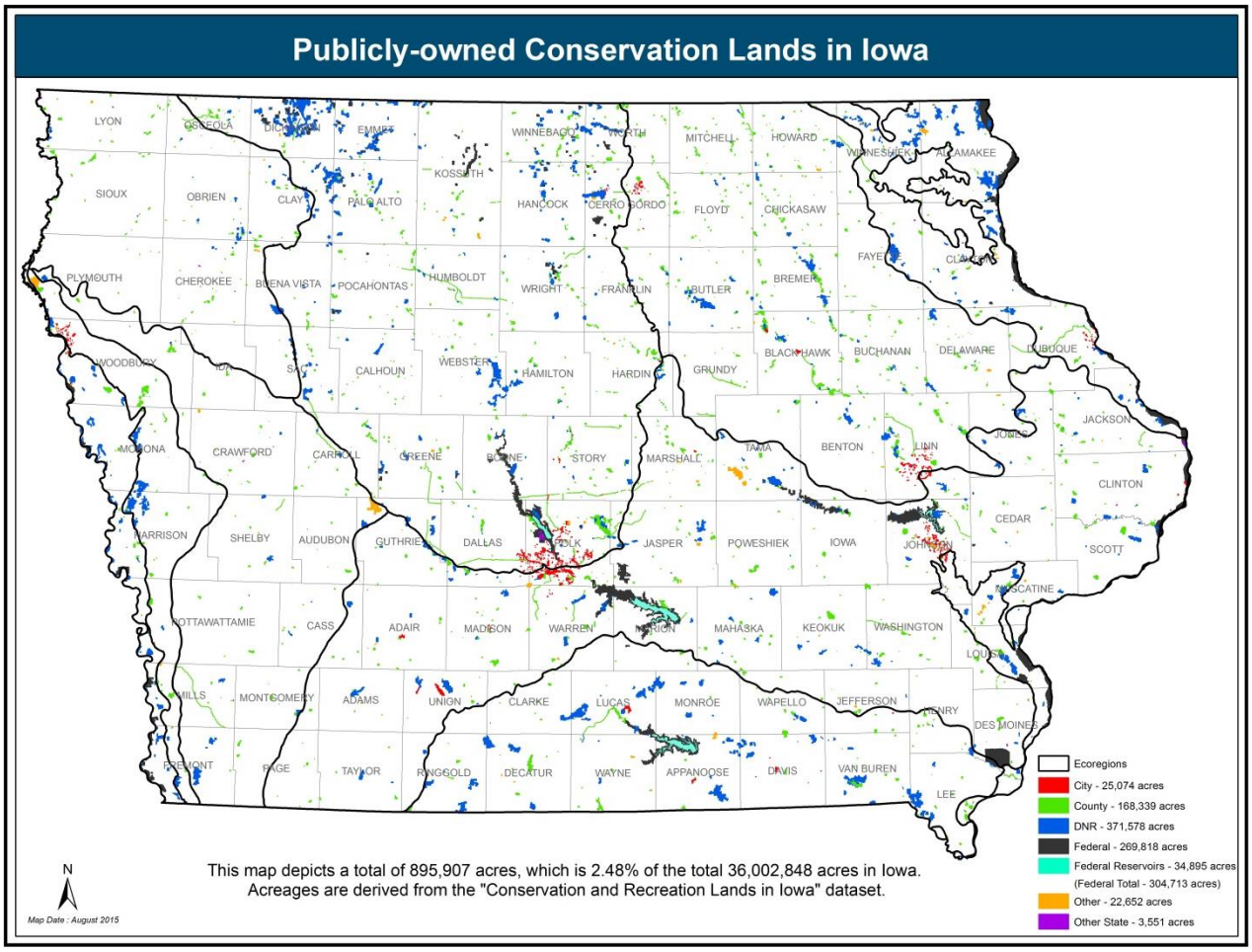
Table 2- 5. Estimates of federal land area for eight Midwest states.
From USDA National Resources Inventory, 2010 Summary Report.

State	Total Surface Area (acres)	Federal Land	Proportion Federal
Iowa	36,016,500	172,400	0.48%
Illinois	36,058,700	491,100	1.36%
Missouri	44,613,900	1,919,400	4.30%
Kansas	52,660,800	504,000	0.96%
Nebraska	49,509,600	647,600	1.31%
South Dakota	49,358,000	3,112,200	6.31%
Minnesota	54,009,900	3,336,100	6.18%
Wisconsin	35,920,000	1,845,300	5.14%

Habitat on private lands

Wildlife habitat on private lands has also received attention from DNR programs. Farm Game Habitat crews roamed the state in the 1950s and 1960s helping landowners establish habitat on their property. In 1971 the number of DNR wildlife management biologists was doubled and they were housed in USDA farm service center offices to promote contacts with private landowners. In the 1980s farmstead shelterbelts and switchgrass cost-sharing programs were introduced to promote these practices on private land. For the past 20 years DNR biologists have actively promoted USDA farm bill practices (e.g. CRP, WRP) that provide landowners funds to assist with developing wildlife habitat.

Map 2- 3. Publicly-owned Conservation Lands in Iowa



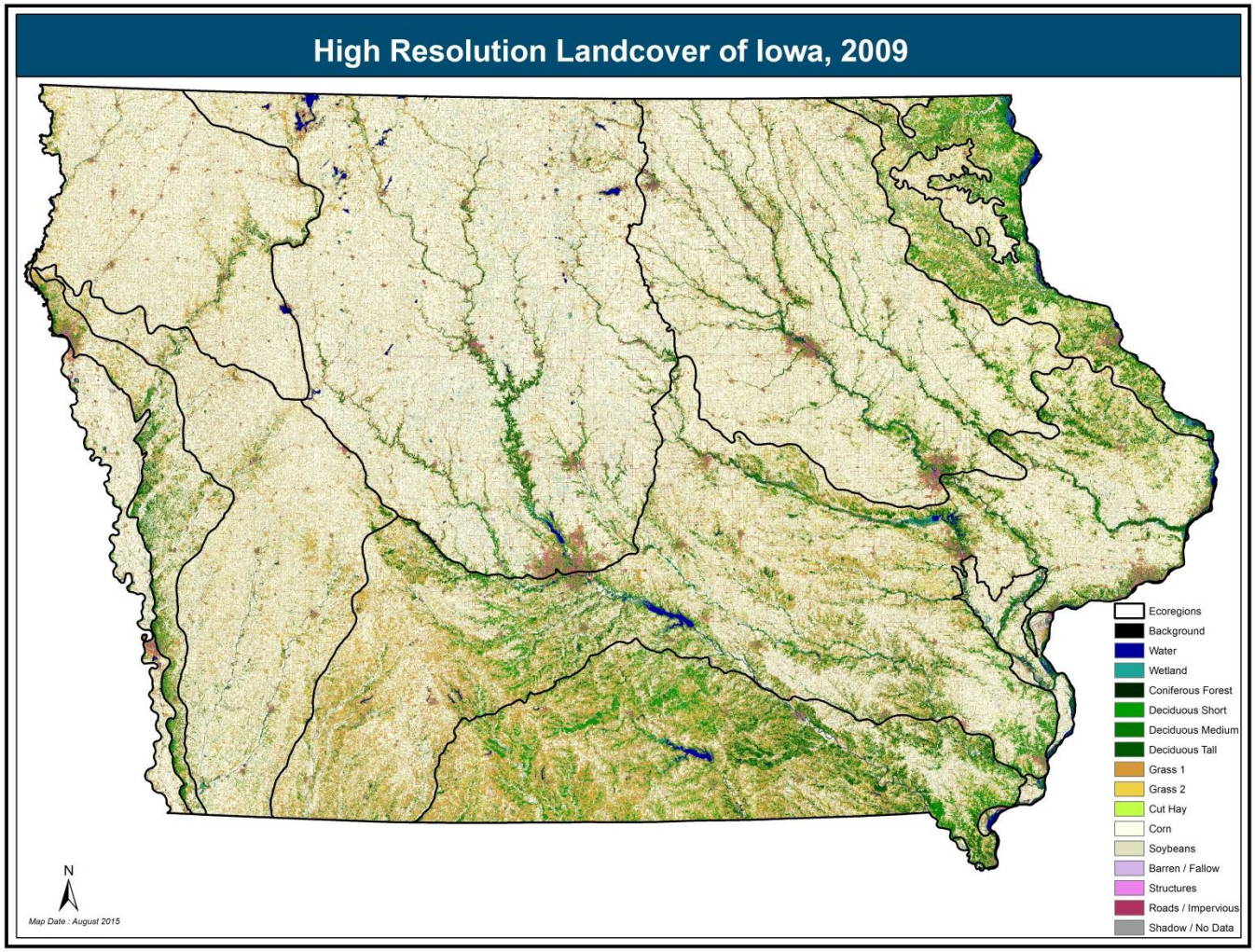
The Wildlife Bureau's Private Lands Program was formed in 2002 to take better advantage of wildlife-friendly USDA farm programs and other Federal grants like the Landowner Incentive Program (LIP) or Wildlife Habitat Incentive Program (WHIP). Now in its 15th year, the Private Lands Program is successful in Iowa because of its many partnerships including Natural Resources Conservation Service, Farm Service Agency, Pheasants Forever, Fish and Wildlife Service, AmeriCorps, Local Soil and Water Conservation Districts, and most importantly, Iowa's landowners. The Program uses this Plan as strategic guidance, working with any interested landowners but also trying to direct staff and resources to highest priority wildlife conservation issues. Program specialists work with hundreds of landowners annually, providing technical assistance and ensuring that farm bill programs provide benefits to wildlife populations. Recommendations for wildlife habitat improvements have been developed for over 500,000 acres.

Iowa's Natural Communities Today

The result of a century and a half of change as a result of human intervention on Iowa's landscape has been a shift in the composition of Iowa's plant communities and the wildlife that inhabits them. Few undisturbed natural plant or wildlife communities exist today. Approximately 0.2% of Iowa's native prairies (47,000 acres including remnant, restored and reconstructed prairies), 5% of its wetlands (255,000 acres of wetlands estimate in 2009 HRLC), and 37% of its forests (2,477,000 acres) remain.

Map 2-4 shows the land cover in Iowa in the year 2009. The majority of the state is covered with row crop, primarily corn and soybeans. Most of the remainder of the state is in grassland, often conservation reserve, road ditches or pasture, with lesser acreages of timber and other habitat types. More details on the current status of Iowa's wildlife are provided in Chapter 3, and the status of wildlife habitats in Chapter 4.

Map 2- 4. Landcover of Iowa in 2009
(DNR High Resolution Land Cover)



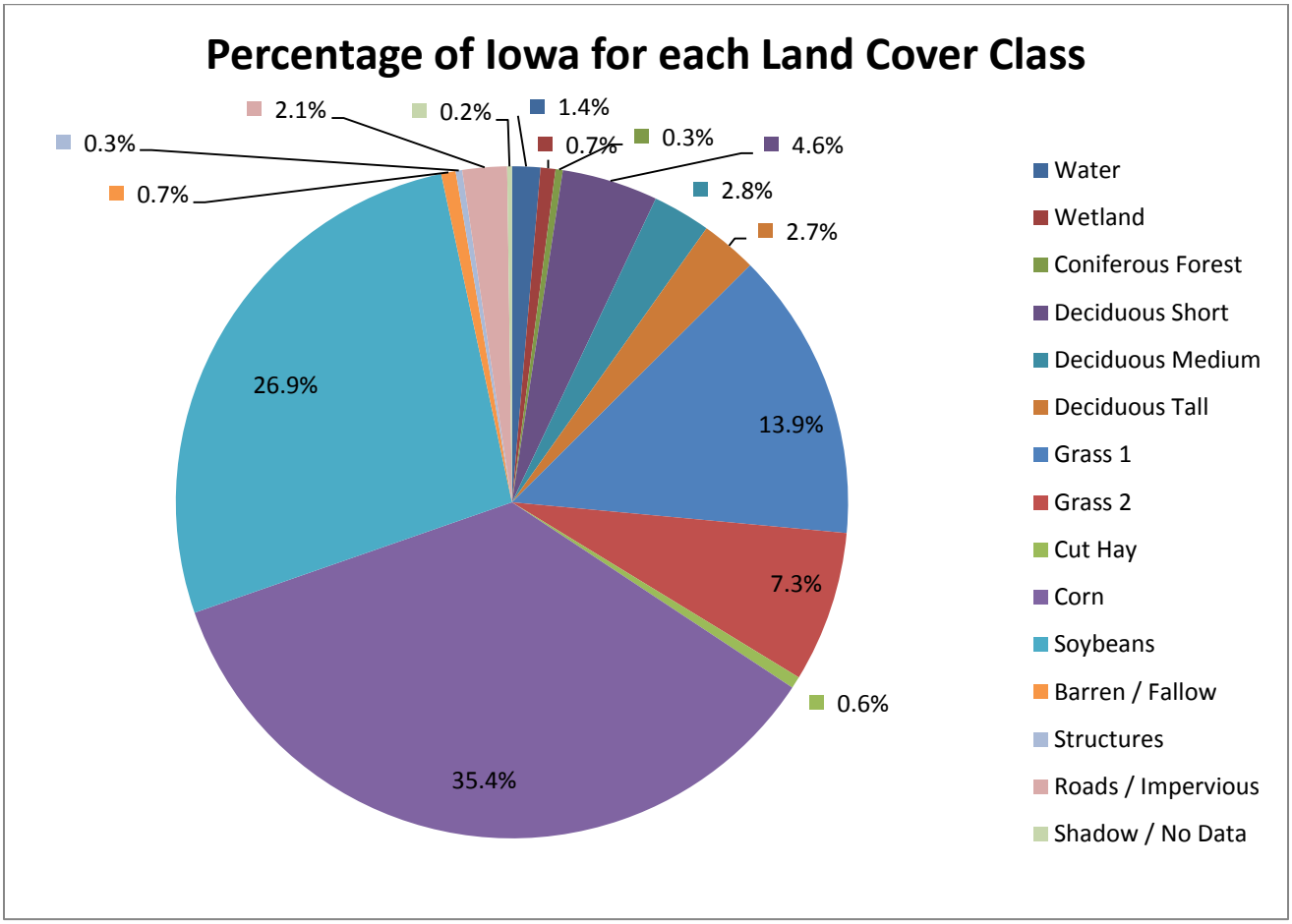


Figure 2- 5. Percentage of Iowa's total acreage for each Land Cover Class. From 2009 High Resolution Land Cover dataset.

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Chapter Three

Iowa Fish and Wildlife and Species of Greatest Conservation Need

Required Element #1: "Information on the distribution and abundance of species of wildlife, including low and declining populations as the state fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the state's wildlife."

Species Included in the Iowa Wildlife Action Plan

The DNR is the sole agency given the responsibility to manage Iowa's fish and wildlife resources, preserve their habitats (Code of Iowa, Chapter 455A), and establish and protect state-listed endangered or threatened species (chapter 481B.4 and Iowa Administrative Code Chapter 571-77(481B)). Iowa law defines *wildlife* as any species of wild mammal, fish, bird, reptile or amphibian (Code of Iowa sections 456.24, 481A.1, 481A.38, 481A.39, 481A.48). In addition to taxonomic groups designated as *wildlife* in Iowa law, this Plan is intended to guide conservation of all Iowa's native fauna for which an adequate level of information is available to assess the conservation status and needs. In the first version of the Plan, butterflies, land snails and fresh water mussels were included, because these invertebrates are listed on the state's endangered and threatened species list. Dragonflies and damselflies were added when significant data were found that listed the distribution and status of species in these groups. For the 2015 version, consideration was given to adding crayfish. A total of 1,115 species were evaluated by subcommittees. Subcommittees considered all species which have been documented in Iowa, including some species which may be vagrant, expanding their range, have been introduced, or have already been extirpated (Table 3- 1).

Determining the Species of Greatest Conservation Need

Taxonomic subcommittees of the IWAP Wildlife Working Group evaluated the status of all species considered for their focal group. The same status assessment criteria were used for all species which are native to Iowa, not already extirpated from the state, not vagrant or accidental in their occurrence within Iowa, and for which there is adequate information to assess conservation status. Until the implementation of the Wildlife Action Plan, Iowa had long lacked a systematic survey to document the distribution and abundance of most wildlife species. Therefore, varying amounts of information were available for subcommittee members to use when assessing taxonomic groups, as a whole, as well as individual species.

Table 3- 1. Number of species evaluated by the IWAP

IWAP taxonomic subcommittees evaluated all species with validated occurrence records for Iowa (includes vagrant species, exotic/introduced species, and those which are now presumed extirpated).

Taxonomic Class	Species	List location
Amphibians	22	Appendix 3
Reptiles	46	Appendix 4
Breeding birds	201	Appendix 5
Non-breeding birds [1]	204	Appendix 6
All birds	*405*	
Butterflies	123	Appendix 7
Crayfish	8	Appendix 8

Taxonomic Class	Species	List location
Dragonflies and Damselflies	114	Appendix 9
Fish	155	Appendix 10
Mammals	83	Appendix 11
Mussels	52	Appendix 12
Terrestrial snails	96	Appendix 13
Total species evaluated	**1,104**	

[1] Species that do not nest in Iowa but migrate through the state

Development of Species Conservation Status Assessment Criteria

We utilized 8 criteria to assess the conservation status of all native, extant Iowa wildlife species. An ad hoc working group of the Wildlife Working Group considered a variety of conservation status assessment schemes, from the published literature, before ultimately developing a set of criteria that could reasonably be utilized by each taxonomic subcommittee for assessing wildlife in Iowa. These included a species assessment methodology described by Partners in Flight as well as NatureServe's ranking system.

The system described in the PIF Handbook on Species Assessment (Panjabi et al. 2012) ranks each species of North American breeding bird based upon seven measures of conservation status:

1. *Population Size* (PS) indicates vulnerability due to the total number of adult individuals in the global population.
2. *Breeding Distribution* (BD) indicates vulnerability due to the geographic extent of a species' breeding range on a global scale.
3. *Non-breeding Distribution* (ND) indicates vulnerability due to the geographic extent of a species' non-breeding range on a global scale.
4. *Threats to Breeding* (TB) indicates vulnerability due to the effects of *current and probable future* extrinsic conditions that threaten the ability of populations to survive and successfully reproduce in breeding areas within North America.
5. *Threats to Non-breeding* (TN) indicates vulnerability due to the effects of *current and probable future* extrinsic conditions that threaten the ability of North American breeding populations to survive over the non-breeding season.
6. *Population Trend* (PT) indicates vulnerability due to the direction and magnitude of changes in population size within North America since the mid-1960s.

NatureServe's Ranking System (Faber-Langendoen et al. 2012), which is used by some state Natural Heritage Programs, also served as the basis for the approach used for this assessment. NatureServe does not independently create the State Ranks (S Ranks) that are listed in the previous version of the IWAP or on NatureServe Explorer. Rather, NatureServe coordinates a network of State Natural Heritage Programs who submit their ranks periodically. NatureServe has more recently moved to the use of a "rank calculator," which incorporates several factors. These are just starting to be used by the states, so looking up S Ranks on NatureServe Explorer http://www.natureserve.org/explorer/ won't necessarily yield results that reflect use of this calculator. Over time S Ranks will be increasingly based upon the use of the rank calculator. Factors included in NatureServe's Ranking System include:

Rarity:

1. Range Extent – defined as the area contained within an imaginary boundary encompassing all known, inferred, or projected sites of present occurrence of a taxon, excluding vagrancy.
2. Area of Occupancy – area within its "extent of occurrence" which is occupied by a taxon, excluding vagrancy.
3. Population – estimated current total of the species within the area of interest (IA)
4. Number of Occurrences – each occurrence is an area of land or water in which a species is or was present
5. Number of Occurrences or % Area with Good Viability – if current conditions prevail, the occurrence is likely to persist for the foreseeable future in its current condition or better
6. Environmental Specificity – degree to which a species depends upon a relatively scarce set of habitats, substrates, food types, or other biotic/abiotic factors within its overall range (this is to be used mostly when the # of occurrences, range extent or area of occupancy are largely unknown)

Trends:

1. Long-term Trend - degree of change over ~200 years (for area of interest) in population size, range extent, # of occurrences, and/or % area with good viability.
2. Short-term Trend – same as above, for 10 years or 3 generations, whichever is longer.

Threats:

1. Threats – incorporates information on severity, scope, impact and timing
2. Intrinsic Vulnerability – to be used when threats unknown

After discussing these assessment systems, the working group decided on 8 criteria that would be used to assess the species included in Iowa's Wildlife Action Plan (See Appendix 16 for a detailed description of the ranks associated with each of the following 8 criteria):

1. Global Range Extent (all other criteria are for Iowa only)
2. Area of Occupancy
3. Long-term Trend
4. Short-term Trend
5. Ecological Specialization (Population Concentration)
6. Dietary Specialization
7. General Ecological Specialization
8. Threat Not Addressed Above

The Scoring Process

The Wildlife Working Group developed a scoring process in which each criterion was weighted according to our understanding of the relative contribution of each factor to a species' overall conservation status. The theoretical potential score for an individual species ranges from 0 - 3.75. Calculated scores ranged from 0.57 (for the Slippershell mussel, which has not been observed in Iowa since 1984) to 3.75 (for several species of low conservation concern that have been expanding their range within Iowa). The cutoff value for SGCN designation was set at $\leq$3.0 (a species score of 3.0 or lower gave a species SGCN status). See Appendix 16 for a detailed explanation of the criteria.

The value of 3.0 (of a possible 3.75) was based on an understanding of how the individual criteria work and the mean species scores (2.96). Not all criteria were expected or intended to have normal distributions. For example, the *Range Extent* criterion exists to significantly reduce the score for the small number of Iowa species which have a global range of less than 40,000 square miles. This is because threats within the Iowa portion of a species' range, with a small overall range, pose greater risk to the species as a whole. Very few species scored a three or lower for this criterion.

Similarly, the *Ecological Specialization - Population Concentration* criterion is intended to highlight those species that aggregate at a small number of locations, and therefore could be at risk of extirpation given one disastrous event during the time period when the population is aggregated. This criterion was not relevant for most Iowa species. Rather, it served to reduce the scores for a small number of species which face this high-risk situation, regardless of their current trend and distribution. Thus, a hypothetical example of an 'average' SGCN species would have a restricted geographic range, occupy only a portion of its former range, be suffering moderate long- and short-term population declines, and be specialized with respect to population concentration, diet, or some other factor. Species with 2 or more fields that are unknown went into a separate "Data Deficient" (DD) category of species - for which information needs are high. These species will be SGCN-DD until such time as there is adequate information to allow assessment of their conservation status. If a species has been extirpated from the state, it was also put into a separate category for further discussion. Examples include the Starhead Topminnow and the Pondmussel. This SGCN-E category was created because some extirpated species are better candidates for conservation efforts than others, depending on whether Iowa remains an important part of their range and whether their conservation status in other areas is stable.

A variety of data resources were utilized by taxonomic subcommittees as they considered which species should be listed as Species of Greatest Conservation Need. In general, the following types of resources were used (see *Specific Resources section at the end of this chapter for a detailed list of resources):*

- Published historic and scientific literature;
- Unpublished reports, scientific surveys and databases maintained by the DNR fisheries, wildlife and water quality bureaus (e.g., Natural Areas Inventory, Multiple Species Inventory and Monitoring Program, Statewide Mussel Survey, Iowa Fish Atlas);
- Personal research and survey data supplied by wildlife ecologists at Iowa educational institutions;
- Museum and personal specimen collections;
- State and regional databases maintained by other conservation organizations (e.g. NatureServe, Partners In Flight, Partners for Amphibian and Reptile Conservation, US Fish and Wildlife Service, US Geological Survey, Iowa Ornithologist's Union, Iowa Audubon, etc.);
- Personal expertise of working group members and consultants.

Table 3- 2. Proportion of Iowa Species Designated as SGCN.

Taxonomic Group	2012	2015			
	# of SGCN in 2012	# of SGCN in 2015	# Species Evaluated (Valid Iowa Records)	# of Species Assessed (Native Species)	% SGCN of Species Assessed
Amphibians	9	16	22	22	73%
Reptiles	23	40	46	46	87%
Birds – Breeding	67	78	201	195	40%
Birds – Non-breeding	18	34	204	113	30%
Butterflies	38	51	123	109	47%
Crayfish*	N/A	7	8	7	N/A
Dragonflies & Damselflies	28	30	114	106	28%
Fish	74	79	155	146	54%
Mammals	19	22	83	57	39%

Taxonomic Group	2012	2015			
	# of SGCN in 2012	# of SGCN in 2015	# Species Evaluated (Valid Iowa Records)	# of Species Assessed (Native Species)	% SGCN of Species Assessed
Mussels	29	43	52	46	93%
Terrestrial Snails*	8	5	96	5	N/A
Total	**313**	**405**	**1104**	**853**	

*The entire groups of native Terrestrial Snails and Crayfish were not assessed for SGCN status due to lack of sufficient information.

The status assessment process resulted in lists of SCGN for each taxonomic group included in the Plan. These lists are displayed in Table 3-3 through 3-13.

Future Changes to List of SGCN

As research and monitoring progress, Iowa may find that the conservation status scores assigned to each species during the 2015 Comprehensive Review and Revision have changed. Also, Iowa may be able to complete the status assessment for species that were rated Data Deficient in 2015. This section outlines the process that would be undertaken to evaluate changes to the list of SGCN within taxonomic groups already included in the Plan prior to the next Comprehensive Review and Revision, scheduled for 2025.

Step 1: Taxonomic Subcommittee Completes Status Assessment

The taxonomic subcommittee for the relevant taxon would use the approved criteria to re-do the Species Status Assessment for the species in question (see Appendix 16).

Step 2: Wildlife Working Group Review and Notification to Fish and Wildlife Service

Once the Species Status Assessment process is completed, the results will be reviewed for approval by the Wildlife Working Group. If approved by the Wildlife Working Group, then the potential changes to the list of SGCN would be compiled for submittal to the US Fish and Wildlife Service (USFWS). The Director of DNR would send a letter of intent to make minor revisions to the Plan to the USFWS Region 3 Coordinator of Wildlife and Sportfish Restoration (WSFR) Programs.

Step 3: Public Review and Submittal of Changes to Fish and Wildlife Service

Once the USFWS has been informed of Iowa's intent to complete a minor revision to the Plan, the list of species to be added to the SGCN category will be made available for public review and comment. After public input is considered and integrated, then the proposed changes to the list of SGCN will be submitted to the USFWS for review and approval.

Evaluation of Additional Taxonomic Groups

As additional information about Iowa wildlife becomes available through biological surveys and research, Iowa may consider evaluating other taxonomic groups for inclusion in the Plan. This section outlines the process that would be undertaken to evaluate any potential additional taxa prior to the Plan's next Comprehensive Review and Revision, scheduled for 2025.

Step 1: Completion of Nomination Form by Sponsor

The evaluation process begins when an interested party (hereafter, "sponsor") submits a form to the Wildlife Working Group of the Implementation Committee. The form is available on the DNR's IWAP website and is included in the Plan

as Appendix 17. The preferred taxonomic level for inclusion in the Plan is an entire order or sub-order of species known to occur within Iowa, but we will consider groups as small as complete genera occurring within Iowa. For that entire taxon, the form requests information such as the list of species with documented occurrences in Iowa, how long the taxon has been studied in Iowa and what portions of the state have been surveyed, a list of publications resulting from the work (if any), and a list of the primary people studying the taxon within Iowa (see Appendix 17).

Step 2: Wildlife Working Group-Sponsor Consultation

Once a completed nomination form has been received, members of the Wildlife Working Group will work with the sponsor to determine the feasibility of adding the taxon. Feasibility will depend on several issues: whether there are an adequate number of experts knowledgeable about the taxon to develop a taxon-specific subcommittee, whether there are potential sources of funding for research and conservation projects for the taxon, and whether established monitoring protocols for the taxon can be integrated into the Multiple Species Inventory and Monitoring (MSIM) program.

Step 3: Species Status Assessment

If the sponsor and the Wildlife Working Group determine that inclusion of the taxon is feasible, then a taxon-specific subcommittee will be formed. The subcommittee will complete a Species Status Assessment process. To be included in the Plan, all Iowa species within the taxonomic group will need to have the Species Status Assessment Scoring Criteria completed (see Appendix 16.) This forms the basis for determining which species would be listed as SGCN, as discussed above. If two or more criteria are unknown for a given species, that species will be placed in the "Data Deficient" category of SGCN.

Step 4: Wildlife Working Group Review and Notification to Fish and Wildlife Service

Once the Species Status Assessment process is completed, the results will be reviewed for approval by the Wildlife Working Group. If approved by the Wildlife Working Group, then the potential changes to the list of SGCN would be compiled for submittal to the US Fish and Wildlife Service (USFWS). The Director of DNR would send a letter of intent to make minor revisions to the Plan to the USFWS Region 3 Coordinator of Wildlife and Sportfish Restoration (WSFR) Programs.

Step 5: Public Review and Submittal of Changes to Fish and Wildlife Service

Once the USFWS has been informed of Iowa's intent to complete a minor revision to the Plan, the list of species to be added to the SGCN category will be made available for public review and comment. After public input is considered and integrated, then the proposed changes to the list of SGCN will be submitted to the USFWS for review and approval.

Table 3- 3. Amphibians of Greatest Conservation Need

Taxonomic order derived from the Society for the Study of Amphibians and Reptiles Standard English and Scientific Names Document, which can be accessed at: http://ssarherps.org/

Iowa Listing: Species having Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Rows highlighted in gray: indicate data deficient SGCN for which information needed to assess conservation status is lacking.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
1	Blue-spotted Salamander	*Ambystoma laterale*	Endangered	N5
2	Smallmouth Salamander	*Ambystoma texanum*		N5
3	Tiger Salamander	*Ambystoma tigrinum*		N5
4	Common Mudpuppy	*Necturus maculosus*	Threatened	N5
5	Eastern Newt	*Notophthalmus viridescens*	Threatened	N5
6	Great Plains Toad	*Anaxyrus cognatus*		N5
7	Fowler's Toad	*Anaxyrus fowleri*		N5
8	Woodhouse's Toad	*Anaxyrus woodhousii*		N5
9	Blanchard's Cricket Frog	*Acris crepitans*		N5
10	Cope's Gray Treefrog	*Hyla chrysoscelis*		N5
11	Eastern Gray Treefrog	*Hyla versicolor*		N5
12	Crawfish Frog	*Lithobates areolatus*	Endangered	N4
13	Pickerel Frog	*Lithobates palustris*		N5
14	Northern Leopard Frog	*Lithobates pipiens*		N5
15	Southern Leopard Frog	*Lithobates sphenocephalus*		N5
16	Plains Spadefoot	*Spea bombifrons*		N5

Table 3- 4. Reptiles of Greatest Conservation Need

Taxonomic order derived from the Society for the Study of Amphibians and Reptiles Standard English and Scientific Names Document, which can be accessed at: http://ssarherps.org/

Iowa Listing: Species having Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Rows highlighted in gray: indicate data deficient SGCN for which information needed to assess conservation status is lacking.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
1	Snapping Turtle	*Chelydra serpentina*		N5
2	Blanding's Turtle	*Emydoidea blandingii*	Threatened	N4
3	Wood Turtle	*Glyptemys insculpta*	Endangered	N3
4	Northern Map Turtle	*Graptemys geographica*		N5
5	Southern Map Turtle	*Graptemys ouachitensis*		N5
6	False Map Turtle	*Graptemys pseudogeographica*		N5
7	Ornate Box Turtle	*Terrapene ornata*	Threatened	N5
8	Yellow Mud Turtle	*Kinosternon flavescens*	Endangered	N5
9	Eastern Musk Turtle	*Sternotherus odoratus*	Threatened	N5
10	Smooth Softshell	*Apalone mutica*		N5
11	Spiny Softshell	*Apalone spinifera*		N5
12	Slender Glass Lizard	*Ophisaurus attenuatus*	Threatened	N5
13	Common Five-lined Skink	*Plestiodon fasciatus*		N5
14	Great Plains Skink	*Plestiodon obsoletus*	Endangered	N5
15	Prairie Skink	*Plestiodon septentrionalis*		N5
16	Six-Lined Racerunner	*Aspidocelis sexlineatus*		N5
17	Western Worm Snake	*Carphophis vermis*	Threatened	N5
18	(Prairie) Ringneck Snake	*Diadophis punctatus*		N5
19	Western (Plains) Hog-nosed Snake	*Heterodon nasicus*	Endangered	N5
20	Eastern Hognose Snake	*Heterodon platirhinos*		N5
21	Prairie Kingsnake	*Lampropeltis calligaster*		N5
22	Speckled Kingsnake	*Lampropeltis holbrooki*	Threatened	N5

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
23	*Plainbelly (Copperbelly) Water Snake	*Nerodia erythrogaster*	Endangered	N5 Threatened
24	Diamondback Water Snake	*Nerodia rhombifer*	Threatened	N5
25	Common Water Snake	*Nerodia sipedon*		N5
26	Smooth Green Snake	*Opheodrys vernalis*	Special Concern	N5
27	Western Rat Snake	*Elaphe obsoleta*		N5
28	Western Fox Snake	*Pantherophis ramspotti*		N5
29	Gopher (Bull) Snake	*Pituophis catenifer*	Special Concern	N5
30	Graham's Crayfish Snake	*Regina grahamii*		N5
31	(Northern) Redbelly Snake	*Storeria occipitomaculata*		N5
32	Western Ribbon Snake	*Thamnophis proximus*		N5
33	Plains Garter Snake	*Thamnophis radix*		N5
34	Lined snake	*Tropidoclonion lineatum*		N5
35	Smooth Earthsnake	*Virginia valeriae*		N5
36	Copperhead	*Agkistrodon contortrix*	Endangered	N5
37	Timber Rattlesnake	*Crotalus horridus*		N4
38	Prairie Rattlesnake	*Crotalus viridis*	Endangered	N5
39	Eastern Massasauga	*Sistrurus catenatus*		N3 Candidate
40	Western Massasauga	*Sistrurus turgeminus*		N3N4 Candidate

*The Copperbelly Water Snake (*Nerodia erythrogaster neglecta*) was renamed Plainbelly Water Snake (*Nerodia erythrogaster*) after the subspecies designation was removed. However, as of 2015, the Copperbelly Water Snake (*Nerodia erythrogaster neglecta*) is still federally listed as threatened (status not yet updated to show recent taxonomic name change).

Table 3- 5. Breeding Birds of Greatest Conservation Need

Taxonomic order derived from the American Ornithologists' Union Check-List of North American Birds, which can be accessed at: http://www.aou.org/checklist/north/.

Iowa Listing: Species having Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov.

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Regionally Important: Partners in Flight regionally important birds in Bird Conservation Regions 11 (Prairie Pothole), 22 (Eastern Tallgrass Prairie), and 23 (Prairie Hardwood Transition).

Rows highlighted in gray: indicate data deficient SGCN for which information needed to assess conservation status is lacking.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing	Regionally Important
1	Trumpeter Swan	*Cygnus buccinator*		N4B, N4N	
2	American Wigeon	*Anas americana*		N5B, N5N	
3	Blue-winged Teal	*Anas discors*		N5B, N5N	
4	Northern Pintail	*Anas acuta*		N5B, N5N	
5	Canvasback	*Aythya valisineria*		N5B, N5N	
6	Redhead	*Aythya americana*		N5B, N5N	
7	Ring-necked Duck	*Aythya collaris*		N5B, N5N	
8	Lesser Scaup	*Aythya affinis*		N5B, N5N	
9	Northern Bobwhite	*Colinus virginianus*		N5	22, 23
10	Ruffed Grouse	*Bonasa umbellus*		N5	11, 23
11	Sharp-tailed Grouse	*Tympanuchus phasianellus*	Presumed Extirpated	N4	11
12	Greater Prairie-Chicken	*Tympanuchus cupido*		N4	11, 22, 23
13	Red-necked Grebe	*Podiceps grisegena*		N5B, N5N	
14	Eared Grebe	*Podiceps nigricollis*		N5B, N5N	
15	American White Pelican	*Pelecanus erythrorhynchos*		N4	
16	American Bittern	*Botaurus lentiginosus*		N4B, N4N	
17	Black-crowned Night-Heron	*Nycticorax nycticorax*		N5B, N5N	
18	White-faced Ibis	*Plegadis chihi*		N4B, N4N	
19	Bald Eagle	*Haliaeetus leucocephalus*	Special Concern	N5B, N5N	

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing	Regionally Important
20	Northern Harrier	*Circus cyaneus*	Endangered	N5B, N5N	11
21	Red-shouldered Hawk	*Buteo lineatus*	Endangered	N5B, N5N	
22	Broad-winged Hawk	*Buteo platypterus*		N5B	
23	Swainson's Hawk	*Buteo swainsoni*		N5B	11
24	King Rail	*Rallus elegans*	Endangered	N4B, N4N	
25	Common Gallinule (formerly Moorhen)	*Gallinula chloropus*		N5B, N5N	
26	Piping Plover	*Charadrius melodus*	Endangered	N3B, N3N Endangered	
27	Upland Sandpiper	*Bartramia longicauda*		N5B	
28	Wilson's Snipe	*Gallinago delicata*		N5B, N5N	
29	American Woodcock	*Scolopax minor*		N5B, N5N	
30	Wilson's Phalarope	*Phalaropus tricolor*		N5B	
31	Franklin's Gull	*Larus pipixcan*		N4B	
32	Least Tern	*Sterna antillarum*	Endangered	N4B Endangered	
33	Black Tern	*Chlidonias niger*	Special Concern	N4B	
34	Forster's Tern	*Sterna forsteri*	Special Concern	N5B, N5N	
35	Yellow-billed Cuckoo	*Coccyzus americanus*		N5B	22, 23
36	Black-billed Cuckoo	*Coccyzus erythropthalmus*		N5B	11, 22, 23
37	Barn Owl	*Tyto alba*	Endangered	N5	
38	Eastern Screech-owl	*Otus asio*		N5	
39	Burrowing Owl	*Speotyto cunicularia*		N4B, N4N	11
40	Long-eared Owl	*Asio otus*	Threatened	N5B, N5N	
41	Short-eared Owl	*Asio flammeus*	Endangered	N5B, N5N	11
42	Common Nighthawk	*Chordeiles minor*		N5B	11, 22
43	Chuck-will's-widow	*Caprimulgus carolinensis*		N5B, NNRN	
44	Eastern Whip-poor-will	*Caprimulgus vociferus*		N5B, NNRN	22, 23
45	Chimney Swift	*Chaetura pelagica*		N5B	11, 22, 23
46	Belted Kingfisher	*Ceryle alcyon*		N5B, N5N	11, 22, 23
47	Red-headed Woodpecker	*Melanerpes erythrocephalus*		N5B, N5N	11, 22, 23
48	Northern Flicker	*Colaptes auratus*		N5B, N5N	11, 22, 23
49	American Kestrel	*Falco sparverius*		N5B, N5N	23
50	Peregrine Falcon	*Falco peregrinus*	Special Concern	N4B, N4N	
51	Eastern Wood-pewee	*Contopus virens*		N5B	22
52	Acadian Flycatcher	*Empidonax virescens*		N5B	22, 23
53	Say's Phoebe	*Sayornis saya*		N4N, N5B	

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing	Regionally Important
54	Eastern Kingbird	*Tyrannus tyrannus*		N5B	11, 22, 23
55	Loggerhead Shrike	*Lanius ludovicianus*		N4	11, 22
56	Bell's Vireo	*Vireo bellii*		N4B	22
57	Horned Lark	*Eremophila alpestris*		N5B, N5N	11, 22, 23
58	Purple Martin	*Progne subis*		N5B	22
59	Bank Swallow	*Riparia riparia*		N5B	11, 22, 23
60	Sedge Wren	*Cistothorus platensis*		N4B, N5N	11
61	Bewick's Wren	*Thryomanes bewickii*		N5B	
62	Veery	*Catharus fuscescens*		N5B	23
63	Wood Thrush	*Hylocichla mustelina*		N5B	22, 23
64	Brown Thrasher	*Toxostoma rufum*		N5	11, 22, 23
65	Worm-eating Warbler	*Helmitheros vermivorus*		N5B	
66	Golden-winged Warbler	*Vermivora chrysoptera*		N4B	11, 23
67	Prothonotary Warbler	*Protonotaria citrea*		N5B	22
68	Kentucky Warbler	*Geothlypis formosus*		N5B	22
69	Common Yellowthroat	*Geothlypis trichas*		N5	22, 23
70	Cerulean Warbler	*Setophaga cerulea*		N4B	22, 23
71	Field Sparrow	*Spizella pusilla*		N5	11, 22, 23
72	Grasshopper Sparrow	*Ammodramus savannarum*		N5B, N5N	11, 22, 23
73	Henslow's Sparrow	*Ammodramus henslowii*	Threatened	N3B, N4N	22, 23
74	Dickcissel	*Spiza americana*		N5B	11, 22, 23
75	Bobolink	*Dolichonyx oryzivorus*		N5B	11, 22, 23
76	Eastern Meadowlark	*Sturnella magna*		N5	22, 23
77	Western Meadowlark	*Sturnella neglecta*		N5	11
78	Baltimore Oriole	*Icterus galbula*		N5B	22, 23

Table 3- 6. Non-breeding Birds of Greatest Conservation Need

Taxonomic order derived from the American Ornithologists' Union Check-List of North American Birds, which can be accessed at: http://www.aou.org/checklist/north/.

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Regionally Important: Partners in Flight regionally important birds in Bird Conservation Regions 11 (Prairie Pothole), 22 (Eastern Tallgrass Prairie), and 23 (Prairie Hardwood Transition).

Rows highlighted in gray: indicate data deficient SGCN for which information needed to assess conservation status is lacking.

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	Common Name	Scientific Name	National Rank/Listing	Regionally Important
1	Greater Scaup	*Aythya marila*	N5B, N5N	
2	Common Loon	*Gavia immer*	N4B, N5N	
3	Little Blue Heron	*Egretta caerulea*	N5B, N5N	
4	Yellow Rail	*Coturnicops noveboracensis*	N3B, N4N	
5	Black Rail	*Laterallus jamaicensis*	N3B, N3N	
6	Whooping Crane	*Grus americana*	N1N Endangered	
7	Black-bellied plover	*Pluvialis squatarola*	N5B, N5N	
8	American Golden-Plover	*Pluvialis dominica*	N5B	
9	Lesser Yellowlegs	*Tringa flavipes*	N5B, N5N	
10	Whimbrel	*Numenius phaeopus*	N5B, N5N	
11	Long-billed Curlew	*Numenius americanus*	N5B, N5N	
12	Hudsonian Godwit	*Limosa haemastica*	N3?B	
13	Marbled Godwit	*Limosa fedoa*	N5B, N5N	
14	Ruddy Turnstone	*Arenaria interpres*	N5B, N5N	
15	Red Knot	*Calidris canutus*	N2N3B, N3N Threatened	
16	Sanderling	*Calidris alba*	N4B, N5N	
17	Semipalmated Sandpiper	*Calidris pusilla*	N5B	
18	White-rumped Sandpiper	*Calidris fuscicollis*	N3B	
19	Pectoral Sandpiper	*Calidris melanotos*	N5B	
20	Stilt Sandpiper	*Micropalama himantopus*	N3B, N4N	
21	Buff-breasted Sandpiper	*Tryngites subruficollis*	N4B	
22	Short-billed Dowitcher	*Limnodromus griseus*	N5B, N5N	

	Common Name	Scientific Name	National Rank/Listing	Regionally Important
23	Long-billed Dowitcher	*Limnodromus scolopaceus*	N5B, N5N	
24	Caspian Tern	*Sterna caspia*	N4N5B, N4N	
25	Olive-sided Flycatcher	*Contopus cooperi*	N4B	
26	Sprague's pipit	*Anthus spragueii*	N4B, N4N Candidate	11
27	Bohemian Waxwing	*Bombycilla garrulus*	N5B, N5N	
28	Smith's Longspur	*Calcarius pictus*	N4B, N5N	
29	Bay-breasted Warbler	*Dendroica castanea*	N5B	
30	Canada Warbler	*Cardellina canadensis*	N5B	
31	American Tree Sparrow	*Spizella arborea*	N5B, N5N	
32	Le Conte's Sparrow	*Ammodramus leconteii*	N3B, N4N	11
33	Harris's Sparrow	*Zonotrichia querula*	N5N	
34	White-winged Crossbill	*Loxia leucoptera*	N5	

Table 3- 7. Butterflies of Greatest Conservation Need

Taxonomic order and scientific names derived from: Opler, PA, and AD Warren. 2002. Butterflies of North America. 2. Scientific Names List for Butterfly Species of North America, north of Mexico. CP Gillette Museum of Arthropod Diversity, Department of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, Colorado. 79 pp. This can be accessed at: http://www.biology.ualberta.ca/old_site/uasm/Opler&Warren.pdf

Iowa Listing: species having Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

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	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
1	Pipevine Swallowtail	*Battus philenor*	Special Concern	N5
2	Zebra Swallowtail	*Eurytides marcellus*	Special Concern	N5
3	Spicebush Swallowtail	*Papilio troilus*		N4?
4	Olympia Marble	*Euchloe olympia*	Special Concern	N4N5
5	Harvester	*Feniseca tarquinius*		N4
6	Purplish Copper	*Lycaena helloides*	Special Concern	N5
7	Acadian Hairstreak	*Satyrium acadica*	Special Concern	N5
8	Edward's Hairstreak	*Satyrium edwardsii*	Special Concern	N4
9	Hickory Hairstreak	*Satyrium caryaevorum*	Special Concern	N4
10	Striped Hairstreak	*Satyrium liparops*	Special Concern	N5
11	White M. Hairstreak	*Parrhasius m-album*		N5
12	Henry's Elfin	*Callophrys henrici*		N5
13	Reakirt's Blue	*Echinargus (Hemiargus) isola*		N5
14	Silvery Blue	*Glaucopsyche lygdamus*	Threatened	N5
15	Melissa Blue	*Plebejus (Lycaeides) melissa*		N5
16	Aphrodite Fritillary	*Speyeria aphrodite*		N5
17	Regal Fritillary	*Speyeria idalia*	Special Concern	N3
18	Silver-bordered Fritillary	*Boloria selene*		N5
19	Gorgone Checkerspot	*Chlosyne gorgone*		N5
20	Baltimore Checkerspot	*Euphydryas phaeton*	Threatened	N4
21	'Ozark' Baltimore Checkerspot	*Euphydryas phaeton ozarkae*	Threatened	N3

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
22	Compton Tortoiseshell	*Nymphalis vaualbum (l-album)*		N5
23	Common Ringlet	*Coenonympha tullia*	Endangered	N5
24	Eyed Brown	*Satyrodes eurydice*		N4
25	Monarch	*Danaus plexippus*		N2N3
26	Southern Cloudywing	*Thorybes bathyllus*		N5
27	Hayhurst's Scallopwing	*Staphylus hayhurstii*		N5
28	Dreamy Duskywing	*Erynnis icelus*	Special Concern	N5
29	Sleepy Duskywing	*Erynnis brizo*	Special Concern	N5
30	Juvenal's Duskywing	*Erynnis juvenalis*		N5
31	Mottled Duskywing	*Erynnis martialis*		N3
32	Columbine Duskywing	*Erynnis lucilius*	Special Concern	N4
33	Poweshiek Skipperling	*Oarisma poweshiek*	Threatened	N1 Endangered
34	Ottoe Skipper	*Hesperia ottoe*	Special Concern	N3N4
35	Leonard's Skipper	*Hesperia leonardus*	Special Concern	N4
36	Dakota Skipper	*Hesperia dacotae*	Endangered	N2 Threatened
37	Crossline Skipper	*Polites origines*		N4N5
38	Long Dash	*Polites mystic*		N5
39	Northern Broken-dash	*Wallengrenia egeremet*		N5
40	Little Glassywing	*Pompeius verna*		N5
41	Arogos Skipper	*Atrytone arogos*	Special Concern	N3
42	Byssus Skipper	*Problema byssus*	Threatened	N3N4
43	Mulberry Wing	*Poanes massasoit*	Threatened	N4
44	Broad-winged Skipper	*Poanes viator*	Special Concern	N5
45	Dion Skipper	*Euphyes dion*	Special Concern	N4
46	Black Dash	*Euphyes conspicua*		N4
47	Two-spotted Skipper	*Euphyes bimacula*	Special Concern	N4
48	Dusted Skipper	*Atrytonopsis hianna*	Special Concern	N4N5
49	Pepper and Salt Skipper	*Amblyscirtes hegon*	Special Concern	N5
50	Common Roadside-skipper	*Amblyscirtes vialis*		N4
51	Swarthy Skipper	*Nastra lherminier*		N5

Table 3- 8. Crayfish of Greatest Conservation Need

Taxonomic order and scientific names derived from NatureServe Explorer.

Iowa Listing: As of 2015, no Crayfish species have been included in Iowa's list of species having Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77). For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

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Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
1	Devil Crayfish	*Cambarus diogenes*		N5
2	Calico Crayfish	*Orconectes immunis*		N5
3	Golden Crayfish	*Orconectes luteus*		N5
4	Northern Clearwater Crayfish	*Orconectes propinquus*		N5
5	Virile Crayfish	*Orconectes virilis*		N5
6	Prairie Crayfish	*Procambarus gracilis*		N5
7	White River Crayfish	*Procambrus acutus*		NNR

Table 3- 9. Dragonflies and Damselflies of Greatest Conservation Need

Taxonomic order and scientific names derived from: Paulson, DR, and SW Dunkle, eds. 2009. A Checklist of North American Odonata. Accessed at: http://www.odonatacentral.org/docs/NA_Odonata_Checklist_2009.pdf

Iowa Listing: As of 2015, no Dragonfly or Damselfly species have been included in Iowa's list of species having Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77). For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Rows highlighted in gray: indicate data deficient SGCN for which information needed to assess conservation status is lacking.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
1	Spotted Spreadwing	*Lestes congener*		N5
2	Amber-winged Spreadwing	*Lestes eurinus*		N4
3	Sweetflag Spreadwing	*Lestes forcipatus*		N5
4	Paiute Dancer	*Argia alberta*		N4
5	Springwater Dancer	*Argia plana*		N5
6	Prairie Bluet	*Coenagrion angulatum*		N3?
7	Taiga Bluet	*Coenagrion resolutum*		N5
8	Boreal Bluet	*Enallagma boreale*		N5
9	Alkali Bluet	*Enallagma clausum*		N5
10	Western Forktail	*Ischnura perparva*		N5
11	Sedge Sprite	*Nehalennia irene*		N5
12	Canada Darner	*Aeshna canadensis*		N5
13	Variable Darner	*Aeshna interrupta*		N5
14	Midland Clubtail	*Gomphus fraternus*		N5
15	Sulphur-tipped Clubtail	*Gomphus militaris*		N5
16	Rapids Clubtail	*Gomphus quadricolor*		N3N4
17	Rusty Snaketail	*Ophiogomphus rupinsulensis*		N5
18	Pale Snaketail	*Ophiogomphus severus*		N5
19	Sioux Snaketail	*Ophiogomphus smithi*		N2
20	Westfall's Snaketail	*Ophiogomphus westfalli*		N3
21	Brimstone Clubtail	*Stylurus intricatus*		N4
22	Elusive Clubtail	*Stylurus notatus*		N3

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
23	Arrow Clubtail	*Stylurus spiniceps*		N4
24	Stream Cruiser	*Didymops transversa*		N5
25	Royal River Cruiser	*Macromia taeniolata*		N5
26	Slender Baskettail	*Epitheca costalis*		N5
27	Smoky Shadowdragon	*Neurocordulia molesta*		N4
28	Stygian Shadowdragon	*Neurocordulia yamaskanensis*		N5
29	Plains Emerald	*Somatochlora ensigera*		N4
30	Carolina Saddlebags	*Tramea carolina*		N5

Table 3- 10. Fish of Greatest Conservation Need

Taxonomy from: Page, LM, H Espinosa-Perez, LT Findley, CR Gilbert, RN Lea, NE Mandrak, RL Mayden, and JS Nelson. 2013. Common and scientific names of fishes from the United States, Canada, and Mexico, 7th Edition. American Fisheries Society, Special Publication 34, Bethesda, MD.

Iowa Listing: species having Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

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	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
1	Chestnut lamprey	*Ichthyomyzon castaneus*	Threatened	N4
2	Northern brook lamprey	*Ichthyomyzon fossor*		N4
3	Silver lamprey	*Ichthyomyzon unicuspis*		N5
4	American brook lamprey	*Lampetra appendix*	Threatened	N4
5	Lake sturgeon	*Acipenser fulvescens*	Endangered	N3N4
6	Pallid sturgeon	*Scaphirhynchus albus*	Endangered	N2 Endangered
7	Shovelnose sturgeon	*Scaphirhynchus platorynchus*		N4 Threatened*
8	Paddlefish	*Polyodon spathula*		N4
9	American eel	*Anguilla rostrata*		N4
10	Skipjack herring	*Alosa chrysochloris*		N5
11	Largescale stoneroller	*Campostoma oligolepis*		N5
12	Gravel chub	*Erimystax x-punctatus*		N4
13	Western silvery minnow	*Hybognathus argyritis*		N4
14	Mississippi silvery minnow	*Hybognathus nuchalis*		N5
15	Plains minnow	*Hybognathus placitus*		N4
16	Pallid shiner	*Hybopsis amnis*		N4
17	Redfin shiner	*Lythrurus umbratilis*		N5
18	Shoal chub	*Macrhybopsis hyostomus*		N5
19	Sturgeon chub	*Macrhybopsis gelida*		N3
20	Sicklefin chub	*Macrhybopsis meeki*		N3
21	Pearl dace	*Margariscus margarita*	Endangered	N5

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
22	Golden shiner	*Notemigonus crysoleucas*		N5
23	Pugnose shiner	*Notropis anogenus*	Endangered	N3
24	River shiner	*Notropis blennius*		N5
25	Silverband shiner	*Notropis shumardi*		N5
26	Ghost shiner	*Notropis buchanani*		N5
27	Blacknose shiner	*Notropis heterolepis*	Threatened/ Possibly Extirpated	N4
28	Ozark minnow	*Notropis nubilus*		N5
29	Carmine shiner	*Notropis percobromus*		N5
30	Weed shiner	*Notropis texanus*	Endangered	N5
31	Topeka shiner	*Notropis topeka*	Threatened	N3 Endangered
32	Mimic shiner	*Notropis volucellus*		N5
33	Channel shiner	*Notropis wickliffi*		N5
34	Pugnose minnow	*Opsopoeodus emiliae*		N5
35	Suckermouth minnow	*Phenacobius mirabilis*		N5
36	Southern redbelly dace	*Phoxinus erythrogaster*		N5
37	Flathead chub	*Platygobio gracilis*		N5
38	Longnose dace	*Rhinichthys cataractae*		N5
39	Blue sucker	*Cycleptus elongatus*		N3
40	Lake chubsucker	*Erimyzon succetta*		N5
41	Black buffalo	*Ictiobus niger*		N5
42	Spotted sucker	*Minytrema melanops*		N5
43	Silver redhorse	*Moxostoma anisurum*		N5
44	River redhorse	*Moxostoma carinatum*		N4
45	Black redhorse	*Moxostoma duquesnei*	Threatened	N5
46	Brown bullhead	*Ameiurus nebulosus*		N5
47	Blue catfish	*Ictalurus furcatus*		N5
48	Slender madtom	*Noturus exilis*		N5
49	Tadpole madtom	*Noturus gyrinus*		N5
50	Freckled madtom	*Noturus nocturnus*	Endangered	N5
51	Redfin (Grass) pickerel	*Esox americanus*	Threatened	N5
52	Northern pike	*Esox lucius*		N5
53	Central mudminnow	*Umbra limi*		N5
54	Brook Trout	*Salvelinus fontinalis*		N5
55	Trout perch	*Percopsis omiscomaycus*		N5
56	Pirate perch	*Aphredoderus sayanus*	Special Concern	N5
57	Burbot	*Lota lota*	Threatened	N5
58	Brook silverside	*Labidesthes sicculus*		N5

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
59	Banded killifish	*Fundulus diaphanus*		N5
60	Starhead topminnow	*Fundulus dispar*		N4
61	Blackstripe topminnow	*Fundulus notatus*		N5
62	Plains topminnow	*Fundulus sciadicus*		N4
63	Mottled sculpin	*Cottus bairdii*		N5
64	Slimy sculpin	*Cottus cognatus*		N5
65	Rock bass	*Ambloplites rupestris*		N5
66	Longear sunfish†	*Lepomis megalotis*		N5
67	Northern sunfish†	*Lepomis peltastes*		N5
68	Western sand darter	*Ammocrypta clara*	Threatened	N3
69	Crystal darter	*Crystallaria asprella*		N3
70	Mud darter	*Etheostoma asprigene*		N4
71	Rainbow darter	*Etheostoma caeruleum*		N5
72	Bluntnose darter	*Etheostoma chlorosomum*	Endangered	N5
73	Iowa darter	*Etheostoma exile*		N5
74	Least darter	*Etheostoma microperca*	Endangered	N5
75	Orangethroat darter	*Etheostoma spectabile*	Threatened	N5
76	Banded darter	*Etheostoma zonale*		N5
77	Logperch	*Percina caprodes*		N5
78	Blackside darter	*Percina maculata*		N5
79	Slenderhead darter	*Percina phoxocephala*		N5
80	River darter	*Percina shumardi*		N5

*In 2010 the Shovelnose sturgeon was listed as Threatened under the Similarity of Appearance Provisions of the Endangered Species Act. The purpose of this is to protect Pallid sturgeon by treating Shovelnose sturgeon as a threatened species where their ranges overlap.

† Until the publication of Page et al. (2013), the Northern Sunfish was called the Longear Sunfish (*L. megalotis*). But, in Page et al. (2013), the name of the form of the Longear Sunfish known to have occurred in Iowa was changed to Northern Sunfish (*L. peltastes*). In 2014, sunfish in the Longear group were reported at DNR hatchery ponds at Fairport near Muscatine. The preliminary conclusion of the experts was that the Fairport fish were Longear Sunfish (*L. megalotis*). If true, this would be a new fish species for the state of Iowa. At the time of printing, results of genetic analyses to confirm this preliminary conclusion are pending.

Table 3- 11. Mammals of Greatest Conservation Need

Taxonomic order derived from Mammal Species of the World, used by the Smithsonian Institution's National Museum of Natural History, which can be accessed at: http://www.mnh.si.edu/ Reference: Wilson, DE and DM Reeder (editors). 2005. Mammal Species of the World: A Taxonomic and Geographic Reference (3rd Ed.) Johns Hopkins University Press. 2,142 pp.

Iowa Listing: species having Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Rows highlighted in gray: indicate data deficient SGCN for which information needed to assess conservation status is lacking.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
1	Hayden's Shrew	*Sorex haydeni*		N4
2	Elliot's Short-tailed Shrew	*Blarina hylophaga*		N5
3	Southern Short-tailed Shrew	*Blarina carolinensis*		N5
4	Least Shrew	*Cryptotis parva*	Threatened	N5
5	Northern (Myotis) Long-eared Bat	*Myotis septentrionalis*		N1N2 Threatened
6	Little Brown Bat	*Myotis lucifigus*		N3
7	Indiana Bat	*Myotis sodalis*	Endangered	N2 Endangered
8	Silver-haired Bat	*Lasionycteris noctivagans*		N5
9	Eastern Pipistrelle	*Perimyotis subflavus*		N5
10	Evening Bat	*Nycticeius humeralis*		N5
11	White-tailed Jackrabbit	*Lepus townsendii*		N5
12	Franklin's Ground Squirrel	*Spermophilus franklinii*		N5
13	Southern Flying Squirrel	*Glaucomys volans*	Special Concern	N5
14	Plains Pocket Gopher	*Geomys bursarius*		N5
15	Plains Pocket Mouse	*Perognathus flavescens*	Endangered	N5
16	Southern Bog Lemming	*Synaptomys cooperi*	Threatened	N5
17	Woodland Vole	*Microtus pinetorum*		N5
18	Gray Fox	*Urocyon cinereoargenteus*		N5
19	Long-tailed Weasel	*Mustela frenata*		N5
20	Least Weasel	*Mustela nivalis*		N5

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
21	Spotted Skunk	*Spilogale putorius*	Endangered	N4
22	Ermine	*Mustela ermine*		N5

Table 3- 12. Mussels of Greatest Conservation Need

Taxonomic order derived from DD Turgeon, JF Quinn Jr, AE Bogan, EV Coan, FG Hochberg, Jr, WG Lyons, PM Mikkelsen, RJ Neves, CFE Roper, G Rosenberg, B Roth, A Scheltema, FG Thompson, M Vecchione & JD Williams. 1998. Common and scientific names of aquatic invertebrates from the United States and Canada: Mollusks. 2nd Edition. American Fisheries Society, Special Publication 26, Bethesda, Maryland. ix + 526 pp

Iowa Listing: Species having Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Rows highlighted in gray: indicate data deficient SGCN for which information needed to assess conservation status is lacking.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
1	Mucket	*Actinonaias ligamentina*		N5
2	Elktoe	*Alasmidonta marginata*		N4
3	Slippershell	*Alasmidonta viridis*	Endangered Extirpated?	N4
4	Three Ridge	*Amblema plicata*		N5
5	Flat Floater	*Anodonta suborbiculata*		N5
6	Cylinder (Cylindrical Papershell)	*Anodontoides ferussacianus*	Threatened	N5
7	Rock Pocketbook	*Arcidens confragosus*		N4
8	Spectacle Case	*Cumberlandia monodonta*	Endangered	N3 Endangered
9	Purple Wartyback	*Cyclonaias tuberculata*	Threatened Extirpated?	N5
10	Butterfly	*Ellipsaria lineolata*	Threatened	N4
11	Elephant Ear	*Elliptio crassidens*		N5
12	Spike	*Elliptio dilatata*		N5
13	Snuffbox	*Epioblasma triquetra*		N3
14	Ebonyshell	*Fusconaia ebena*		N4N5
15	Wabash pigtoe	*Fusconaia flava*		N5
16	Higgins' Eye Pearlymussel	*Lampsilis higginsii*	Endangered	N1N2 Endangered
17	Fatmucket	*Lampsilis siliquoidea*		N5
18	Yellow Sandshell	*Lampsilis teres anodontoides*	Endangered	N5

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
19	White Heelsplitter	*Lasmigona camplanata*		N5
20	Creek Heelsplitter	*Lasmigona compressa*	Threatened	N5
21	Fluted Shell	*Lasmigona costata*		N5
22	Pondmussel	*Ligumia subrostrata*		N5
23	Black Sandshell	*Ligumia recta*		N4N5
24	Washboard	*Megalonaias nervosa*		N5
25	Threehorn Wartyback	*Obliquaria reflexa*		N5
26	Hickorynut	*Obovaria olivaria*		N4
27	Bullhead (Sheepnose)	*Plethobasus cyphyus*	Endangered	N3 Endangered
28	Pyramid pigtoe	*Pleurobema rubrum*		N2N3
29	Round pigtoe	*Pleurobema sintoxia*	Endangered	N4N5
30	Pink Heelsplitter	*Potamilus alatus*		N5
31	Pink Papershell	*Potamilus ohiensis*		N5
32	Monkeyface	*Quadrula metanevra*		N4
33	Wartyback	*Quadrula nodulata*		N4
34	Pimpleback	*Quadrula pustulosa*		N5
35	Mapleleaf	*Quadrula quadrula*		N5
36	Salamander mussel	*Simpsonaias ambigua*		N1
37	Strange Floater (Creeper, Formerly Squawfoot)	*Strophitus undulatus*	Threatened	N5
38	Pistolgrip	*Tritogonia verrucosa*	Endangered	N4
39	Fawnsfoot	*Truncilla donaciformis*		N5
40	Deertoe	*Truncilla truncata*		N5
41	Pondhorn	*Uniomerus tetralasmus*		N5
42	Paper Pondshell	*Utterbackia imbecillis*		N5
43	Ellipse	*Venustaconcha ellipsiformis*	Threatened	N4

Table 3- 13. Terrestrial Snails of Greatest Conservation Need

Taxonomic order and nomenclature derived from DD Turgeon, JF Quinn Jr, AE Bogan, EV Coan, FG Hochberg, Jr, WG Lyons, PM Mikkelsen, RJ Neves, CFE Roper, G Rosenberg, B Roth, A Scheltema, FG Thompson, M Vecchione & JD Williams. 1998. Common and scientific names of aquatic invertebrates from the United States and Canada: Mollusks. 2nd Edition. American Fisheries Society, Special Publication 26, Bethesda, Maryland. ix + 526 pp

Iowa Listing: Species having Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Rows highlighted in gray: indicate data deficient SGCN for which information needed to assess conservation status is lacking.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Listing	National Rank/Listing
1	Iowa Pleistocene Snail	*Discus macclintocki*	Endangered	N1 Endangered
2	Minnesota Pleistocene Succinea	*Novasuccinea n. Sp. Minnesota a*	Endangered	N2
3	Iowa Pleistocene Succinea	*Novasuccinea n. Sp. Minnesota b*	Endangered	NNR
4	Hubricht's Vertigo	*Vertigo hubrichti*	Threatened	N3
5	Bluff Vertigo	*Vertigo meramecensis*	Endangered	N2

The previous version of the IWAP listed eight species of Terrestrial Land Snails as SGCN, all of which were listed as state Threatened or Endangered. Since that time, the scientific literature has indicated that Frigid Ambersnail (*Catinella gelida*) is not a valid species, and that both the Iowa Pleistocene Vertigo (*Vertigo iowaensis*) and the Briarton Pleistocene Snail (*Vertigo briarensis*) are actually the same species as Hubrict's Vertigo (*Vertigo hubrichti*).

Specific resources utilized by each taxonomic subcommittee during SGCN assessment:

Amphibians and Reptiles

References used by the Amphibian and Reptile Subcommittee include:

- A Field Guide to the Amphibians and Reptiles of Iowa, LeClere(2013);
- Iowa Multiple Species Inventory and Monitoring Program ;
- Christiansen and Bailey (1986, 1988, and 1991);
- NatureServe National and Sub-national Heritage Status Rankings;
- Partners for Amphibian and Reptile Conservation: www.parcplace.org

Birds

The distribution and abundance of birds in Iowa is better understood than any other taxa considered in the IWAP. As a result the Bird Subcommittee had many sources of information to consult. References utilized by the Bird Subcommittee include:

- *Birds of Iowa* (Kent and Dinsmore 1996);
- *Iowa Birds* (Dinsmore et al. 1984);
- Iowa Multiple Species Inventory and Monitoring Program;
- *The Iowa Breeding Bird Atlas* (Jackson et al. 1996) and *The Iowa Breeding Bird Atlas II* (*in press*);
- *Trends in Iowa Wildlife Populations and Harvest;*
- USGS Breeding Bird Survey;
- NatureServe National and Sub-national Heritage Status Rankings;
- *The State of the Birds* Annual Reports;
- Partners in Flight Bird Landbird Conservation Plans for Iowa Physiographic Areas;
- USFWS Region 3 Birds of Conservation Concern (2008);
- North American Waterfowl Management Plan (2012);
- North American Waterbird Conservation Plan (2002);
- United States Shorebird Conservation Plan (2002);
- North American Landbird Conservation Plan (2004);
- Upper Mississippi-Great Lakes Joint Venture 2007 Conservation Strategies (Landbird, Shorebird, Waterfowl, Waterbird);
- Prairie Pothole Joint Venture Implementation Plans 2005 (Landbirds, Shorebird, Waterbird, Waterfowl);
- The Prairie-Forest Border Ecoregion: A Conservation Plan (The Nature Conservancy);
- Partners In Flight *Saving Our Shared Birds* (2010);
- Iowa Important Bird Area Priority Birds List (Audubon).

Butterflies

References used by the Butterfly Subcommittee include:

- The Butterflies of Iowa - Schlicht et al. (2007)
- Schlicht and Orwig (1998)
- Iowa Multiple Species Inventory and Monitoring Program
- Selby (2010)
- Swengel et al. (2011)
- Iowa Butterfly Survey Network

Dragonflies and Damselflies

References used by the Dragonfly and Damselfly Subcommittee include:

- Cruden and Gode (2000)
- Iowa Odonata Survey: www.iowaodes.org
- Odonata Central: www.odonatacentral.org
- Iowa Multiple Species Inventory and Monitoring Program

Fish

References used by the Fish Subcommittee include:

- Harlan and Speaker (1987)

- Wilton (2004)
- Iowa Biological Stream Monitoring Database (BioNet): the portal for all data collected as part of the state's Biological Monitoring and Assessment programs
- Iowa Aquatic Gap (Loan-Wilsey et al. 2005)
- Heitke et al. (2006)
- Sindt et al. (2011)
- Parks et al. (2014)

Mammals

References used by the Mammal Subcommittee include:

- Bowles *et al*. (1998)
- Iowa Multiple Species Inventory and Monitoring Program
- Trends in Iowa Wildlife Populations and Harvest;
- NatureServe National and Sub-national Heritage Status Rankings;

Mussels

References used by the Mussel Subcommittee include:

- Frest (1987)
- Arbuckle and Downing (2000)
- Poole and Downing (2004)
- Heidebrink (2002)
- Hoke (2009)
- Statewide Freshwater Mussel Survey (J. Kurth)
- Mississippi River mussel sampling data (S. Gritters)
- Iowa Multiple Species Inventory and Monitoring Program

Terrestrial Snails

Comparatively little is known about the distribution and status of this group in Iowa. References used by the Land Snail Subcommittee Include:

- Frest (1987 and 1991)
- Nekola and Coles (2010)
- Clark et al. (2008)
- Turgeon et al. (1998)
- The Poweshiek Skipper Project website has a section dedicated to Iowa's terrestrial snails: http://www.poweshiekskipper.org/biodiversity/land%20snails.html

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Chapter Four

Habitats of Species of Greatest Conservation Need

Required Element #2: Descriptions of the extent and condition of habitats and community types essential to conservation of species of greatest conservation need.

Habitat availability, quantity, and quality are primary factors influencing the viability of wildlife populations. To protect and manage for species of greatest conservation need it is essential to identify the distribution of species within the state and the natural resources critical to their survival in and around occupied areas. Categorizing Iowa's habitat types and the SGCN species that depend on them will aid the design of effective management practices that will directly benefit Iowa's wildlife.

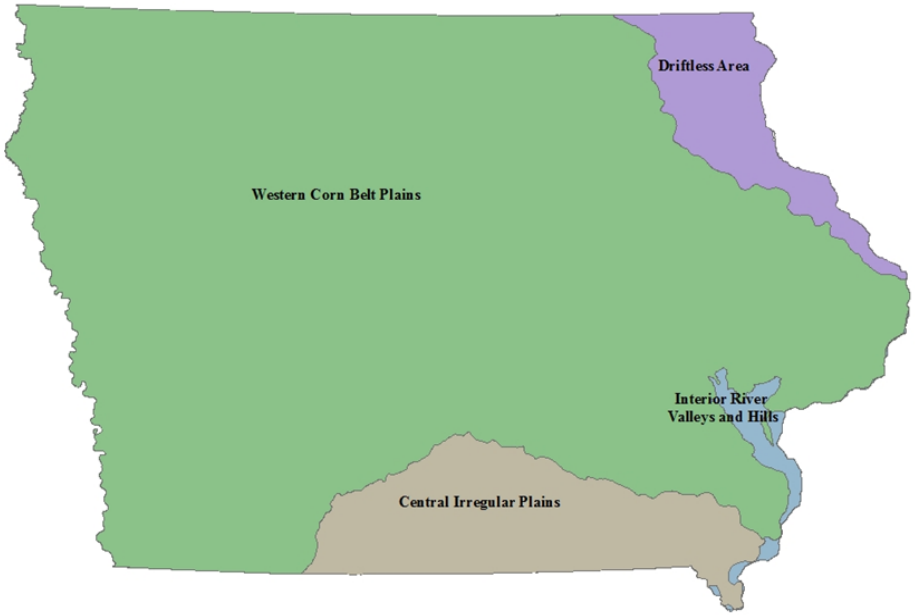
Organizing Frameworks – Ecoregions and Watersheds

In addition to hierarchical systems for classification of lifeforms (taxonomy) and habitat types, geographic classification frameworks are also used to organize natural resource management, research, and planning activities. Over the years, natural resource agencies have moved from using political (e.g., county or state) boundaries toward the use of more holistic, ecosystem-based (e.g., watershed or flyway) frameworks for planning and delivering conservation. Due to this shift in methodology, many potentially useful ecoregional classification systems have been developed. Using biotic and abiotic ecological principles and processes, numerous authors have developed hierarchical ecoregional classification systems for a range of geographical scales (Cleland et al 1997). The Iowa Wildlife Action Plan is intended to provide useful information to users of watershed- and ecoregional-based approaches, and to illustrate the complementary use of these frameworks. Previous iterations of the Plan used the Landform Regions of Iowa (Iowa Geologic Survey, Iowa DNR) as a coarse-scale geographic framework, and watershed boundaries for some finer-scale analyses.

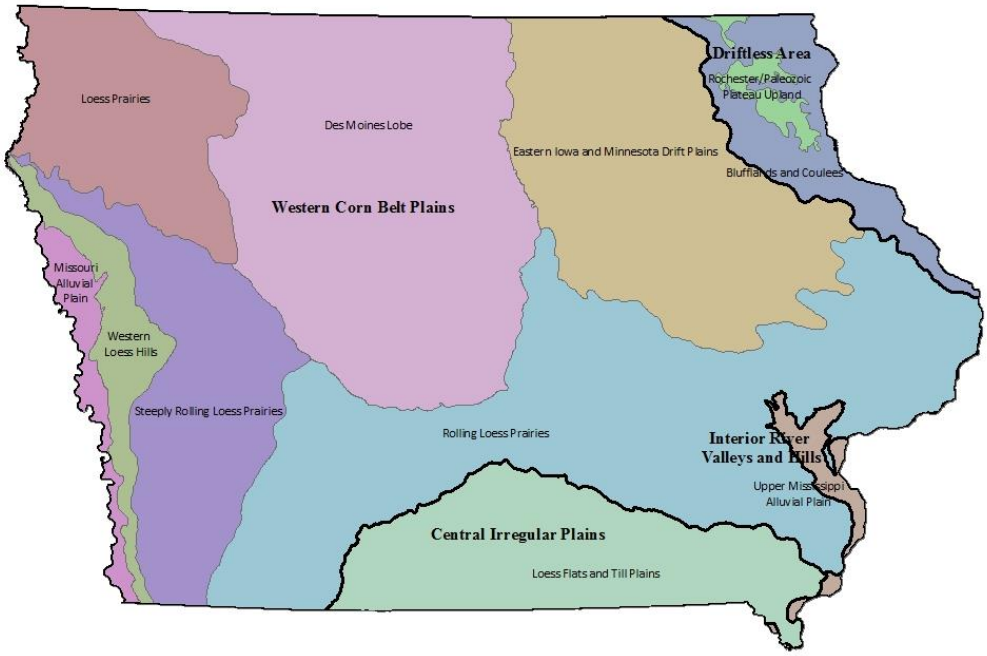
Ecoregions

One limitation of the Landform Regions of Iowa is that it was developed specifically for management and planning use in Iowa and, thus, does not follow a consistent hierarchical classification framework as other national ecoregional datasets. A variety of readily-available continental or national ecoregional datasets exist that were developed independent of political boundaries and are commonly used by conservation entities across the country. The Association of Fish & Wildlife Agencies (AFWA) recommends that for the development of State Wildlife Action Plans, resource managers "select classification systems, mapping units, and other such methodologies and data sources that will support the ultimate integration of SWAP priorities into future implementation of regional and national conservation initiatives…" (AFWA, 2012). Although developed at a coarser scale than the Landform Regions of Iowa (1:24,000), the Environmental Protection Agency (EPA) Ecoregions of the Continental US (1:250:000) is a dataset capable of providing consistency for the development of SWAPs. For more seamless collaboration across state and federal lines, this Plan utilizes the EPA ecoregional framework for describing terrestrial and aquatic resources and conservation management and planning in Iowa (Map 4- 1 and Map 4- 2).

Map 4- 1. Environmental Protection Agency Level III Ecoregions of the Continental US mapped in Iowa



Map 4- 2. Environmental Protection Agency Level IV Ecoregions of the Continental US mapped in Iowa
(Large font denotes the names of Level III ecoregions and small font, Level IV ecoregions.)



Watersheds

A watershed is a geographic area of land for which all surface water (storm or base flow) drains or flows to a point of lower elevation. Watersheds come in many shapes and sizes and can be delineated at several scales. The US Geological Survey has created and mapped a hierarchical classification of hydrologic units, individually identified at each successively smaller level by a Hydrologic Unit Code (HUC), for representing variable levels of surface drainage basins or distinct hydrologic features (available at: http://nhd.usgs.gov/wbd.html).

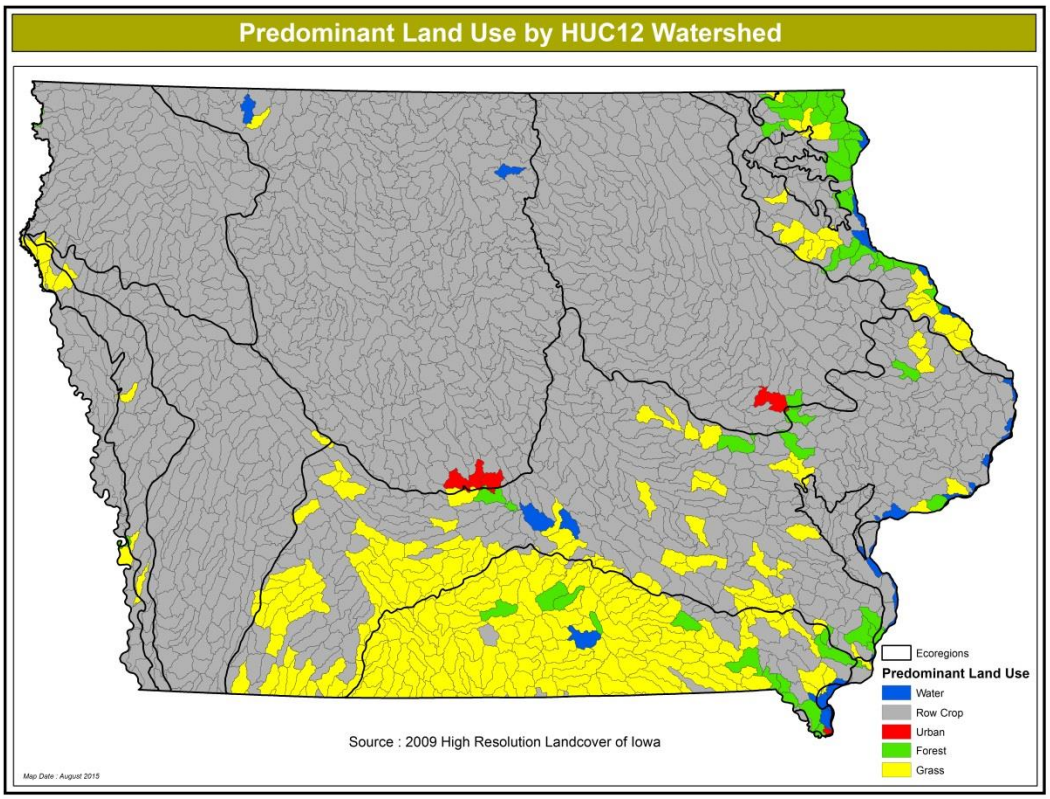
Watersheds are a useful spatial framework for establishing ecologically relevant boundaries for the evaluation of water quantity and quality, and subsequently aquatic habitats, across Iowa. The hierarchical nature of the HUC

framework makes it scale-able to an issue of interest and the boundaries have been mapped and agreed-upon by most conservation entities in the US Furthermore, HUCs are useful as units of evaluation because the water quantity and quality as measured at a given point along a flow line provides information about higher topographic areas from that point. Thus, the effects of natural processes or of management of land and water within a watershed can be evaluated. For these reasons, watersheds are used for a variety of analyses within this Plan, particularly those analyses which specifically focus on aquatic organisms or require a finer spatial resolution than the ecoregions provide.

Organizing Frameworks – Terrestrial and Aquatic Habitat Classes

Iowa has a variety of land use and land cover datasets useful in analysis of the extent and location of Iowa's wildlife habitat. A look at the predominant land use by watershed provides a current overview of the big picture of Iowa's habitat (see **Map 4- 3**).

Map 4- 3. Predominant modern land use by US Geological Survey Hydrologic Unit Code (HUC) 12 watersheds as determined from the 2009 Iowa High Resolution Land Cover



Terrestrial Habitat Classes

The 2006 and 2012 versions of the IWAP utilized nine terrestrial vegetation classes defined by Iowa GAP as the basis for evaluating terrestrial wildlife habitats. Vegetation classes were mapped from digital remote sensing of 30 Landsat 5 Thematic Mapper (TM) images spanning 12 scenes across the state for obtaining statewide coverage and two to three images per scene from between 1990 and 1994 (Kane et al. 2003). Given the extent of land use changes since 1990 and the lack of effort within the Midwest region to remap GAP land cover with recent satellite imagery, there has been a trend toward the use of newer land cover products (the Iowa Land Cover 2002 dataset (Kollasch 2005), and more recently, the Iowa 2009 High Resolution Land Cover (HRLC) dataset; available at:

http://www.iowadnr.gov/Environment/GeologyMapping/MappingGIS.aspx) to inform our understanding of terrestrial wildlife habitats.

The habitat classes used in this plan were modeled after the Iowa 2009 HRLC which is described in **Table 4- 1** and provides more recently updated land cover information than those used in previous versions of the IWAP. A primary reason that this Plan utilizes a land cover classification as the basis for terrestrial habitat types is because it provides a means to more closely connect our monitoring framework with the current reality on the ground. To design wildlife monitoring programs that relate wildlife species distribution and trends to habitat types, it is necessary to periodically map land cover spatially in a Geographic Information System (GIS) using new or recent imagery for an area of interest. The use of outdated land cover has been a challenge for reliably modeling current or recent years' occupancy of SGCN by the Multiple Species Inventory and Monitoring Program, further described in Chapter 7.

Table 4- 1. Description of the land cover classes mapped in Iowa's 2009 High Resolution Land Cover dataset

Name	Description
Water	Spatial/spectral areas of open water, generally without any vegetation present. This class may occur in areas of shadow, or in recently cultivated bare ground.
Wetland	Spatial/spectral areas that are temporarily flooded or permanently wet. Some areas may be in crops in the summer NAIP imagery. This class generally reflects the presence of both a wetness signature and a vegetation signature.
Coniferous Forest	Spatial/spectral areas of evergreen forest. These areas show clearly as forest in the summer imagery, but are separated from deciduous forest by being very lush in the spring imagery. Late spring imagery, and imagery from certain sensors do not well separate conifers from other vegetation. In the 2007 and 2010 Spring imagery areas, when conifer discrimination is poor, a Landsat classification was used to coarsely separate Coniferous forest from Deciduous forest.
Deciduous Short	Spatial/spectral areas of broadleaf deciduous forest, trees or shrubs less than 3.5 meters (~15 feet) tall. (See Deciduous Tall)
Deciduous Medium	Spatial/spectral areas of broadleaf deciduous forest, or trees more than 3.5 meters (~15 feet) tall and less than 12 meters (~40 feet). (See Deciduous Tall)
Deciduous Tall	Spatial/spectral areas of broadleaf deciduous forest or trees more than 12 meters (~40 feet) tall. Lidar normalized elevation data were used to stratify the deciduous forest class into three height classes, as listed.
Grassland 1	Spatial/spectral areas of grasses. Includes rural road ditch complexes, grassed waterways, some grassland/forest edge areas, and some tracts of grasses that are spectrally separable. This is the catch-all class for grasslands that are not otherwise separable into more detailed classes.
Grassland 2	Spatial/spectral areas of grasslands that exhibit lushness in their spectral signature in the spring image. This spectral response could be indicative of the absence of a heavy layer of senesced grasses, such as in areas grazed in the previous season, or in lawns. It might also be interpreted as representing cool season grasses that are lush in spring. This class includes hay which has not been recently cut.
Cut Hay	Spatial/spectral areas free or nearly free of vegetation in the summer image, and showing lushness in the spring image. This will usually represent alfalfa or hay fields that have been recently mowed, but is sometimes spectrally confused with barren areas, especially fallow fields. Probably the majority of the alfalfa on the landscape is included in the Grass 2 class. It was not readily separable in this product due to lack of spectral content.
Corn	Spatial/spectral areas of row crop planted to corn in 2009. This will include small amounts of spectrally confused areas planted to soybean or other crops. This class probably also includes some areas planted to uncommon classes, such as sorghum, etc.

Name	Description
Soybeans	Spatial/spectral areas of row crop planted to soybeans in 2009. Will include small amounts of spectrally confused areas planted to corn or other row crops.
Barren/Fallow	Spatial/spectral areas that are free or nearly free of vegetation in the summer image, and suggestive of row crop or bare soil in the spring image. Often these areas were characterized by early harvest (or no crop planted), and presented a bare soil aspect in the summer image.
Structures	Spatial/spectral areas that represent buildings, bridges, or other structures, with a minimum elevation of 3 meters (~10 feet).
Roads/Impervious	Spatial/spectral areas that are primarily parts of major roadways, rural asphalt or crushed rock roads, paved city streets and parking areas. This class may also occur in quarries and other areas of exposed rock, and in dry barren agricultural areas, as well as in sandbars.
Shadow/No Data	Spatial/spectral areas usually representing shadow from trees or buildings. Includes areas of missing data, usually due to the presence of cloud or shadows in the imagery. Often shadow pixels, especially those from buildings, are inseparable from water bodies, and are originally assigned there by the interpreter.

The 2009 HRLC represents the most recently available land cover information for the state and was developed at a fine pixel resolution (1-m and 2- to 3-m for county- and statewide-levels, respectively), and for management planning, the upper-level habitat classification (e.g., *Deciduous Forest*) is highly useful as a basis for evaluating terrestrial wildlife habitats outlined in this Plan. Alternatively, a variety of national land cover datasets (e.g., US National Vegetation Classification (FGDC 2008), GAP, CropScape (USDA-NASS 2014), and National Land Cover Dataset (USGS 2014)) exist for Iowa which can provide additional land cover information, although these were developed at a relatively coarse pixel resolution (30-m or larger) which may mask fine-scale habitat heterogeneity, may only provide an upper-level habitat classification, represent land cover information from a temporal period too far past for application to current management and research efforts, or were developed for use at only regional- or landscape-scales (e.g., 1:100,000 scale).

However, the national Terrestrial Ecological Systems of the United States (TES; 30-m resolution; Comer et al. 2003) spatial dataset provides a recently updated (2008) land cover classification at finer mid-level ecological systems (e.g., *North-central interior dry oak forest and woodland*) useful for supplementing the 2009 HRLC upper-level land cover classification. Thus, the availability of two independent land cover datasets – the highly spatially detailed, fine resolution 2009 HRLC and the detailed mid-level ecological systems classification of the TES – provides useful information in statewide and local research and management efforts, particularly in combination.

Table 4- 2. Mid-level habitat classes of the Terrestrial Ecological Systems of the United States (TES) applicable to and mapped within Iowa.

	Terrestrial Habitat Classes
1.	North-Central Interior Sand and Gravel Tallgrass Prairie
2.	Northern Tallgrass Prairie
3.	Great Plains Prairie Pothole
4.	Central Tallgrass Prairie
5.	North-Central Interior Wet Meadow-Shrub Swamp
6.	Eastern Great Plains Wet Meadow, Prairie and Marsh
7.	Introduced Wetland Vegetation
8.	North-Central Interior Dry Oak Forest and Woodland
9.	Great Plains Wooded Draw and Ravine
10.	Paleozoic Plateau Bluff and Talus
11.	North-Central Interior Maple-Basswood Forest
12.	North-Central Interior Floodplain
13.	North-Central Interior Dry-Mesic Oak Forest and Woodland
14.	Developed-Open Space
15.	Developed-Low Intensity
16.	Developed-Medium Intensity
17.	Developed-High Intensity
18.	Open Water
19.	Agriculture - Pasture/Hay
20.	Agriculture - Cultivated Crops and Irrigated Agriculture

Table 4- 3. Proportion of each land cover type mapped within Iowa from the 2009 High Resolution Land Cover dataset

Land Cover Type	Acres	Percent of Iowa
Agricultural & Grassland		
Corn	12,749,569	35%
Soybeans	9,714,462	27%
Cut Hay	206,298	1%
Barren/Fallow	251,334	1%
Grass 1 (road ditches, grass waterways, Conservation Reserve grassland)	5,020,967	14%
Grass 2 (uncut hay, lawns, pasture)	2,618,523	7%
All Agricultural & Grassland	30,561,153	85%
Forest		
Deciduous Forest Short	1,663,936	5%
Deciduous Forest Medium	1,004,894	3%
Deciduous Forest Tall	976,029	3%
Total Deciduous	3,644,859	10%
Coniferous Forest	126,072	0% (0.3%)
All Forest	3,770,931	10%
Developed		
Roads/Impervious Surfaces	771,398	2%
Structures	113,657	0% (0.3%)
All Developed	885,054	2%
Aquatic		
Wetlands	257,921	1%
Surface water	489,302	1%
TOTAL SURFACE AREA	35,964,362	100%

Distribution of Terrestrial Habitats

Wildlife habitats are not uniformly distributed throughout the state (**Table 4- 4**). Agriculture dominates all ecoregions and ranges from 29% of the land cover in the Loess Flats & Till Plains ecoregion to 80% in the Northwest Iowa Loess Prairies ecoregion. The largest total proportions of wooded, grassland, and wetland habitats exist in the Loess Flats & Till Plains and the Paleozoic Plateau/Coulee Section ecoregions, and comprise 67% and 66% of the total land cover in each region, respectively. The Northwest Iowa Loess Prairie, Des Moines Lobe, and the Missouri Alluvial Plain contain the least total proportions of wooded, grassland, and wetland habitats, which together comprise 17%, 19%, and 19% of the total land cover in each ecoregion, respectively.

Table 4- 4. Proportion of 2009 Iowa High Resolution Land Cover major cover types by Environmental Protection Agency Level III and IV Ecoregions in Iowa.

			Major land cover classes for ecoregions, as a proportion of each ecoregion's land area				
Ecoregion[1]	Acres in Iowa	% of State	Wooded	Grassland	Wetland	Total	Rowcrops + Hay
40. Central Irregular Plains	3,620,563	10%	24%	41%	2%	67%	29%
40a. Loess Flats & Till Plains	3,620,563	10%	24%	41%	2%	67%	29%
47. Western Corn Belt Plains	30,171,226	84%	8%	18%	2%	28%	68%
47a. Northwest Iowa Loess Prairies	2,804,513	8%	2%	13%	1%	17%	80%
47b. Des Moines Lobe	7,814,565	22%	4%	12%	3%	19%	78%
47c. Eastern IA & MN Drift Plains	5,444,713	15%	7%	15%	1%	23%	73%
47d. Missouri Alluvial Plain	636,685	2%	4%	11%	3%	19%	75%
47e. Steeply Rolling Loess Prairies	3,337,773	9%	4%	19%	1%	24%	74%
47f. Rolling Loess Prairies	9,120,039	25%	13%	27%	2%	42%	54%
47m. Western Loess Hills	1,012,938	3%	19%	25%	1%	45%	52%
52. The Driftless Area	1,783,771	5%	27.5%	29.7%	2.7%	60%	36%
52b. Paleozoic Plateau/ Coulee Section	1,492,085	4%	32%	31%	3%	66%	30%
52c. Rochester/ Paleozoic Plateau Upland	291,686	1%	6%	23%	0%	29%	66%
72. Interior River Valleys & Hills	426,908	1%	14%	13.8%	8%	36%	50%
72d. Upper Mississippi Alluvial Plain	426,908	1%	14%	14%	8%	36%	50%
Total Acres	36,002,469	100%	-	-	-	-	-

[1]See Map 4- 1 and Map 4- 2 for locations of ecoregions. See Chapter 2 for more detailed descriptions of ecoregions. Grasslands class includes pastures. The remainder of the landcover for each Ecoregion is a combination of developed areas and open water.

Aquatic Habitat Classes

The aquatic habitat types chosen for use in the IWAP are displayed in **Table 4- 5**. In the natural world, there is no clear delineation between these aquatic habitat classes. Creeks grade into streams and streams grade into rivers. There are many sizes of water bodies between small ponds and large lakes. Shallow natural lakes, or open water marshes, provide a significant transition between lakes and streams. They are extremely sensitive to fluctuations in water quality, water level and invasive species. Aquatic classes may show differences in flow rate, bottom substrate, water quality and clarity, water temperature and dissolved oxygen content as well as differences in associated plant and animal species. Aquatic species utilizing vegetated herbaceous wetlands are included in the Wetland terrestrial habitat class (**Table 4- 1**).

Defining aquatic habitat classes helps describe the ecological need of aquatic species in a way that allows conservationists to focus on undertaking conservation actions in the right places for the right species. In addition, the following classes are all able to be mapped and therefore these classifications can be used to stratify the survey designs for aquatic organisms.

Table 4- 5. Aquatic Habitat Classes Used in the IWAP

Aquatic Habitat	Description
River	Large flowing bodies of water. Third order and lower (larger). The Mississippi is a 10th order river.
Stream **A. Warm Water** **B. Cold Water**	Smaller flowing bodies of water that serve as tributaries to rivers. The stream class includes first and second order streams. Also referred to as headwater streams.
On-stream Impoundment	Slowly flowing bodies of water formed from artificial damming of a river, or stream, generally less than 500 acres in size and having a watershed to lake ratio >80:1.
Federal Flood Control Reservoirs	Iowa has 4 federal flood control reservoirs: Saylorville, Red Rock, Coralville, and Rathbun.
Mississippi River Pools	Pools on the Mississippi River caused by the construction of the lock and dam system.
Backwater	Slow flowing bodies of water associated with larger river systems. Back-channel low-lying areas filled with water during high flow events but may be completely isolated from the river during low flow and may exhibit no flow during these periods. They are especially prevalent on the Mississippi River.
Oxbow	A sub-class of backwaters, they are water bodies formed in old river channels that are now cut off from the main channel and flow of a river.
Lake **A. Natural** **B. Constructed**	Large bodies of water exhibiting little or no flow with emergent vegetation over less than 25% of the surface area. "Publicly owned lake" means any constructed or natural lake having a watershed acreage-to-lake surface area ratio of less than 80 to 1 and owned by an Iowa county or municipal government or by the state of Iowa. (IAC 571 Chapter 31)
Shallow lake	Open freshwater systems where maximum depth is less than 10 feet. Normally in a permanent open water state due to the altered hydrology of watersheds and unmanaged outlet structures that maintain artificially high water levels. May be fringed by a border of emergent vegetation in water depths less than 6 feet. When clear, they are dominated by emergent and submergent vegetation.
Pond	Smaller standing body of water, less than 10 acres in size.
Surface Mines	Surface mines are artificial water bodies in excavated basins, often the result of sand and gravel mining operations, or resulting from excavations to provide fill materials for roadway construction like overpass ramps on major highways.

Iowa has over 19,000 miles of interior rivers and streams. There are 87 cold water streams located in northeast Iowa with a combined length of 266 miles. The 25 largest interior rivers extend over 3,500 miles and numerous smaller creeks and streams feed each.

All interior rivers and streams are part of either the Mississippi or the Missouri River systems. The Mississippi River watershed is 38,860 square miles (69 % of Iowa's surface area). The Missouri River drains 17,379 square miles (31%).

An oxbow is formed when a river channel changes course and sediments block the entrance and exit of a meander in the old channel. Large oxbows are found along the Missouri and Mississippi Rivers and smaller, pond-like oxbows are found along many interior rivers and streams.

There are four US Army Corps of Engineers flood control reservoirs on the Des Moines River (Saylorville and Red Rock reservoirs), the Iowa River (Coralville Reservoir) and the Chariton River (Rathbun Reservoir).

Natural lakes are most common in the Loess Prairies and the Des Moines lobe ecoregions. Thirty-one major natural lakes with a combined surface area of almost 29,000 acres and 17 marsh-like shallow lakes with over 3,000 acres of combined surface area are still present in Iowa in spite of the extensive drainage of the past 150 years.

Constructed lakes include recreational lakes, municipal water supplies, river impoundments and surface mine lakes. These are generally small; less than one-fourth of these are over 100 acres. More than 200 man-made dams on rivers, streams and creeks impound areas ranging from 15 acres to 19,000 acres.

There are more than 87,000 ponds statewide. Most are in the Rolling Loess Prairies and Central Irregular Till Plains ecoregions, south of Iowa Highway 92. Ponds are generally less than 10 acres. An estimated 53% of Iowa's surface water area is in private ownership, and that vast majority of that acreage is in farm ponds.

Wetlands are transitions between terrestrial and aquatic systems and have saturated soil for a majority of the growing season. All wetlands have three things in common: hydric soils, a hydrology, and the presence of aquatic plants. Many different wetland classifications exist. In general, wetlands can be classified as:

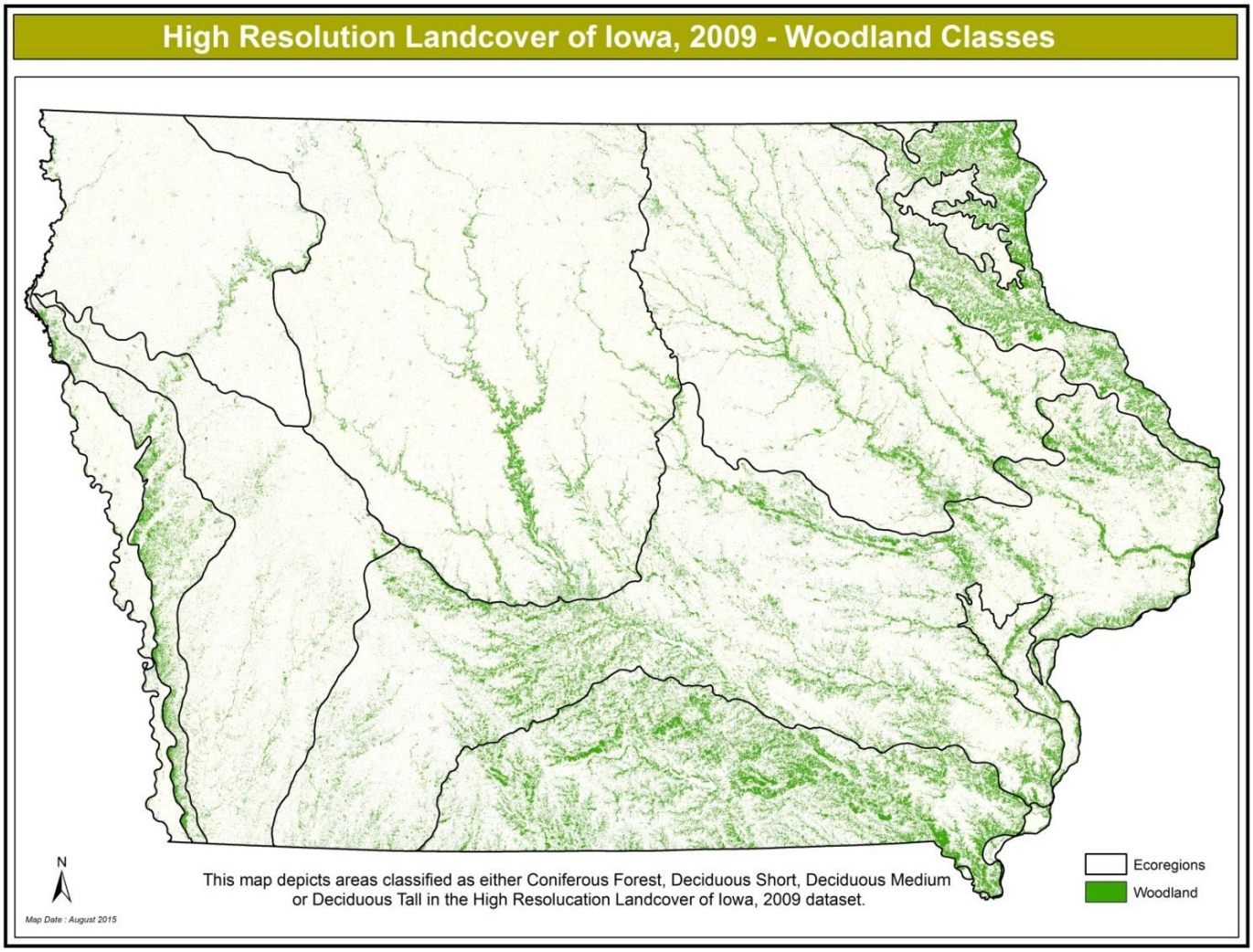
- Marshes, open and unforested wetlands dominated by cattails, sedges and grasses;
- Wet meadows which are dominated by sedges with very shallow water levels or are just saturated to soil level;
- Bogs and fens which are made up of unique living plants over partially decomposed organic matter (peat).

Wetlands in these categories are included with the terrestrial habitat classes under Wetlands (Table 4-1).

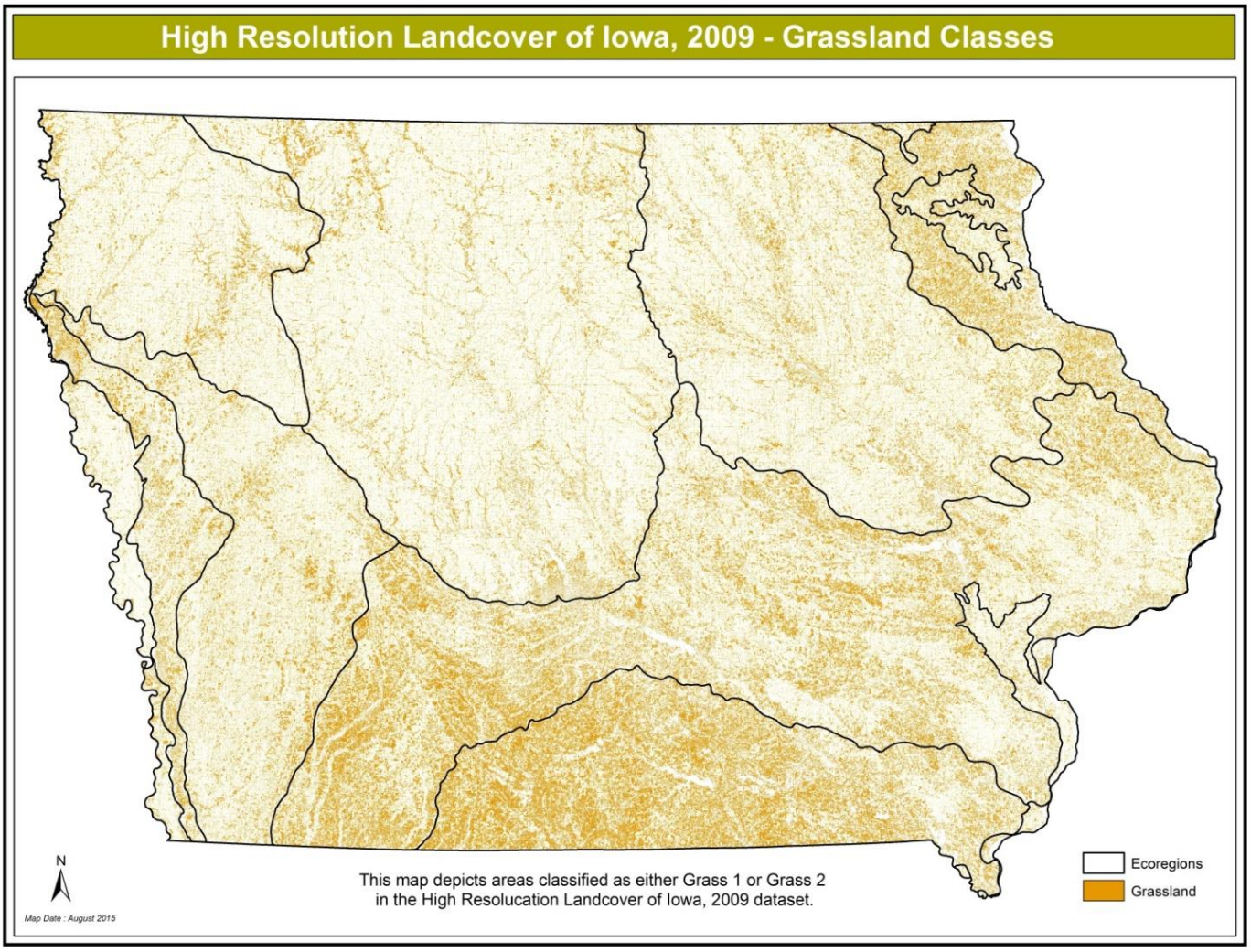
Habitat Maps

The maps on the following pages give a visual impression of the distribution of wildlife habitats, and they highlight two problems that are discussed later in the Plan. Most habitat blocks are small and highly fragmented compared to Iowa's original landscape. A century of sub-dividing the land for agricultural purposes has left few large blocks in any vegetative cover except for row crops. For example, 45% of Iowa’s forests exist in patches less than 100 acres in size (Flickinger et al. 2010). This has implications for area-sensitive species that require large blocks of habitat to survive or reproduce successfully. It may also make it difficult for less mobile species to pioneer new habitats or to find replacement habitat if their habitat patch is destroyed or altered unacceptably.

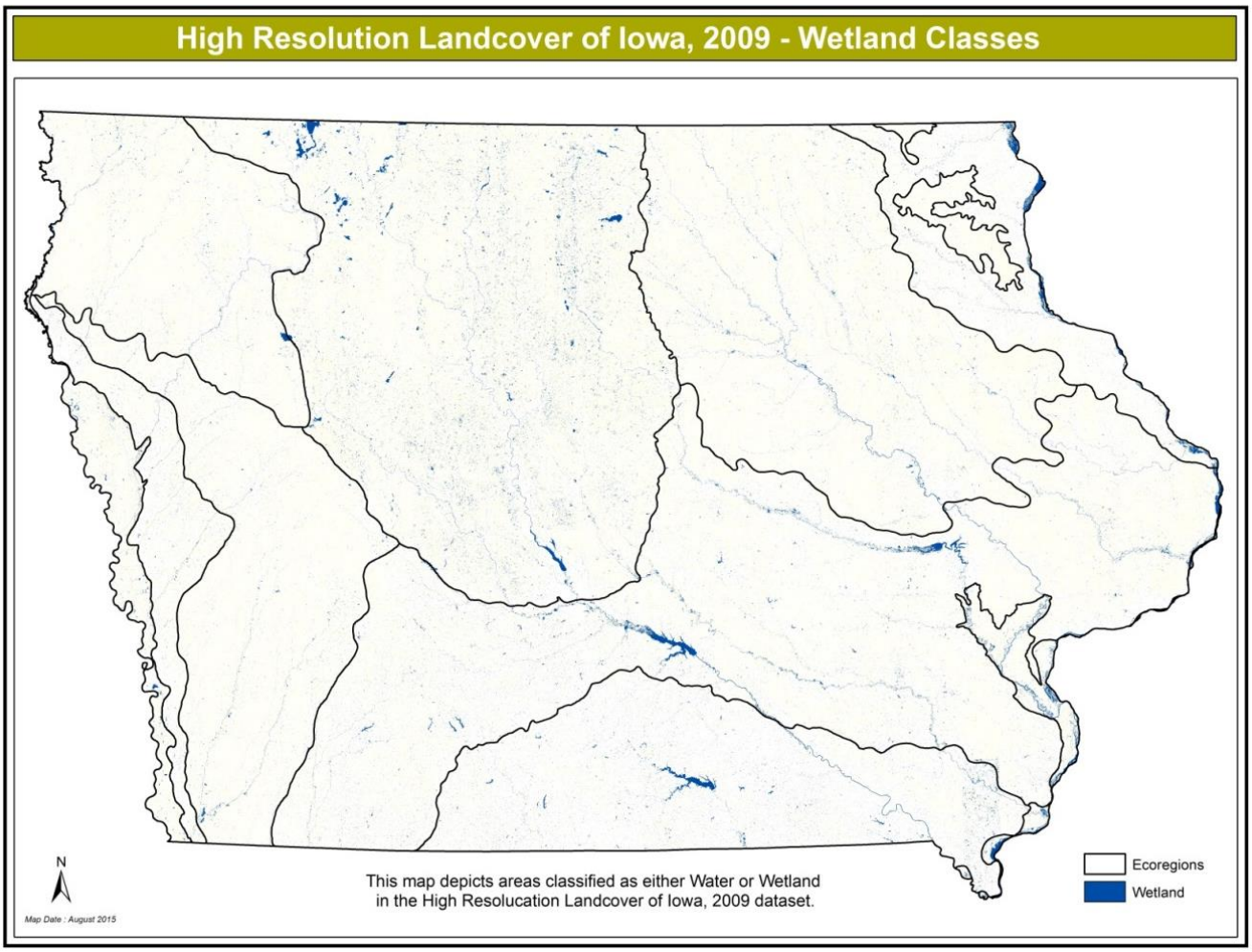
Map 4- 4. Forest & Woodland Land Cover



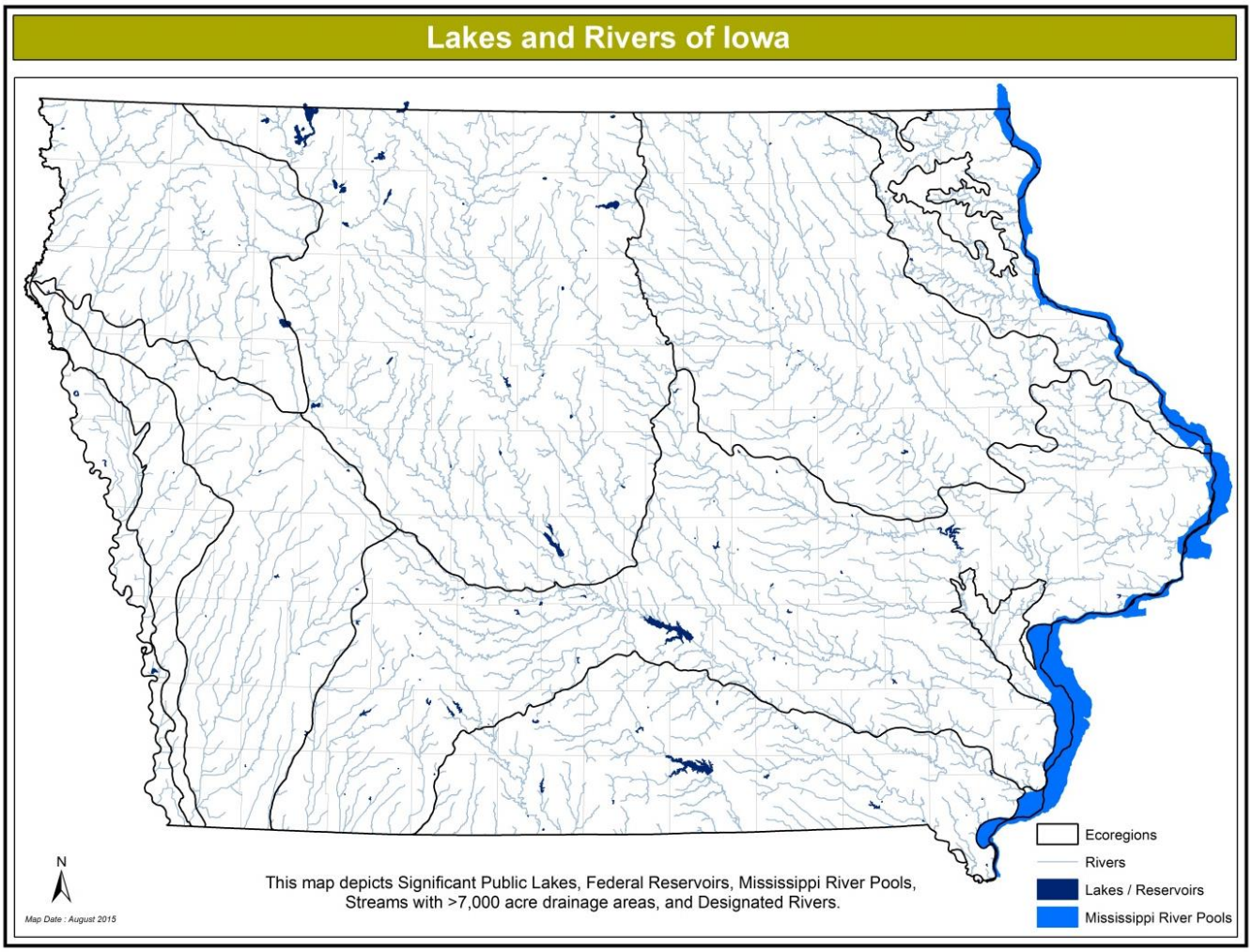
Map 4- 5. Grassland Land Cover



Map 4- 6. Wetland Land Cover



Map 4- 7. Major Lakes and River Systems of Iowa (Source: Iowa DNR)



Habitat Preferences of SGCN

The Wildlife Working Groups' Taxonomic Subcommittees assigned each SGCN to a habitat class or classes. Aspects of each species' biology and behavior complicated this process. Some are generalists and can occupy a variety of habitats; others have very narrow habitat tolerances. Some species require different habitats at different stages in their life cycles, at different seasons of the year or at different times of the day. Working Groups identified those habitats that were considered to be the most critical or limiting to the species distribution and abundance in Iowa. Habitat preferences are taken from the existing literature and do not necessarily include all of the terrestrial and aquatic habitat classes listed in this Plan. Habitat preferences for individual SGCN are found in Appendix 18.

Appendix 19 displays SGCN with common habitat preferences grouped into the habitat classes used in this Plan. Species with more than one preferred habitat were listed in each class. Groupings of SGCN by habitat class give a very general overview useful for identifying habitat protection or restoration priorities at the landscape level. Detailed habitat management plans for SGCN must consider their entire individual habitat needs.
Habitat management guidance documents are developed and updated as information becomes available, and therefore not provided within the Plan.

Flowing water aquatic habitats had the greatest number of SGCN of any habitat class, followed by wetlands (See Appendix 19, Table 19-11). The number of aquatic SGCN nearly equals the number of terrestrial species, yet surface water covers just 1% of Iowa. Aquatic and semi-aquatic taxa had the highest percentage of their species listed as SGCN (Table 3-2).

Priorities for Habitat Protection

Given the lack of natural areas remaining in Iowa, general strategies for prioritization of habitat protection tend to focus on enlarging the size of habitat complexes, reducing fragmentation, and increasing connectivity between larger areas of habitat. However, there are many species that have very specific habitat requirements, and some of those specialist species require habitats that are rare in Iowa or particularly sensitive to human disturbance. Thus, conservation of wildlife will require an approach that addresses both coarse-scale as well as fine-scale habitat needs.

Landscape-Scale Prioritization

Land protection not only provides habitat for wildlife and recreational opportunities for people, but also offers opportunities to maintain and restore ecosystem functions such as water filtration, flood abatement, carbon storage, etc. Intact ecosystems tend to provide more benefits and are more resilient to outside stressors. Therefore, land protection efforts in Iowa should continue to focus on the following principles:

1. Development of functional landscapes – adding parcels to existing protected areas to create core areas of fish and wildlife habitat.
2. Decreasing fragmentation – using land protection to decrease the number of edges between habitat and non-habitat areas.
3. Increasing connectivity – protecting and/or managing for wildlife use of areas between existing habitat core areas to facilitate movement between these areas.
4. Protection of native sod – protecting and/or managing for remnant prairies or other areas which have not been previously plowed. (See Iowa Tallgrass Prairie Working Group, 2013 for more information on this principle and how it's applied.)

Rare and Sensitive Communities

Land protection and management efforts in Iowa should also continue to focus on preservation of rare and/or sensitive ecological communities, which in turn support rare wildlife species. Some of Iowa's unique landforms or natural communities are of global significance. For example, the Loess Hills of western Iowa comprise one of the most extensive Loess deposits in the world. Below are descriptions of important rare and sensitive communities in Iowa.

The following descriptions are all adapted from NatureServe Explorer (Faber-Langendoen et al. 2012).

1. Sand Prairie –This system is found in the northern Midwest, particularly in Minnesota, Wisconsin, Michigan, and possibly ranging into Ontario. It is often found on glacial features such as kames, eskers, moraines, lakeplains (though excluding the Great Lakes lakeplain) and sandplains, and along eolian dunes. In contrast to the deeper, richer soils supporting other tallgrass systems in the region, the underlying soils in this system tend to be more shallow, sandy, rocky, and/or gravelly outwash soils. Organic content is significantly lower. Fire and drought are the major dynamics influencing this system. If fire and periodic drought are not present, woody species begin to invade this system, especially in the eastern parts of its distribution. Wind can also

play a role, especially on examples found on sandplains and/or eolian dunes. (From NatureServe North-Central Interior Sand and Gravel Tallgrass Prairie).

2. North-Central Interior Shrub-Graminoid Alkaline Fens - This fen system is found in the glaciated portions of the Midwest and southern Canada. Examples of this system can be located on level to sloping seepage areas, in pitted outwash or in kettle lakes associated with kettle-kame-moraine topography. Groundwater flows through marls and shallow peat soils, and groundwater is typically minerotrophic and slightly alkaline. Examples of this system contain a core fen area of graminoids surrounded by shrubs. Alterations in wetland hydrology and agricultural development can threaten examples of this system. (From NatureServe Explorer - North-Central Interior Shrub-Graminoid Alkaline Fen).

   Algific Talus Slopes and Goat Prairies - This system is found in the driftless regions of southeastern Minnesota, southwestern Wisconsin, and northern Iowa and Illinois. This region was not glaciated like the surrounding areas and thus is predominated by rolling hills and bluff outcrops. This system is found primarily on blufftops and dry upper slopes along the Upper Mississippi River. This system contains a mosaic of woodlands, savannas, prairies and sparsely vegetated limestone, dolomite, and/or sandstone outcrops, with occasional talus, especially algific talus. Soils range from thin to moderately deep and are moderately to excessively well-drained with a high mineral content. Historically, fire was the most important dynamic maintaining these systems, however, fire suppression within the region has allowed more canopy cover and thus very few prairie openings remain. Algific talus harbors a number of unusual Pleistocene relict species, including plants and snails. (From NatureServe Paleozoic Plateau Bluff and Talus).

3. Prairie remnants -
   a. *Central Tallgrass Prairies* - this system is found primarily in the Central Tallgrass Prairie ecoregion ranging from eastern Kansas and Nebraska to northwestern Indiana. This system differs from other prairie systems to the north and south by being the most mesic with primarily deep, rich Mollisol soils. These soils are usually greater than 1 meter deep. This system is dominated by tallgrass species such as *Andropogon gerardii*, *Sorghastrum nutans*, and *Panicum virgatum*. These species typically grow to 1-2 m tall in the rich soils found in this system. Other mid- and shortgrass species, such as *Bouteloua curtipendula*, *Hesperostipa spartea*, and *Schizachyrium scoparium*, are usually present and can be common or locally dominant on patches of this system, particularly slopes or other areas with drier habitats. Several forb species are also associated with this system making it one of the most diverse grassland systems. As many as 300 herbaceous plant species could occur in this system across its range. The environment and habitat of this system do not prevent invasion by shrubs and trees. High-quality examples of this system have trees and shrubs widely scattered or clustered in areas that are wetter and/or more sheltered from fire than the surrounding grassland. Fire, drought, and grazing are the primary natural dynamics influencing this system and help prevent woody species from invading. However, conversion to agriculture has been the prime disturbance since post-European settlement. The rich soils and long growing season make this an ideal location for farming row crops, and as a result very few examples of this system remain.
   b. *Northern Tallgrass Prairie* - This system is found primarily in the Northern Tallgrass ecoregion ranging along the Red River basin in Minnesota and the Dakotas to Lake Manitoba in Canada. It constitutes the northernmost extension of the "true" prairies. Similar to Central Tallgrass Prairie (described above) this system is dominated by tallgrass species such as *Andropogon gerardii*, *Sorghastrum nutans*, and *Panicum virgatum*. However, the soils in this region are not as rich or deep, and thus this

system does not have as much species diversity as grasslands to the south. This system is often found on well-drained, drier soils. Grazing and fire influenced this system historically. Much of this system has been converted to agriculture with very few unaltered and highly fragmented examples remaining.

4. Great Plains Prairie Potholes - The prairie pothole system is found primarily in the glaciated northern Great Plains of the United States and Canada, and is characterized by depressional wetlands formed by glaciers scraping the landscape during the Pleistocene era. This system is typified by several classes of wetlands distinguished by changes in topography, soils and hydrology. Many of the basins within this system are closed basins and receive irregular inputs of water from their surroundings (groundwater and precipitation), and some export water as groundwater. Hydrology of the potholes is complex. Precipitation and runoff from snowmelt are the principal water sources, with groundwater inflow secondary. Evapotranspiration is the major water loss, with seepage loss secondary. Most of the wetlands and lakes contain water that is alkaline (pH >7.4). The concentration of dissolved solids result in water that ranges from fresh to extremely saline. The flora and vegetation of this system are a function of the topography, water regime, and salinity. In addition, because of periodic droughts and wet periods, many wetlands within this system undergo vegetation cycles. This system includes elements of aquatic vegetation, emergent marshes, and wet meadows that develop into a pattern of concentric rings. This system is responsible for a significant percentage of the annual production of many economically important waterfowl in North America and houses more than 50% of North American's migratory waterfowl, with several species reliant on this system for breeding and feeding. Much of the original extent of this system has been converted to agriculture, and only approximately 40-50% of the system remains undrained. (From NatureServe Great Plains Prairie Potholes).

5. Oak Savanna - This system is found primarily in the northern glaciated regions of the Midwest with the largest concentration in the prairie-forest border ecoregion. It is typically found on rolling outwash plains, hills and ridges. Soils are typically moderately well- to well-drained deep loams. This system is typified by scattered trees over a continual understory of prairie and woodland grasses and forbs. Quercus macrocarpa is the most common tree species and can range from 10-60% cover. The understory is dominated by tallgrass prairie species such as Andropogon gerardii and Schizachyrium scoparium associated with several forb species. Historically, frequent fires maintained this savanna system within its range and would have restricted tree canopies to 10-30%. Fire suppression in the region has allowed trees to establish more dense canopies. Periodic, strong wind disturbances and browsing also impact this system. Much of this system has also been converted to urban use or agriculture, and thus its range has decreased considerably. (From NatureServe North Central Interior Oak Savanna).

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Chapter Five

Conservation Challenges Facing Iowa's Wildlife and Habitats

Required Element #3: "Descriptions of problems which may adversely affect the state's wildlife species identified in required element #1 or their habitats…"

Assessing Threats to Iowa's Wildlife and Habitats

DNR fisheries and wildlife biologists, and Implementation Committee and Working Group members that had the appropriate expertise and experience identified and evaluated the most important problems facing Iowa's wildlife today. Four threat impact levels – Low, Medium, High, or Very High – were used to evaluate the relative importance of each threat, taking into account both the scope and the severity of each threat (**Table 5- 1**).

Separate evaluations were made for each taxonomic class (Chapter 3, Table 3-1) and each habitat class (Chapter 4, Table 4-1 and Table 4-5). The results of these evaluations are summarized in Tables 5-4 through 5-15. Further details are displayed in Appendix 20.

In addition, Appendix 21 explores potential threats to wildlife resulting from climate change. That Appendix provides a summary of the findings from a project conducted from 2009-2011 to assess the climate change vulnerability of Iowa's Species of Greatest Conservation Need.

Table 5- 1. Definitions of Threat Impacts (after the International Union for Conservation of Nature [IUCN] Threat Classification System for calculating threat impact scores).

Threat Impact Calculation		Scope			
Severity		Pervasive	Large	Restricted	Small
	Extreme	Very High	High	Medium	Low
	Serious	High	High	Medium	Low
	Moderate	Medium	Medium	Low	Low
	Slight	Low	Low	Low	Low

The items on the list represent *potential* threats, which require interpretation based on the biology of the species or habitats being evaluated. The list of threats should not be interpreted as a list of things that are bad for wildlife. Rather, it is a framework from which to evaluate potential threats, stresses, or conservation challenges for wildlife for the purpose of identifying the most effective means of conserving healthy wildlife populations.

Defining Threats

In 2002, a coalition of global conservation practitioners joined together and formed the Conservation Measures Partnership (CMP). The Partnership's mission is to 'advance the practice of conservation by developing, testing, and promoting principles and tools to credibly assess and improve the effectiveness of conservation actions. The partnership includes non-governmental conservation organizations such as National Audubon Society, The Nature Conservancy, Wildlife Conservation Society, and World Wildlife Fund, as well as governmental entities such as the US Fish and Wildlife Service, and the US Agency for International Development. You can read more about the Partnership at their website: http://www.conservationmeasures.org/.

In 2004, CMP developed the first edition of the "Open Standards for the Practice of Conservation" which has since been updated in 2007 and 2013.

One outcome of this partnership that is also a building block for increasing collaboration is the development of a "standard lexicon" for conservation, including a taxonomy, or hierarchy, of threats and conservation actions (Salafsky et al. 2008). Adopting the use of the standard terminology allows conservationists operating at any spatial scale to share information and experiences, facilitating learning and improvement among conservation practitioners. The 2015 revision of the IWAP makes use of this standard lexicon for the classification of threats and actions in order to increase the ability of our threats and actions to be compared across state lines or other political boundaries. This helps make clear how the IWAP fits in as one piece of regional, national, or even global efforts to conserve wildlife. Aside from a small number of additions, the use of this taxonomy does not substantially change the threats listed in the 2012 or 2006 versions of the IWAP; rather, it clarifies some of them and re-organizes them into a multilevel system. Before listing these threats, it will be helpful to review relevant definitions which describe the general elements of conservation projects. These definitions will be relevant to this chapter as well as the following chapter which addresses conservation actions.

Definitions

(adapted from Salafsky et al. 2008)

- *Focal Conservation Target* or *Biodiversity Target*: The biological entities (species, communities, or ecosystems) that a project is trying to conserve (e.g., a population of a specific species of fish or a forest ecosystem). Some practitioners also include ecological and evolutionary phenomena and processes (e.g., migration, speciation) as targets.
- *Stresses:* Attributes of a conservation target's ecology that are impaired directly or indirectly by human activities (e.g., reduced population size or fragmentation of forest habitat). A stress is not a threat in and of itself, but rather a degraded condition or "symptom" of the target that results from a direct threat.
- *Direct Threats:* The proximate human activities or processes that have caused, are causing, or may cause the destruction, degradation, and/or impairment of focal conservation targets (e.g., unsustainable fishing or logging). Direct threats are synonymous with *sources of stress* and *proximate pressures*. Threats can be past (historical), ongoing, and/or likely to occur in the future. Natural phenomena are also regarded as direct threats in some situations.
- *Contributing Factors:* The underlying factors, usually social, economic, political, institutional, or cultural, that enable or otherwise add to the occurrence or persistence of proximate direct threats. There is typically a chain of contributing factors behind any given direct threat.
- *Conservation Actions:* Interventions undertaken by conservationists designed to achieve conservation goals (e.g., establishing an ecotourism business or setting up a protected area). Actions can be applied to contributing factors, direct threats, or directly to the targets themselves.
- *Project Teams:* The groups of people involved in designing, implementing, managing, and monitoring projects (e.g., a partnership between a local nongovernmental organization and a community or the staff of a national park).

Threats Taxonomy

Appendix 22 displays the full list and definitions of Level I and II Threats, as developed for the global conservation community by the Conservation Measures Partnership. Several of the threats included in the full list are, thankfully, not relevant or exceedingly improbable in Iowa within the next few decades (e.g. Geological Events such as Volcanoes or Avalanches). Table 5-3 lists these threats and provides examples and explanations relevant to Iowa.

For those threats that are negligible in Iowa (e.g. tsunamis and avalanches), The "Scope" portion of the assessments address the low likelihood or limited spatial distribution of these issues in Iowa. The "Severity" portion of the threat assessments take into account the *potential* impact that could occur. Thus, several items that appear clearly detrimental to wildlife will still be rated as "negligible" if they do not occur on at least 1% of Iowa's landscape currently and have a low likelihood of occurring over the next 10-20 years. Similarly, several low and moderate values may result in an overall ranking of high due to the fact that multiple threats may interact with each other resulting in a combined effect that is worse than any of the threats on its own (Table 5-2).

Table 5- 2. Algorithm for assigning overall threat impact for a target across all threats (after the International Union for Conservation of Nature [IUCN] Threat Classification System for calculating threat impact scores).

Impact Values of Level 1 Threat Categories	Overall Threat Impact
≥1 Very High, *OR* ≥2 High, *OR* 1 High + ≥2 Medium	**Very High**
1 High, *OR* ≥3 Medium, *OR* 2 Medium + 2 Low, *OR* 1 Medium + ≥3 Low	**High**
1 Medium, *OR* ≥4 Low	**Medium**
1-3 Low	**Low**

Table 5- 3. Threat taxonomy for Iowa's wildlife and habitats.

Level I Threats	Iowa-specific explanations and examples
1. Residential & Commercial Development	Threats from human settlements or other non-agricultural land uses with a substantial footprint.
1.1 Housing & Urban Areas	• Conversion of natural vegetation to residential uses, resulting in less area for wildlife to occupy. • As amount of impervious surfaces increase, the amount of land with infiltration capacity is reduced, causing stormwater runoff to end up in rivers and streams. • Changes to shorelines of waterbodies that may result in loss of vegetation and increased bank erosion.
1.2 Commercial & Industrial Areas	• Conversion of natural vegetation to industrial uses, resulting in less area for wildlife to occupy and reduction of infiltration capacity of land as impervious surfaces increase.
1.3 Tourism & Recreation Areas	• Degradation or destruction of habitat for the purpose of fulfilling recreational goals in an area and the increased risk of negative human-wildlife interactions associated with human use of an area. The threats associated with this vary in severity depending on recreational goals. For example, the landscape changes and land use practices associated with golf courses have a more significant impact on wildlife than hiking trails.
2. Agriculture & Aquaculture	Threats from farming and ranching as a result of agricultural expansion and intensification, including silviculture, mariculture and aquaculture.

Level I Threats	Iowa-specific explanations and examples
2.1 Annual & Perennial Non-Timber Crops	• Large fields lacking natural vegetation cover (exposing bare soil) for many months of the year, and supporting corn and soybeans during the growing season. • Fragmentation of large tracts of a given habitat type into smaller areas. • Loss of connectivity by the introduction of breaks into linear habitats that had previously connected areas of habitat to each other. • The removal of vegetation in or adjacent to bodies of water which may lead to increased flooding, siltation, and water temperatures. • Removal of wildlife species associated with negative impacts on agricultural productivity.
2.2 Wood & Pulp Plantations	• Stands of trees planted for wood or pulp industries. Assessments reflect the relatively small scope and *potential* severity of the wood and pulp industry, which is currently very limited in Iowa.
2.3 Livestock Farming & Ranching	• The use of grazing in such a way that it is detrimental to wildlife, for example, using too heavy of a stocking rate, grazing too early or late in the growing season resulting in habitat loss, including loss of residual winter cover for wildlife and alteration of the species composition of pastures and woodlands. • Physical damage to stream banks and riparian vegetation caused by livestock which increases the risk of erosion in an area.
2.4 Marine & Freshwater Aquaculture	• Potential impacts of stocking predatory fishes on populations of other fishes, amphibians, and dragonflies and damselflies. • Removal of predators to fish such as otters.
3. Energy Production & Mining	Threats from production of non-biological resources.
3.1 Oil & Gas Drilling	• Exploring for, developing, and producing oil or gas. Assessments reflect the relatively small scope and *potential* severity of the oil and gas drilling industry, which is currently very limited in Iowa
3.2 Mining & Quarrying	• Rock/gravel mines can open up suitable habitat for some species but destroy suitable habitat for others through forest clearing, earth removal, and water collection on site. • Frack sand mine development.
3.3 Renewable Energy	• Wind energy development that reduces the suitability of habitat by altering how wildlife uses an area and causes direct mortalities through collisions (esp. birds and bats) of wildlife with wind turbines. • Corn ethanol production (leading to increased acres in corn). Removal of corn stover from cropfields for biofuel production, use of non-native plants for biofuel development, harvest of native grasses for biofuel production.
4. Transportation & Service Corridors	Threats from long narrow transport corridors and the vehicles that use them, including associated wildlife mortality.
4.1 Roads & Railroads	• Habitat loss, fragmentation, and the opening of blocks of habitat to detrimental intrusions. • Direct mortality of wildlife being struck by vehicles. • Increased risk to habitat of spills on roadways or railroads and restriction of potential for habitat restoration in an area.
4.2 Utility & Service Lines	• Fragmentation of habitat associated with opening up an area for erecting wires and constructing service roads. • Direct mortality through collisions of wildlife with wires (esp. birds).
4.3 Shipping Lanes	• Dredging to maintain shipping channels. Development of shipping lanes was the primary reason for channelization of the Missouri River and development of the lock and dam system in the Mississippi River, altering the natural processes of Iowa's border rivers.
4.4 Flight Paths	• Destruction and fragmentation of habitat that occurs when establishing in airport. • Removal of species that may attempt to use an airport facility for breeding or foraging. • Restriction of habitat restoration potential associated with an area near an airport due to efforts to prevent wildlife related accidents on site.
5. Biological Resource Use	Threats from consumptive use of "wild" biological resources including both deliberate and unintentional harvesting effects; also persecution or control of specific species.

Level I Threats	Iowa-specific explanations and examples
5.1 Hunting and Collecting Terrestrial Animals	• Illegal taking of any species as well as illegal pet trade (especially pertaining to turtles).
5.2 Gathering Terrestrial Plants	• Gathering plants from natural areas impacting the natural vegetation.
5.3 Logging & Wood Harvesting	• Timber harvest is not a threat *per se*, but the method, extent, and timing of harvest may affect the habitat available for wildlife, particularly SGCN.
5.4 Fishing & Harvesting Aquatic Resources	• Detrimental over-use of aquatic species for recreational or commercial purposes.
6. Human Intrusions & Disturbance	Threats from human activities that alter, destroy and disturb habitats and species associated with non-consumptive uses of biological resources.
6.1 Recreational Activities	• Detrimental over-use of natural areas that degrades wildlife habitat or deters wildlife from using an area. • Recreational activities conducted outside of designated areas that destroys sensitive habitat. • Direct wildlife mortality through collisions with motor-boats, snowmobiles, ATVs, etc.
6.2 War, Civil Unrest & Military Exercises	• Assessments reflect the relatively small scope and *potential* severity of war and military exercises, which is currently very limited in Iowa.
6.3 Work & Other Activities	• Mowing of roadways or other grasslands, planting, cultivation, harvesting of crop fields.
7. Natural Systems Modification	Threats from actions that convert or degrade habitat in service of "managing" natural or semi-natural systems, often to improve human welfare.
7.1 Fire & Fire Suppression	• Excessive or untimely fire management that may kill individual animals, destroy habitats or alter habitats at critical life stages for SGCN. • The removal of fire as a natural succession resulting in the conversion of grasslands to woody habitat containing shrubs or trees.
7.2 Dams & Water Management/Use	• Removal of surface water from lakes and wetlands (and associated alteration of water table and groundwater flows). • The inundation of terrestrial habitats caused by man-made dams and the alteration of natural seasonal occurrence of floods associated with these structures. • Structures on flowing rivers and streams that impound water, resulting in altered aquatic habitats, decreased flow rates and increased siltation above the structure as well as creating a barrier to fish movement. • 95% of pothole wetlands drained and converted to agriculture. • Channelization - The straightening of stream channels leading to decreased stream lengths, increased flow rates, and increased frequency of flooding. • Shoreline/bank erosion – siltation originating from the bank or shoreline of a body of water. • Loss of submerged/emergent plants – the loss of rooted plants in the water that may result in altered aquatic habitats. • Streambed degradation - the lowering of the bed of a flowing body of water due to increased scouring action resulting from increased flow rates and altered hydrology.
7.3 Other Ecosystem Modifications	• Rip rap along shorelines of rivers and lakes, removal of snag trees from woodlands or from river and streams removing habitat for fish and wildlife.
7.4 Removing/Reducing Human Maintenance	• Loss of management on Iowa's wetlands, grasslands, and forests leads to succession and invasive species encroachment.
8. Invasive & Other Problematic Species & Genes	Threats from non-native and native plants, animals, pathogens/microbes, or genetic materials that have or are predicted to have harmful effects on biodiversity following their introduction, spread and/or increase in abundance
8.1 Invasive Non-Native/Alien Plants & Animals	• The proliferation of non-native species that outcompete or prey upon native species, or cause habitat degradation (e.g. feral hogs destroying habitat, household pets preying on wildlife, zebra mussels and other aquatic nuisance species outcompeting native aquatic species, exotic honeysuckle outcompeting native species, Emerald Ash Borer altering woodlands by killing ash trees, etc.).

Level I Threats	Iowa-specific explanations and examples
8.2 Problematic Native Species	• The proliferation of native species that outcompete or prey upon other species, or cause habitat degradation (e.g. insect damage, encroachment of native woody species into grasslands, willows or cottonwood trees into wetlands, over-abundance of mesopredators impacting other species reproduction or survival, etc.).
8.3 Introduced Genetic Material	• Risk of pesticide resistance genes spreading to non-target species, genetic swamping of local populations through releases of lab-raised individuals (e.g. release of butterflies at special events), habitat restoration projects using non-local seed stock, genetically modified insects for biocontrol, genetically modified trees.
8.4 Pathogens & Microbes	• Disease and pathogens that affect wildlife and their habitats (e.g. Chytrid fungus and ranavirus in amphibians, snake fungus disease in reptiles, white-nose syndrome decimating bat populations, highly pathogenic avian influenza in birds, chronic wasting disease in cervids, chronic wasting disease prions adhering to plants, oak wilt, bur oak blight, and Dutch elm disease)
9. Pollution	Threats from introduction of exotic and/or excess materials or energy from point and nonpoint sources
9.1 Household Sewage & Urban Waste Water	• Nutrient pollution – the excessive addition of nutrients into aquatic systems leading to accelerated eutrophication. • Chemical pollution - the introduction of harmful chemicals into aquatic ecosystems.
9.2 Industrial & Military Effluents	• Chemical pollution - the introduction of harmful chemicals into aquatic ecosystems. Risk of oil spills from pipelines.
9.3 Agricultural & Forestry Effluents	• Deposition of silt and sand sediments in aquatic ecosystems. • Excessive addition of nutrients into aquatic systems leading to accelerated eutrophication. • Pesticides or herbicides applied to agricultural crops that eventually end up in aquatic ecosystems. These products can have direct impacts on animals (eg. Atrazine causing deformities in amphibians) or indirectly affect wildlife by harming the plants that comprise their habitat. • Tile drainage of agricultural fields leading to accelerated transport of surface water to rivers and lakes that decreases the ability of hydrological systems to tolerate large fluctuations in precipitation.
9.4 Garbage & Solid Waste	• Garbage and waste that is improperly disposed of and ends up in the natural environment posing a risk for wildlife and their habitats, (e.g. lead from ammunition, fishing tackle, or other sources being ingested by wildlife directly or by being taken up by plants in the environment, improperly discarded fishing line or other debris entangling wildlife).
9.5 Air-Borne Pollutants	• Aerial application of pesticides in agricultural or urban/suburban areas and associated spray drift that ends up in areas that were not intended to be treated or affects non-target species.
9.6 Excess Energy	• Potential impacts of heated effluents discharged to Iowa's interior and border rivers, light pollution (e.g. ,attracting insects to unproductive areas such as gas stations), sound pollution from airports, highways, or other sources.
10. Geological Events	Threats from catastrophic geological events
10.1 Volcanoes	• Assessments reflect the relatively negligible scope and *potential* severity of volcanic activity, which is currently improbable in Iowa (although even distant volcanic activity could impact Iowa).
10.2 Earthquakes/Tsunamis	• Assessments reflect the relatively negligible scope and *potential* severity of earthquakes, which are currently infrequent and mild in Iowa.
10.3 Avalanches/Landslides	• Assessments reflect the relatively negligible scope and *potential* severity of avalanches, which are currently improbable in Iowa given the relative lack of topographic relief in the state.
11. Climate Change and Severe Weather	Threats from long-term climatic changes which may be linked to global warming and other severe climatic/weather events that are outside of the natural range of variation, or potentially can wipe out a vulnerable species or habitat

Level I Threats	Iowa-specific explanations and examples
11.1 Ecosystem Encroachment	• As ranges of plant species contract, expand or shift, the plant communities that wildlife inhabit will change, and could encroach upon adjacent systems.
11.2 Changes in Geochemical Regimes	• In the Midwest, summertime precipitation has become more variable, leading to more frequent periods of drought and more frequent intense rainfall events.
11.3 Changes in Temperature Regimes	• Broad scale changes in temperature, fluctuations or extremes in temperatures in a geographical area. Even small increases in mean temperature are correlated with more frequent extreme temperature events. In Iowa, temperature increases have been more pronounced in winter and during nighttime.
11.4 Changes in Precipitation & Broad-Scale Hydrological Regimes	• Broad scale changes in precipitation, fluctuations or extremes in precipitation in a geographical area. • Increases in mean precipitation have been most pronounced in the spring, and have been manifested through increasing frequency of intense precipitation events. In the Midwest, summertime precipitation has become more variable, leading to more frequent periods of drought and more frequent intense rainfall events. Intense precipitation events increase soil erosion and flood risk.
11.5 Severe/Extreme Weather Events	• Fluctuations or extremes in precipitation in a geographical area (e.g., thunderstorms, tornadoes, ice storms, blizzards, dust storms).

Table 5- 4. Threats to Terrestrial Wildlife (including all habitat classes).

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level I Threats	Amphibians	Birds	Butterflies	Land Snails	Mammals	Reptiles
1. Residential & Commercial Development	H	H	M	M	M	H
2. Agriculture & Aquaculture	VH	VH	VH	M	VH	VH
3. Energy Production & Mining	L	H	L	L	M	M
4. Transportation & Service Corridors	H	VH	M	M	H	VH
5. Biological Resource Use	M	H	L	H	H-L	VH
6. Human Intrusions & Disturbance	VH	H	M	L	H	VH
7. Natural Systems Modification	VH	VH	VH	M	VH	VH
8. Invasive & Other Problematic Species & Genes	VH	VH	H	M	H	VH
9. Pollution	H	VH	H	L	VH	VH
10. Geological Events	-	-	-	-	-	-
11. Climate Change & Severe Weather	VH	VH	VH	H	H	H

Table 5- 5. Threats to Aquatic Wildlife (including all habitat classes)

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level I Threats	Crayfish	Dragonflies & Damselflies	Fish	Mussels
1. Residential & Commercial Development	M	H	H	M
2. Agriculture & Aquaculture	M	VH	H	VH
3. Energy Production & Mining	L	M	M	L
4. Transportation & Service Corridors	L	M	L	H
5. Biological Resource Use	L	L	L	M
6. Human Intrusions & Disturbance	-	L	-	M
7. Natural Systems Modification	VH	VH	VH	VH
8. Invasive & Other Problematic Species & Genes	H	M	H	M
9. Pollution	M	VH	M	H
10. Geological Events	-	-	-	-
11. Climate Change & Severe Weather	H-M	VH	H	H

Table 5- 6. Statewide Threats to Amphibians

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Threats were assessed for habitat classes considered most relevant to amphibians.

Level I Threats	Grassland	Rowcrop	Wetland	Woodland
1. Residential & Commercial Development	M	L	M	H
2. Agriculture & Aquaculture	VH	NA	H	H
3. Energy Production & Mining	L	-	L	L
4. Transportation & Service Corridors	M	L	H	H
5. Biological Resource Use	L	-	M	M
6. Human Intrusions & Disturbance	L	VH	-	L
7. Natural Systems Modification	M	VH	H	H
8. Invasive & Other Problematic Species & Genes	L	Unknown	H	H
9. Pollution	L	M	H	M
10. Geological Events	-	-	-	-
11. Climate Change & Severe Weather	H	H	H-M	L
Overall Threat	M	M	VH	VH

Table 5- 7. Statewide Threats to Reptiles

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Threats were assessed for habitat classes considered most relevant to reptiles.

Level I Threats	Grassland	River	Rowcrop	Wetland	Woodland
1. Residential & Commercial Development	M	L	L	M	M
2. Agriculture & Aquaculture	VH	H	NA	H	H
3. Energy Production & Mining	M	-	-	L	L
4. Transportation & Service Corridors	H	M	L	H	H
5. Biological Resource Use	H	VH	-	H	M-L
6. Human Intrusions & Disturbance	H	-	VH	L	M
7. Natural Systems Modification	VH	M	M	H	H
8. Invasive & Other Problematic Species & Genes	H	H	Unknown	H-M	H
9. Pollution	M	H	L	H	L
10. Geological Events	-	-	-	-	-
11. Climate Change & Severe Weather	M	H	M	H-M	M
Overall Threat	VH	VH	M	VH	H

Table 5- 8. Statewide Threats to Birds

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Threats were assessed for habitat classes considered most relevant to birds.

Level I Threats	Grassland	Shrubland	Rowcrop	Woodland	Wetland
1. Residential & Commercial Development	L	M	L	M	L
2. Agriculture & Aquaculture	VH	H	NA	H	H
3. Energy Production & Mining	M	-	M	L	M
4. Transportation & Service Corridors	M	M	M	H	H
5. Biological Resource Use	-	L	M	H-M	L
6. Human Intrusions & Disturbance	H	L	M	M	L
7. Natural Systems Modification	VH	H	VH	H	H
8. Invasive & Other Problematic Species & Genes	VH	H	Unknown	H	H
9. Pollution	H	M	M	H	M
10. Geological Events	-	-	-	-	-
11. Climate Change & Severe Weather	H	M	H	M	H
Overall Threat	VH	VH	M	VH	VH

Table 5- 9. Statewide Threats to Butterflies

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Threats were assessed for habitat classes considered most relevant to butterflies.

Level I Threats	Grassland	Rowcrop	Wetland	Woodland
1. Residential & Commercial Development	L	L	L	L
2. Agriculture & Aquaculture	VH	NA	H	L
3. Energy Production & Mining	L	-	L	L
4. Transportation & Service Corridors	L	L	L	L
5. Biological Resource Use	L	-	-	L
6. Human Intrusions & Disturbance	M	M	L	-
7. Natural Systems Modification	H	L	H	M
8. Invasive & Other Problematic Species & Genes	M	Unknown	H	L
9. Pollution	H	M-L	M	L
10. Geological Events	-	-	-	-
11. Climate Change & Severe Weather	H-M	H	H	M
Overall Threat	VH	M	H	L

Table 5- 10. Statewide Threats to Crayfish

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Threats were assessed for all aquatic habitat classes together, which was considered most relevant to crayfish.

Level I Threats	All Aquatic Habitats
1. Residential & Commercial Development	M
2. Agriculture & Aquaculture	M
3. Energy Production & Mining	L
4. Transportation & Service Corridors	L
5. Biological Resource Use	L
6. Human Intrusions & Disturbance	-
7. Natural Systems Modification	VH
8. Invasive & Other Problematic Species & Genes	H
9. Pollution	M
10. Geological Events	-
11. Climate Change & Severe Weather	H-M
Overall Threat	H

Table 5- 11. Statewide Threats to Dragonflies & Damselflies

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Threats were assessed for habitat classes considered most relevant to Dragonflies & Damselflies.

Level I Threats	Grassland	Rivers	Rowcrop	Wetland	Woodland
1. Residential & Commercial Development	M	L	-	L	L
2. Agriculture & Aquaculture	VH	L	NA	VH	H
3. Energy Production & Mining	L	L	-	L	L
4. Transportation & Service Corridors	L	L	Not a Threat	M	-
5. Biological Resource Use	-	-	-	-	L
6. Human Intrusions & Disturbance	L	-	L	-	-
7. Natural Systems Modification	M	H	VH	VH	-
8. Invasive & Other Problematic Species & Genes	Unknown	Unknown	Unknown	M	Unknown
9. Pollution	L	VH	L	H	-
10. Geological Events	-	-	-	-	-
11. Climate Change & Severe Weather	H	H	H	H	H
Overall Threat	H	VH	L	VH	H

Table 5- 12. Statewide Threats to Fish

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Threats were assessed for all aquatic habitat classes together, which was considered most relevant to fish.

Threat	All Aquatic Habitats
1. Residential & Commercial Development	H
2. Agriculture & Aquaculture	H
3. Energy Production & Mining	M
4. Transportation & Service Corridors	L
5. Biological Resource Use	L
6. Human Intrusions & Disturbance	-
7. Natural Systems Modification	VH
8. Invasive & Other Problematic Species & Genes	H
9. Pollution	M
10. Geological Events	-
11. Climate Change & Severe Weather	H
Overall Threat	VH

Table 5- 13. Statewide Threats to Mammals

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Threats were assessed for habitat classes considered most relevant to mammals.

Level I Threats	Grassland	Rivers	Rowcrop	Wetland	Woodland
1. Residential & Commercial Development	L	L	L	L	M
2. Agriculture & Aquaculture	VH	VH	NA	VH	H
3. Energy Production & Mining	L	-	L	L	L
4. Transportation & Service Corridors	M	L	L	M	M
5. Biological Resource Use	L	-	-	-	H-L
6. Human Intrusions & Disturbance	M	-	M	-	M
7. Natural Systems Modification	H	H	L	VH	M
8. Invasive & Other Problematic Species & Genes	H	L	M	L	M
9. Pollution	L	H	L	H	L
10. Geological Events	-	-	-	-	-
11. Climate Change & Severe Weather	M	H	L	H-M	Not a significant impact within next 10 years
Overall Threat	H	M	L	H	M

Table 5- 14. Statewide Threats to Mussels

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Threats were assessed for all aquatic habitat classes combined which is considered most relevant to mussels.

Level I Threats	All Aquatic Habitats
1. Residential & Commercial Development	M
2. Agriculture & Aquaculture	VH
3. Energy Production & Mining	L
4. Transportation & Service Corridors	H
5. Biological Resource Use	M
6. Human Intrusions & Disturbance	M
7. Natural Systems Modification	VH
8. Invasive & Other Problematic Species & Genes	M
9. Pollution	H
10. Geological Events	-
11. Climate Change & Severe Weather	H
Overall Threat	VH

Table 5- 15. Driftless Area Threats to Terrestrial Snails

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Threats were assessed for the woodland habitat class, which is the most relevant to terrestrial snails.

Level I Threats	Woodland
1. Residential & Commercial Development	M
2. Agriculture & Aquaculture	M
3. Energy Production & Mining	L
4. Transportation & Service Corridors	M
5. Biological Resource Use	H
6. Human Intrusions & Disturbance	L
7. Natural Systems Modification	M
8. Invasive & Other Problematic Species & Genes	M
9. Pollution	L
10. Geological Events	-
11. Climate Change & Severe Weather	H
Overall Threat	H

References Cited in Chapter Five

Conservation Measures Partnership. 2013. *Open standards for the practice of conservation.* Version 3.0. Last accessed August 25, 2015. www.ConservationMeasures.org

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Chapter Six

A Vision for Iowa's Wildlife in the Year 2030

Required Element #4: "Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions."

Background

Few Iowans are aware that their state was once a land of unparalleled wildlife abundance and diversity. Early settlers discovered, however, that underneath Iowa's prairies lay the finest farmland in the world. In less than a century the prairies were plowed and with them went flocks of prairie chicken, herds of bison and elk and the cougars, gray wolves, black bear and bobcat that preyed on them. Wetlands were drained and flocks of waterfowl numbering in the millions that nested here were diminished to a tiny fraction of their former numbers. Most of the forests were cleared, the white-tailed deer and wild turkey disappeared and once-uncountable flocks of passenger pigeons became extinct. Plowing freed the prairie soil to run into once-clear waters and game fish like brook trout, northern sunfish and grass pickerel disappeared. Once a wilderness, Iowa had become home to a multitude of small family farms. Only small animals like the bobwhite quail, rabbits, squirrels and the soon-to-be-introduced ring-necked pheasant thrived.

The 20th century brought its own changes driven by the constant improvement in farming technology. Ever-larger and more powerful farm equipment; the introduction of herbicides, pesticides, plant hybrids and genetically modified crops; and Federal farm programs that have rewarded all-out production eventually made much of the state unsuitable for even farm-adapted wildlife.

Wildlife conservation programs have returned adaptable wildlife like deer and wild turkey to our forests, Canada geese and Trumpeter swans to our wetlands, bald eagles and peregrine falcons to our skies, and river otters to our streams. Land conservation efforts have restored thousands of acres of grasslands, wetlands and forest. Farm programs have placed hundreds of thousands of acres under temporary conservation practices on private land.

But after more than eight decades of conservation, one-third of all of Iowa's fish and wildlife are still considered in need of immediate conservation to stop their numbers from eventually dwindling into threatened or endangered status. A host of less-visible and specialized wildlife – songbirds, lizards and snakes, frogs and salamanders, fish, freshwater mussels and highly-fragile butterflies among others - is seriously threatened by the disappearance and degradation of their habitats. Iowa has less than 3 percent of its landscape in permanently protected wildlife habitat and managed under conservation practices. The remainder is privately held and subject to the whims of landowners as they respond to economic and social pressures. The pace of conservation efforts has not been able to keep up with the wholesale habitat destruction of the past century that still continues today. Without assistance to reverse these trends, more species will face a grim future – eventual disappearance from our state.

Iowa is farming country

Barring an environmental or economic collapse of global proportions, Iowa will remain one of the world's great agricultural regions. The most appropriate use of most of this landscape is in agricultural production. Nothing in this Plan suggests returning Iowa to its pre-settlement state on any but a small part of the land. The challenge for Iowans is to find a way to protect our remaining wildlife heritage and preserve a legacy for our heirs by creating viable and socially-acceptable wildlife environments within a landscape dominated by agriculture.

A Vision for the Future

To establish a focus for future wildlife conservation activities, the Advisory Committee to the original Iowa Wildlife Action Plan – a group of fish and wildlife professionals, educators, researchers, private conservation organizations, concerned citizens and representatives of the agricultural community - developed a vision for the status of Iowa's wildlife in 25 years. The vision statement has six elements that include benefits to fish and wildlife, the citizens who enjoy and support them, and the private landowners who must embrace them if the vision is to be realized. With each vision element the Advisory Committee developed specific conservation actions that need to be implemented to reach the Plan's goals in a 25-year framework. When the ten-year comprehensive review and revision process began, the Implementation Committee identified that the six vision elements that were initially identified by the Advisory Committee should remain in place as the cornerstone of the Plan's conservation strategy. Progress on implementation of the Visions over the first 10 years of the Plan is discussed in Chapter 11.

These vision elements, conservation strategies and conservation actions are not specifically designed to be implemented by DNR. They are designed to provide a broad framework of actions that can be undertaken by conservationists at all levels of government, by private conservation organizations and by private citizens. The conservation actions identified in the following pages will require a broad array of funding sources, skills and expertise. Extensive coordination will continue to be necessary between these stakeholders to make the vision a reality.

Defining Conservation Actions

As explained in Chapter 5, this plan categorizes both threats and conservation actions based on a taxonomy developed by the Conservation Measures Partnership (CMP). You can read more about the Partnership at their website: http://www.conservationmeasures.org/. In 2004, CMP developed the first edition of the "Open Standards for the Practice of Conservation" which has since been updated in 2007 and 2013.

One outcome of this partnership that is also a building block for increasing collaboration is the development of a "standard lexicon" for conservation, including a taxonomy, or hierarchy, of threats and conservation actions (Salafsky et al. 2008). Adopting the use of the standard terminology allows conservationists operating at any spatial scale to share information and experiences, facilitating learning and improvement among conservation practitioners. The 2015 revision of the IWAP makes use of this standard lexicon for the classification of threats and actions in order to increase the ability of our threats and actions to be compared across state lines or other political boundaries. This helps make clear how the IWAP fits in as one piece of regional, national, or even global efforts to conserve wildlife. The use of this taxonomy does not substantially change the actions listed in the 2012 or 2006 versions of the IWAP. Rather, this revision provides the original visions, goals, strategies and actions, and then provides a list of potential conservation actions from the CMP Actions Taxonomy that might be undertaken by any entity to implement that portion of the vision.

The *Open Standards* defines a conservation strategy as: A set of actions with a common focus that work together to achieve specific goals and objectives by targeting key intervention points, integrating opportunities, and limiting constraints. These can include a broad array of conservation actions such as habitat restoration, land protection, policy change, or education. Some of the Conservation Actions identified within this Plan are more accurately described as Strategies, so this revision identifies them as "Conservation Strategies and Actions." The following visions and the associated conservation actions remain essentially the same as when they were originally developed in 2004, because they were designed to be 25-year strategies. For this revision, those involved with the Plan wished to maintain consistency in the overarching objectives agreed-upon originally formulated at the public forum in 2004. However, in order to make them easier to cross-walk with the Conservation Measures Partnership's Conservation Actions Taxonomy, the plan displays each action followed by a description of where it fits within the taxonomy. For definitions of each Level I and Level II action, see Appendix 23. Table 6-1 also displays explanations and examples.

A Vision for Iowa's Wildlife

By 2030 Iowa will have viable wildlife populations that are compatible with modern landscapes and human social tolerance.

Goals

- Common species will continue to be common.
- Populations of species of greatest conservation need will increase to viable (self-sustaining) levels.
- The abundance and distribution of wildlife will be balanced with its impact on the economic livelihood and social tolerance of Iowans.

Conservation Strategies and Actions

1. Develop scientifically reliable knowledge on the distribution, relative abundance and ecological needs of all wildlife species, including invasive species.
   a. Follow up with monitoring so that knowledge stays current.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	8. Research & Monitoring 8.1 Basic Research & Status Monitoring

2. Develop a balanced program of wildlife conservation by increasing the emphasis on species of greatest conservation need.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	6. Conservation Designation & Planning 6.6 Species Designation, Planning & Monitoring 7. Law & Policy 7.2 Policies & Regulations

3. Focus on protection, restoration, reconstruction, connection and enhancement of native plant communities and wildlife habitats.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	1. Land/Water Management 1.1 Site/Area Stewardship 1.2 Ecosystem & Natural Process (Re)Creation

	6. Conservation Designation & Planning 6.1 Site/Area Protection 6.2 Easements & Resource Rights

4. Restore viable wildlife populations to suitable habitats through informed relocation and reintroduction programs.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	2. Species Management 2.1 Species Stewardship 2.2 Species Re-Introduction & Translocation

5. Develop methods to identify and reduce economic and social conflicts between wildlife and citizens.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	3. Awareness Raising 3.1 Outreach & Communications 5. Livelihood, Economic & Moral Incentives 5.2 Substitution & Alternative Livelihoods

Explanation

Achieving this goal requires improving scientific knowledge about many species whose biology, abundance and current distribution in Iowa are poorly understood, particularly nongame. It may require population and habitat restoration and enhancement over a broad geographic range and the development of new management techniques to protect the interests of the private landowner. If successful, it will aid the long-term viability of all wildlife, increase biodiversity, promote greater access to wildlife-associated recreation, and provide economic benefits to Iowans.

See Appendix 23 for definitions of each Level I and Level II Conservation Action.

A Vision for Wildlife Habitats

By 2030 Iowa will have healthy ecosystems that incorporate diverse, native habitats capable of sustaining viable wildlife populations.

Goals

- The amount of permanently protected wildlife habitat in Iowa will be doubled to 4% of the state's land area.
- Protected habitats will be diverse, representative, native plant communities in large and small blocks on public and privately owned land and waters.

Conservation Strategies and Actions

1. Identify habitats, landscapes and travel corridors important to species of greatest conservation need in all regions of the state.
   a. Coordinate with all government natural resource agencies and non-governmental organizations to identify areas at regional, state, and local scales.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	6. Conservation Designation & Planning

	6.3 Land/Water Use Planning & Zoning 10. Institutional Development 10.3 Alliance & Partnership Development

2. Permanently protect, restore, reconstruct and enhance large public and private areas of wildlife habitat - systems that include large core tracts, watershed and greenbelt corridors, and other associated travel corridors - that can be managed for biodiversity.
   a. Develop a series of core habitat blocks in the range of 3,000 - 5,000 acres of permanently protected and managed habitat.
   b. Evaluate existing permanently protected areas for potential expansion.
   c. Work with legislators to implement *smart growth* efforts in these designated core areas.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	6. Conservation Designation & Planning 6.1 Site/Area Protection 6.2 Easements & Resource Rights 6.3 Site/Area Planning & Monitoring 7. Law & Policy 7.1 Policies & Regulations 7.3 Private Sector Standards & Codes

3. Ensure that long-term Federal and State land conservation programs meet the needs of landowners and wildlife on privately owned lands and waters.
   a. Use existing tools and create new tools to permanently protect private lands and waters and expand outreach efforts.
   b. Encourage Federal land conservation programs that allow existing native habitats to be enrolled.
   c. Work to mandate Federal and state wildlife agency involvement in the prioritization, design, and implementation of the Federal programs.
   d. Staff a state position to coordinate wildlife priorities with all Federal land conservation programs with emphasis placed on habitats for species of greatest conservation need.
   e. Integrate this Plan with existing Federal programs.
   f. Expand existing Federal and State programs that focus on water quality of streams and rivers but allow flexibility for local issues to be addressed.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	5. Livelihood, Economic & Moral Incentives 5.2 Substitution & Alternative Livelihoods 5.3 Market Forces 5.4 Valuation of/Payments for Ecosystem Services 6. Conservation Designation & Planning 6.2 Easements & Resource Rights 7. Law & Policy 7.1 Legislation 7.2 Policies & Regulations 10. Institutional Development 10.3 Alliance & Partnership Development 10.4 Financing Conservation

4. Provide technical guidance and supplemental cost share programs to private landowners to maximize the benefits to wildlife from Federal land conservation programs.
   a. Utilize habitat developments on private land to supplement government habitat protection programs. Use USDA farm programs to improve connectivity between habitats by targeting landowners in key areas.
   b. Expand DNR's Private Lands Program efforts to meet the needs of SGCN outlined in this Plan.
   c. Provide for improved coordination of all Federal, state, county and non-governmental organizations private lands programs to efficiently deliver technical assistance to landowners.
   d. Provide incentives to landowners to implement practices that benefit SGCN in targeted areas. Provide additional incentives to neighboring landowners who put adjacent land into a program so larger tracts of land or corridors are created.
   e. Educate all natural resource agencies staff about the Plan.
   f. Create a central site for all resources of the Plan and make available to natural resource agencies and landowners.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	6. Conservation Designation & Planning 6.2 Easements & Resource Rights 9. Education & Training 9.2 Training & Capacity Development 10. Institutional Development 10.1 Organizational Management & Administration 10.2 Institutional & Civil Society Development 10.3 Alliance & Partnership Development

5. Coordinate public land acquisition and private land habitat programs to provide habitat on a landscape scale.
   a. Use the Plan as a tool for private lands and public land natural resource protection, management and restoration efforts.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	1. Land/Water Management 1.2 Ecosystem & Natural Process (Re)Creation 3. Awareness Raising 3.1 Outreach & Communications 6. Conservation Designation & Planning 6.1 Site/Area Protection 6.2 Easements & Resource Rights 6.3 Land/Water Use Planning & Zoning 6.4 Site/Area Planning & Monitoring

Explanation

Currently only about 2.7% of Iowa's wildlife habitats are permanently protected – 895,000 acres by state, county, or Federal ownership and 107,000 acres on private land in permanent easements. To reach the goal of doubling the amount of permanently protected habitat by 2030, protection through acquisition or easements, restoration, reconstruction and enhancement of critical habitats must be accelerated to 29,000 acres annually (~3.5 times the current pace). Fragmentation must be minimized by developing large blocks of habitat connected by corridors for the free exchange of organisms. Landowner education and cost sharing programs must be expanded to increase the

amount of permanently protected habitat on private lands and waters. Ensuring that the short term benefits provided by Federal land conservation programs are continued must be a high priority for all stakeholders as the long-term goals are pursued. Watershed and hydrologic alterations must be restored wherever necessary and feasible to benefit all wildlife.

See Appendix 23 for definitions of each Level I and Level II Conservation Action.

A Vision for Wildlife Management

Diverse wildlife communities will be developed on public and private lands and waters through the use of adaptive ecological management principles.

Goal

- Wildlife and fisheries management will be based on science.

Conservation Strategies and Actions

1. Establish wildlife population and habitat management goals for public and private lands and evaluate their effectiveness.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	6. Conservation Designation & Planning 6.2 Easements & Resource Rights 9. Education & Training 9.2 Training & Capacity Development 10. Institutional Development 10.1 Organizational Management & Administration 10.2 Institutional & Civil Society Development 10.3 Alliance & Partnership Development

2. Develop and implement management plans on public and privately owned lands and waters that promote biodiversity and improve the status of species of greatest conservation need.
   a. Provide coordination and implement activities that involve all in-state land management agencies (state, county and Federal) across state lines and include the Missouri and Mississippi River systems.
   b. Coordinate all Federal, state, county and NGO's private lands programs to efficiently provide management plans to landowners.
   c. Implement a statewide private lands management coordination committee.
   d. Educate natural resource management staff on management needs of species of greatest conservation need.
   e. Develop standard elements for all public and private land management plans.
   f. Acquire tools and gather reference materials and make them easily accessible to all natural resource managers and landowners.
   g. Expand and create local habitat working teams to implement the plans on private and public lands and waters. Provide these teams and private contractors' incentives for equipment.
   h. Expand the DNR's Prairie Seed Harvest Program to meet the demand of the state's public land managers for local eco-type prairie seed.
   i. Develop and implement a statewide strategy to eradicate invasive species.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	6. Conservation Designation & Planning 6.4 Site/Area Planning & Monitoring 9. Education & Training 9.2 Training & Capacity Development 10. Institutional Development 10.1 Organizational Management & Administration 10.2 Institutional & Civil Society Development 10.3 Alliance & Partnership Development

3. Coordinate habitat management messages and objectives among all layers of conservation agencies and groups to promote goals of the plan and work toward compatible policies.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	10. Institutional Development 10.1 Organizational Management & Administration 10.2 Institutional & Civil Society Development 10.3 Alliance & Partnership Development

4. Work with legislators to address liability issues related to landowners' usage of outside contractors to implement management practices on their land.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	7. Law & Policy 7.1 Legislation 7.2 Policies & Regulations 7.3 Private Sector Standards & Codes

5. Educate other government land management and protection agencies on the Plan so it may be used in conjunction with their work activities (ex. DOT, IACCB, USFWS).

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	9. Education & Training 9.2 Training & Capacity Development 10. Institutional Development 10.1 Organizational Management & Administration 10.2 Institutional & Civil Society Development 10.3 Alliance & Partnership Development

6. Provide funding and staff positions to carry out the actions of the Plan.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	10. Institutional Development 10.1 Organizational Management & Administration 10.4 Financing Conservation

7. Protect ecosystem stability by developing invasive species management plans that provide early detection strategies to control exotic invasive species.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	1. Land/Water Management 1.2 Site/Area Stewardship 6. Conservation Designation & Planning 6.4 Site/Area Planning & Monitoring 8. Research & Monitoring 8.1 Basic Research & Status Monitoring

Explanation

When the habitat goal is met, the vast majority of land in Iowa will still be in private ownership and used for agricultural purposes. Meeting the wildlife population goal will require intensive and carefully planned management on lands and waters protected for wildlife, whether in public or private ownership. Management for all species must be coordinated using ecological principles that can be evaluated and adapted if population or landowner objectives are not met. Landowners and conservationists must work in harmony so that environmentally sustainable agriculture is practiced and all land is managed using sound conservation practices.

See Appendix 23 for definitions of each Level I and Level II Conservation Action.

A Vision for Wildlife-Associated Recreation

More Iowans will participate in wildlife-associated recreation, and all Iowans will have access to publicly owned recreation areas to enjoy wildlife in its many forms.

Goals

- The number of Iowans participating in wildlife-associated recreation (wildlife viewing, photography, hiking, outdoor classrooms, hunting, fishing etc.) should increase 50 percent by 2030;
- Wildlife-associated recreation will be available to all Iowans on public lands near their home;

Conservation Strategies and Actions

1. Understand market-based research to determine the wildlife-associated recreational interests of all Iowans, especially non-traditional users like minority and ethnic groups and citizens with disabilities.
    a. Gather information from Statewide Comprehensive Outdoor Recreation Plan (SCORP) survey

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	8. Research & Monitoring 8.1 Basic Research & Status Monitoring 8.2 Effectiveness Monitoring/Adaptive Management

2. Expand training programs in wildlife-associated recreation skills to increase citizen participation and improve public health.
    a. Work with the DNR outdoor skills committee and associated partners to complete the development of outdoor skills modules,
    b. Create a network of lending sites for recreation equipment to teach programs,
    c. Provide training for interested teachers, youth leaders, and other educators through formal and non-formal venues.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	9. Education & Training 9.2 Training & Capacity Development 10. Institutional Development 10.1 Organizational Management & Administration 10.2 Institutional & Civil Society Development 10.3 Alliance & Partnership Development

3. Coordinate wildlife population, habitat and management goals for public lands with potential recreational uses to assure that all recreation is compatible with sound wildlife management, minimizes conflicts between users and protects critical habitat from overuse.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	6. Conservation Designation & Planning 6.3 Land/Water Use Planning & Zoning 6.4 Site/Area Planning & Monitoring 7. Law & Policy 7.2 Policies & Regulations 10. Institutional Development 10.1 Organizational Management & Administration 10.2 Institutional & Civil Society Development 10.3 Alliance & Partnership Development

Explanation

Currently 1.3 million Iowans participate in wildlife-associated recreation. To accommodate additional users, public access for a variety of wildlife-associated recreational uses must be assured on public and private lands and waters wherever these activities are compatible with sound management for all wildlife. Access will be improved around urban areas and in counties where it is lacking today. Outreach programs must be developed so that all Iowans regardless of race or gender will find wildlife-associated recreation activities that are enjoyable and available to them.

See Appendix 23 for definitions of each Level I and Level II Conservation Action.

A Vision for Wildlife Education

Iowans will respect wildlife for its many values and they will advocate effectively for conservation of wildlife and wildlife habitats.

Goals

Iowans will understand the relationships of:

a) land use, and its impacts on wildlife diversity & abundance
b) land use, and its impacts on quality of life for all citizens
c) land use, and its impacts on Iowa's economic sectors related to wildlife recreation
d) wildlife diversity & abundance, and its impacts on quality of life in Iowa
e) wildlife diversity & abundance, and its impacts on Iowa's economy
f) quality of life for all citizens, and its impacts on Iowa's economy
g) Iowa's economic decisions and their impacts on wildlife-based contributions to quality of life for all citizens

Conservation Strategies and Actions

1. Work with stakeholders to develop consistent messages about the value of wildlife and their associated habitats that convey health, wellness, economic, and other *quality of life* benefits (tourism and economic development, departments of health, physicians, wellness coordinators, etc.)

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	3. Awareness Raising 3.1 Outreach & Communication 5. Livelihood, Economic & Moral Incentives 5.1 Linked Enterprises & Livelihoods 5.4 Valuation of/Payments for Ecosystem Services 5.5 Non-Monetary Values

2. Refine and expand current wildlife education efforts targeted to formal and non-formal education venues. Focus on:
   a. Priorities established in this Plan,
   b. Needs identified by the formal education community (e.g., through direct contact with the Iowa Department of Education and Area Education Agencies),
   c. Information collected through teacher focus groups
   d. Needs of other potential target audiences.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	9. Education & Training 9.1 Formal Education 9.2 Training & Capacity Development

3. Determine appropriate target audiences based on the overarching goals of this Plan.
   a. Determine audience needs through needs assessments
   b. Develop appropriate informational materials and distribution venues

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	8. Research & Monitoring 8.1 Basic Research & Status Monitoring 8.2 Effectiveness Monitoring/Adaptive Management 9. Education & Training 9.2 Training & Capacity Development

4. Secure additional staff to coordinate educational efforts across the state
   a. Materials development,
   b. Staff training and assistance,
   c. Maintenance of regional partnerships to facilitate implementation of educational efforts.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	10. Institutional Development 10.1 Organizational Management & Administration 10.2 Institutional & Civil Society Development 10.3 Alliance & Partnership Development

	10.4 Financing Conservation

5. Develop training programs for professionals in fields that affect land use (agriculture, engineering, community planning, developers, etc.) and community leaders to inform them of the impacts of development on wildlife habitats and the quality of life for citizens on a local level.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	3. Awareness Raising 3.1 Outreach & Communications 5. Livelihood, Economic & Moral Incentives 5.1 Linked Enterprises & Livelihoods 9. Education & Training 9.2 Training & Capacity Development

6. Pro-active wildlife education for K-12 classrooms as well as post-secondary and adult conservation education and outdoor skills must be expanded through aggressive outreach programs.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	9. Education & Training 9.1 Formal Education

Explanation

To attain these visions, political leaders must be made aware of the economic and social benefits that are achieved through scientific management of Iowa's wildlife and provide the necessary funding. Pro-active wildlife education for K-12 classrooms as well as post-secondary and adult conservation education and outdoor skills must be expanded through aggressive outreach programs. Educational programs must be developed for professionals in other disciplines and for state, regional and community leaders that make decisions on the development and use of natural resources that impact wildlife.

See Appendix 23 for definitions of each Level I and Level II Conservation Action.

A Vision to Fund Wildlife Conservation

Stable, permanent funding will be dedicated to the management of wildlife at a level adequate to achieve the visions of this plan.

Goals

- Government (Federal, state, and county) and private conservation spending will be increased so that the goals of this Plan are reached by 2030.
- Funding will be dependable, secure, and appreciated as a powerful economic and social investment.

Conservation Strategies and Actions

1. Develop a marketing campaign that will convince citizens, conservation professionals, and activists in private conservation groups, community leaders and politicians that funding this Plan will be an important step in helping to solve a myriad of social and economic problems in Iowa.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	3. Awareness Raising

	3.1 Outreach & Communications

2. Expand membership in the coalition of traditional wildlife and agricultural groups that is lobbying Congress for Federal farm conservation programs on private land to include nongame and recreational interests.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	7. Law & Policy 7.1 Legislation 7.2 Policies & Regulations 10. Institutional Development 10.2 Institutional & Civil Society Development 10.3 Alliance & Partnership Development

3. Develop a broad-based coalition of conservation leaders, educators, politicians and local economic interests to identify and secure passage of permanent funding mechanisms that will provide sufficient funding to meet Plan goals in 25 years.

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	7. Law & Policy 7.1 Legislation 7.2 Policies & Regulations 10. Institutional Development 10.1 Organizational Management & Administration 10.2 Institutional & Civil Society Development 10.3 Alliance & Partnership Development 10.4 Financing Conservation

4. Leverage conservation dollars and make use of private dollars as well as public funds

Crosswalk to the Actions Taxonomy:	
Level I & Level II Actions	10. Institutional Development 10.3 Alliance & Partnership Development 10.4 Financing Conservation

Explanation

Achieving the visions outlined in this plan will require cooperation from public-private partnerships at all levels of government (Federal, state and local) and from all private stakeholders. Funding from all sources will have to reach a greater level than at any time in the past. Historically funding for wildlife programs in Iowa has come from hunters and anglers through license fees and excise taxes. All Iowans will receive tangible and intangible benefits when the IWAP is implemented. Presently, 25 percent of Iowans hunt or fish; another 25 percent enjoy wildlife viewing; and 74 percent say they enjoy seeing wildlife during other recreation activities. Wildlife-associated recreation generates $1.5 billion in economic activity annually in Iowa, equivalent to 16,000 jobs. Increasing wildlife habitat will reduce soil erosion, improve water quality, and reduce drinking water costs for all citizens. The costs for implementing the Plan should be borne by all citizens.

See Appendix 23 for definitions of each Level I and Level II Conservation Action.

Conservation Actions Taxonomy

Appendix 23 displays the full taxonomy and definitions of Level I and II Conservation Actions, as developed for the global conservation community by the Conservation Measures Partnership. **Table 6- 1** lists conservation actions and provides some explanation and a few examples that may have relevance in Iowa. A few of the actions included in the full list are not applicable or appropriate for governmental agencies to engage in (e.g. Protests & Civil Disobedience). This Plan is implemented by a wide array of entities (individuals, non-profit organizations, municipal, state or federal agencies, educational institutions, etc.). The actions listed are not all applicable to every type of conservation entity. However, any individual or organization with an interest in implementing the Plan should hopefully be able to find a way to contribute to making the Plan's visions a reality.

References Cited in Chapter Six

Conservation Measures Partnership. 2013. Open standards for the practice of conservation. Version 3.0. Last accessed August 25, 2015. www.ConservationMeasures.org

Salafsky, N, D Salzer, AJ Stattersfield, C Hilton-Taylor, R Neugarten, SHM Butchart, B Collen, N Cox, LL Master, S O'Connor, and D Wilkie. 2008. A standard lexicon for biodiversity conservation: unified classifications of threats and actions. Conservation Biology 22:897-911.

Table 6- 1. Conservation Actions as defined by the Conservation Measures Partnership, with some explanation and examples.

Because this Conservation Actions taxonomy was developed to be inclusive of all types of conservation across the globe, some actions listed below may not be particularly relevant to Implementation of this Plan, and inclusion here does not imply that this Plan recommends or supports undertaking any of the following actions. **Recommended actions are listed above on pages 3-13**, with a cross-walk to the actions taxonomy presented in this table. The purpose of providing the taxonomy is to provide an organizational framework by which conservation efforts can be presented across species groups or ecosystem types, across entities, and across states and regions.

Conservation Actions	Iowa-specific explanation and examples
A. Target Restoration/Stress Reduction Actions	**Actions to directly restore a target or mitigate a stress**
1. Land/Water Management	**Actions directed at conserving or restoring sites, ecosystems and the wider environment**
1.1 Site/Area Stewardship	Enhancing areas/mitigating stresses for particular sites and/or ecosystem types. (e.g. maintaining natural vegetation, removing invasive species, etc.)
1.2 Ecosystem & Natural Processes (Re)Creation	Restoring, reconstructing, or enhancing natural areas and natural disturbance processes (e.g. planting and maintaining natural vegetation, conducting prescribed fires, wetland drawdowns and other actions to restore degraded hydrologic regimes, etc.). Some overlap with 1.1 but typically on a larger scale.
2. Species Management	**Actions directed at conserving or restoring specific species**
2.1 Species Stewardship	Conserving specific species within their current range (e.g. providing and maintaining artificial nest structures, management of game species, provision of food plots, etc.)

Conservation Actions	**Iowa-specific explanation and examples**
2.2 Species Re-Introduction & Translocation	Re-introducing species to places where they formerly occurred or to suitable future habitat (e.g. species re-introduction projects such as Greater Prairie-chickens)
2.3 Ex-Situ Conservation	Protecting biodiversity out of its native habitats with the aim of ultimately restoring it to these habitats (e.g. captive breeding programs for rare species, seed banking, etc.)
B. Behavioral Change / Threat Reduction Actions	**Actions to get people to stop direct threats or continue/increase positive behaviors**
3. Awareness Raising	**Actions designed to make people aware of key issues, thus leading to behavior change**
3.1 Outreach & Communications	Promoting desired behavioral change by providing information through various media and other channels (e.g. naturalist programming, press releases, educational webpage development, etc.)
3.2 Protests & Civil Disobedience	Promoting desired behavioral change by conducting protests or other confrontational means (e.g. petitions, protest marches, etc)
4. Law Enforcement & Prosecution	**Monitoring and enforcing compliance with existing laws, policies & regulations, and standards & codes at all levels**
4.1 Detection & Arrest	Detecting and/or directly stopping violations of existing laws, policies/regulations and standards/legal codes (e.g. conservation officer patrols)
4.2 Criminal Prosecution & Conviction	Ensuring sanctions for violations of existing laws, policies/regulations and standards/legal codes (e.g. following up on arrests)
4.3 Non-criminal Compliance Enforcement	Threatening or bringing non-criminal legal action to get individuals, organizations, or firms to change behavior (e.g. legal actions carried out in civil arena)
5. Livelihood, Economic & Moral Incentives	**Actions using livelihood, economic and moral incentives to directly influence behavior or to change attitudes that then lead to behavioral change**
5.1 Linked Enterprises & Livelihoods	Developing enterprises that directly depend on the maintenance of natural resources or provide substitute livelihoods as a means of changing behaviors or attitudes (e.g. supporting eco-tourism or other non-damaging natural resource-based businesses)
5.2 Substitution & Alternative Livelihoods	Promoting alternative products and services that substitute for environmentally damaging ones (e.g. grass banking, wetland mitigation, recycling and use of recycled materials, etc.)
5.3 Market Forces	Using market mechanisms to change behaviors and attitudes (commodity certification programs like “wildlife-friendly” meat products, development of cap-and-trade markets for greenhouse gas emissions, etc.)
5.4 Valuation of / Payments for Ecosystem Services	Using direct or indirect payments for ascribing economic value to change behaviors and attitudes (tax incentives for conservation, compensation for provision of ecosystem services

Conservation Actions	Iowa-specific explanation and examples
5.5 Non-Monetary Values	Using intangible and moral values to change behaviors and attitudes (development of religious arguments for conservation, linking conservation to human health and well-being)
C. Enabling Condition Actions	**Actions that create the conditions necessary for other conservation efforts to succeed**
6. Conservation Design & Planning	**Actions to legally or formally protect sites and/or species**
6.1 Site/Area Protection	Legally or formally establishing or expanding public or private parks, reserves, and other protected areas roughly equivalent to IUCN Categories I-VI* (expanding or creating new areas of National Wildlife Refuges, National Parks ,Forests, State, County, or City Wildlife Areas, Forests, Parks, private protected areas, etc.)
6.2 Easements & Resource Rights	Legally or formally establishing protection or easements of some specific aspect of the resource on private lands outside of IUCN Categories I-VI (Conservation Easements through Farm Bill programs such as Conservation Reserve Program, Wetland Reserve Easement, other programs through land trusts etc.)
6.3 Land/Water Use Planning & Zoning	Legally or formally designating land or water uses (e.g. formal planning and zoning by Councils of Government, as well as non-regulatory conservation area designation such as Bird Conservation Areas, Important Bird Areas, and Amphibian & Reptile Conservation Area, etc.)
6.4 Site/Area Planning & Monitoring	General planning and monitoring of public or private parks, reserves and other protected areas roughly equivalent to IUCN Categories I-VI*(e.g. development of management plans for National Wildlife Refuges or Wildlife Management Areas, monitoring of areas, conducting Adaptive Resource Management)
6.5 Site Infrastructure	Creating and maintaining the physical infrastructure for protected areas and other conservation sites (e.g. maintaining parking areas, roads, fences, signs, etc. in conservation areas)
6.6 Species Designation, Planning & Monitoring	General designation and management of specific plant and animal populations of concern (e.g., development of species-specific management plans such as the Greater Prairie-chicken conservation plan, monitoring in association with such plans, designation of species as SGCN, etc.)
7. Law & Policy	**Actions to develop, change, and influence formal legislation, regulations, and voluntary standards**
7.1 Legislation	Making, implementing, changing, influencing, or providing input into formal government sector legislation at all levels: international, national, state/provincial, municipal, tribal (e.g. providing information to policy-makers, working to influence congressional or legislative appropriations, developing permitting systems)

Conservation Actions	**Iowa-specific explanation and examples**
7.2 Policies & Regulations	Making, implementing, changing, influencing, or providing input into policies and regulations affecting the implementation of laws and codes at all levels: international, national, state/provincial, municipal, tribal private (e.g. providing input into agency plans or regulations, working with communities to implement zoning, etc.)
7.3 Private Sector Standards & Codes	Setting, implementing, changing, influencing, or providing input into voluntary standards & professional codes that govern private sector practice (voluntary codes of practice)
7.4 Compliance & Enforcement Capacity	Monitoring and enforcing compliance with laws, policies & regulations, and standards & codes at all levels (strengthening regulatory monitoring efforts)
8. Research & Monitoring	**Basic and applied research to support conservation work**
8.1 Basic Research & Status Monitoring	Basic research related to conservation (e.g. ecological research on the habitat requirements of a specific species or suite of species)
8.2 Effectiveness Monitoring / Adaptive Management	Assessment of and learning about the effectiveness of strategies (e.g. research designed to assess the effectiveness of conservation strategies or actions)
9. Education & Training	**Enhancing knowledge and skills of specific individuals**
9.1 Formal Education	Enhancing knowledge and skills of students in a formal degree program (e.g. public schools, colleges and universities, continuing education programs)
9.2 Training & Capacity Development	Enhancing knowledge, skills and information exchange for practitioners, stakeholders, and other relevant individuals in structured settings outside of degree programs (e.g. workshops and trainings for carrying out management, developing guidelines or manuals for natural resource managers, etc.)
10. Institutional Development	**Creating the institutions needed to support conservation work**
10.1 Organizational Management & Administration	Doing the work needed to establish and operate conservation organizations and agencies (e.g. hiring & managing staff for conservation agencies at any level of government)
10.2 Institutional & Civil Society Development	Creating or providing non-financial support & capacity building for non-profits, government agencies, communities, and for-profits (developing local land trusts or other conservation organizations, starting public-private partnerships, starting prescribed fire cooperatives, etc.)
10.3 Alliance & Partnership Development	Forming and facilitating partnerships, alliances, and networks of organizations (e.g. holding meetings, conferences, engaging stakeholders, developing networks and communities of practice, etc.)
10.4 Financing Conservation	Raising and providing funds for conservation work

* IUCN Protected Areas Categories System: IUCN protected area management categories classify protected areas according to their management objectives. For more information, visit:
http://www.iucn.org/about/work/programmes/gpap_home/gpap_quality/gpap_pacategories/

Category Ia: Strict Nature Reserve

Category Ib: Wilderness Area

Category II: National Park
Category III: Natural Monument or Feature
Category IV: Habitat/Species Management Area
Category V: Protected Landscape/Seascape
Category VI: Protected area with sustainable use of natural resources

Chapter Seven

Research, Survey, Inventory and Monitoring

Required Element #5: Proposed plans for monitoring Species of Greatest Conservation Need 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.

Required Element #3: Descriptions of problems that may adversely affect SGCN or their habitats, and priority research and survey efforts needed to identify factors that may assist in their restoration and improved conservation of these species and habitats.

Background

The lack of species-specific information on the abundance and distribution of SGCN was one of the greatest challenges faced when initially developing this Plan. In some cases species were added to the list simply because information was outdated or unavailable. This continues to occur today despite much progress being made over the past decade, which is why this 2015 version of the Plan identifies Data Deficient species. Because of the dearth of information for the majority of Iowa species, inventory and monitoring for fish and wildlife species became the top priority for implementation of this Plan.

On the other hand, Iowa is fortunate to have a strong spatial data program. The amount and distribution of potential wildlife habitat is comparatively well known. As we continue to implement this Plan, and have more wildlife data to relate to our spatial datasets, we will become better equipped to identify qualitative differences among habitats and track qualitative changes over time.

Iowa recognizes that monitoring is critical to the determination of the status of species, not only those of greatest conservation need, but also the more common species. By monitoring the effects of conservation actions on wildlife, adaptive management decisions can be made to continue to improve, or to cease to harm wildlife species.

For clarity, *inventory, survey and monitoring* are defined as (Thompson et al. 1998):

- **Inventory -** Process of making an itemized list of species occurring within a given area.
- **Survey -** An incomplete count of individuals, objects, or items within a specified area and time period.
- **Monitoring -** A repeated assessment of some quality, attribute, or task for the purpose of detecting a change in average status within a defined area over time.

Long-term monitoring programs give the best picture of the status of wildlife populations over time. Well-designed short term surveys and inventories can indicate the current status and distribution of wildlife but are often valid only in the area where they are conducted and may quickly become obsolete if habitat or other critical factors change. In Iowa the rapid change in habitat availability on agricultural lands as USDA farm programs change is a frequent example.

Many research studies too numerous to list have provided information on the presence of individual species or groups of species. Prior to the first version of this Plan, virtually all monitoring programs in Iowa have focused on

game species, T & E species, common bird surveys (e.g., Breeding Bird Survey), and evaluations of wildlife restorations. This left a large majority of Iowa's fauna out of long-term monitoring programs, making an assessment of trends very difficult.

Statewide Wildlife Inventory – Iowa's Multiple Species Inventory and Monitoring Program

When this Plan was initially developed in 2005, the Steering Committee and the Monitoring Working Group sub-committee agreed that the first priority for monitoring and research was to inventory Iowa's permanently protected wildlife habitats and a sample of habitat on private lands within the state. In addition, virtually all wildlife specialists involved in developing this Plan agreed that inventories, surveys, and monitoring of SGCN to guide habitat and population conservation actions was an essential component for managing Iowa's wildlife into the future. Therefore, in order to meet these needs, the Multiple Species Inventory and Monitoring Program (MSIM) was established in a partnership between Iowa DNR and Iowa State University (ISU). This program, which was launched in 2006, incorporates permanent sampling sites situated on public (federal, state, and county owned) as well as private lands. The design of this program is based on the US Forest Service's "Multiple Species Inventory and Monitoring Guide" (Manley et al. 2005).

Taxa Which Still Need Initial Inventory Work

Difficulties with development of an effective sampling protocol for terrestrial snails and a comparative lack of experts in identification of individual snail species has remained a hurdle. Therefore, the inventory phase for terrestrial snails is not completed as of 2015. With the proposed addition of crayfish to the list of SGCN, sampling protocols for crayfish have been developed and tested. If potential additional taxa are added to the list of SGCN through the process outlined in Chapter 3, then survey protocols for those taxa will also need to be developed and tested for integration into the MSIM framework for Iowa.

Multiple Species Inventory and Monitoring Program

There are five specific objectives which the MSIM Program is designed to address. They are outlined below.

Objective 1a: Current Inventory of Wildlife in Iowa

This objective is primarily concerned with estimating the statewide spatial distribution of species. Species occurrence and distribution have been derived from the use of several short-duration, high-intensity searches at a large number of areas scattered widely across the state with locations randomly chosen based on the 19 habitat classifications designated in this Plan. (Now that the initial inventory phase of the MSIM program has been completed, and given that the habitat classifications were revised in the current version of this Plan, the need for stratification based on habitat class will be revisited.)

The design of the MSIM Program has provided the ability to estimate the spatial distribution and status of many species. The overall protocol determines how widespread or isolated a species is within the state and relates distribution to the condition of habitats. Permanent monitoring plot locations were chosen from protected properties based on a stratified random sampling design using quadrant of the state and habitat classification as the stratifications. For a property to be considered it had to contain at least 101 ha (250 ac) of protected land or water within a contiguous boundary (i.e., smaller state owned areas with adjoining CRP, WRP, NRCS lands were included in potential locations). This design is based on the US Forest Service's Multiple *Species Inventory and Monitoring Guide* (Manley et al. 2005). This Guide outlines monitoring techniques for vertebrate species on National Forest Land. This design allows collection of both vertebrate wildlife data and also plant species composition and habitat data (Manley et al. 2005).

By stratifying the plot locations based upon habitat classifications, we are able to monitor multiple SGCN associated with each habitat type. With the development and implementation of MSIM, Iowa now has nearly 10 years of data on the distribution and abundance of wildlife species including amphibians, small and meso-mammals, butterflies, odonates, freshwater mussels, reptiles, fish and birds.

Private lands sampling sites are mostly focused on lands with wildlife conservation purposes (such as lands enrolled in conservation easement programs such as the Conservation Reserve Program or Wetlands Reserve Program, or managed by conservation entities such as The Nature Conservancy or the Iowa Natural Heritage Foundation). The DNR and ISU have joint responsibility for coordinating this statewide survey and monitoring program, with assistance from other partners and land management agencies (USFWS, US Army Corps of Engineers, Iowa National Guard, Iowa County Conservation Boards, Iowa Cooperative Fish and Wildlife Research Unit, non-governmental organizations, etc.)

We have adapted the Forest Service Guide to include protocols for additional taxa included within this Plan. Within each permanent terrestrial sampling plot, several techniques are utilized to collect data on a wide variety of wildlife (Figure 7.1). Briefly, specific procedures include pre-field work analysis of GIS coverages and selection of station (bird point count, trap placements) locations. Field work data collection has used trapping, timed track searching, and remote cameras for mammals; ANABAT detectors and limited trapping for bats; visual encounter surveys, coverboards, and trapping of amphibians and reptiles; point counts and timed searching for birds; walking transects and timed searching for butterflies; visual encounter surveys for odonates; coverboards for snails; electroshocking and trawling for fish; and quadrat surveys for mussels. In addition, data are collected on weather conditions, vegetative characteristics, aquatic variables, and habitat attributes. This allows us to collect information at the microhabitat scale to draw more specific correlations between species occurrence and habitat characteristics/environmental variables.

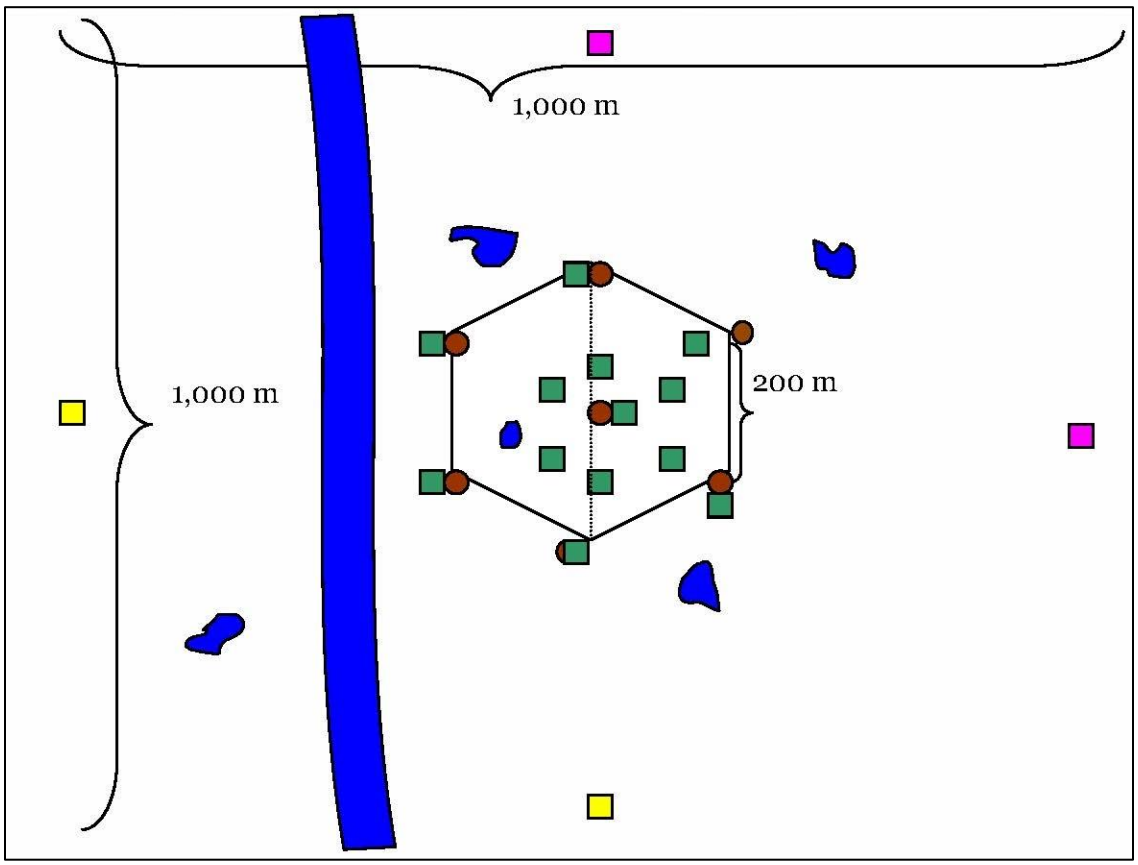

Figure 7- 1. Diagram of permanent sampling location.

Bird point counts (brown circles) are conducted at each point of the hexagon, including the middle point. Small mammal traps are set along the edge transects as well as the middle transect. The middle transect is walked for butterflies. Coverboards for herpetofauna are illustrated with green squares. Wetlands (in blue) are searched using time constrained visual encounter surveys for amphibians, dragonflies, and damselflies. Waterbodies are also electroshocked (where applicable) for fish and quadrats are used to search for mussels. Pink squares represent trailmaster camera locations.

Objective 1b: Inventory of Habitat

The above described habitat data collection is done in addition to information currently collected by the DNR Geographic Information Systems Section which periodically evaluates and compiles landcover classification data (year 2009 is the last complete data set) similar to that recommended by Schoonmaker and Luscombe (2005). This allows the DNR to track the percentages of habitat types and, over time, changes in these percentages across the state. At this time, we anticipate this evaluation to be the primary method for monitoring changes in habitats. However, when coupled with the ground-truthing and habitat data collection, which should occur at each of the permanent sampling locations, we can correlate finer scale habitat parameters with broader land cover types. These land cover types serve as the habitat classes for this Plan.

The primary parameter of interest in these designs is the proportion of habitat occupied. Simply knowing species occurrence patterns may not provide sufficient information for managing these species. MacKenzie et al. (2005) suggests that presence and absence data can be used as a substitute for species abundance as long as the detection probability for the species can be estimated. Estimation of species abundance would require more intense sampling protocols. This design would be expected to generate less information per species because fewer sampling areas and

a smaller group of species would be surveyed due to the higher cost per sampling unit. In addition, although providing more in-depth examination of a group of species, the number of taxonomic groups surveyed would be smaller due to the higher costs associated with this more intensive effort.

Objective 2: Monitoring Species and Their Habitats

Now that the initial inventory and survey has been completed, the same sites have begun to be re-visited using the same protocols. This set of subsequent visits, which began during the field season of 2015, converts the inventory into the monitoring program. Depending on funding, sample sites will be visited repeatedly every 5 years, with a subset of sites from each habitat being sampled every year to ensure continuity. As with the inventory program, the monitoring program has protocols to examine the plant species composition and the habitats within each sampling site.

The number of sites to be visited per year is dependent upon both funding available and the number of sites needed per habitat class to statistically track changes in species occurrence. A factor in the decision of the number of sites to be visited per year depends upon the percent change (increase or decrease in species occurrence) prudent for determining the status of wildlife populations within Iowa. To detect a smaller percent change, we would need to monitor more sites (Manley et al. 2005).

Data collected within the monitoring program will determine the change in area occupied by a given species (whether sites are being colonized or populations are going extinct) (MacKenzie et al. 2003), the change in the spatial distribution of species, changes in community composition, and changes in habitat. Knowing both changes in habitat and changes in species occurrence allows for inferences to be drawn about correlations between the two. We emphasize, however, that this would be the impetus for future research as opposed to definitive conclusions.

Data collection is conducted by field technicians who are under the direction of ISU and DNR as paid technicians. All field technicians undergo training that includes species identification and handling techniques, habitat classification techniques, and other training specific to the data being acquired. Data analysis is conducted collaboratively by ISU and DNR.

Data Management and Archiving

DNR developed and maintains a database to house data collected through the MSIM program. This database can house information gathered by any entity using the MSIM protocols. The database is secured, but permission to access various reports can be requested. All DNR wildlife biologists have access to records of MSIM species records by property name or county name, for example.

In addition, observations of species tracked by the Natural Areas Inventory program (mostly State and Federally Threatened and Endangered Species) are entered into Iowa's Natural Areas Inventory (NAI) Database, which is used in environmental reviews and other planning processes.

Reporting, Periodic Review, and Evaluation

The monitoring protocol underwent a peer review process prior to implementation. The protocols undergo an internal review every 1 to 2 years and if problems are noticed, advice is sought from outside sources (e.g., university faculty and non-government organization scientists). In addition to the DNR review, information from the monitoring program is presented to the taxonomic subcommittees under the IWAP Wildlife Working Group. Results from the monitoring program are reported in regular progress reports, beginning with the "Inventory Assessment" once the

initial round of the program was completed and the data was analyzed. At that time any problems encountered with the data collection protocol were addressed and specific directions for research recommendations were suggested. Reports on the project have been made available to the public through the DNR website. An additional benefit that results from periodic review is the opportunity to evaluate current objectives and establish new objectives and goals of the program in order to adequately meet the changing needs of Iowa's wildlife.

We did expect that some species would likely be missed by the inventory and monitoring programs, but believe that the information gained on a large number of species outweighs this short-coming. We have identified a small number of species that are not being adequately monitored. In some cases, we have solicited proposals to do true research projects with these species (examples include research projects on occurrence of secretive marsh birds, and on Leonard's and Ottoe skippers). In other cases we have collaborated with experts to tweak sampling protocols to allow MSIM to sample these species (e.g., adding timed track searches to look for meso-mammals instead of the baited, boxed track plates, adding tree-mounted traps to capture flying squirrels, adding gopher mound counts to document pocket gopher occurrence). Figure 7.2 illustrates how we implement the decision making process concerning SGCN research and action needs to progress.

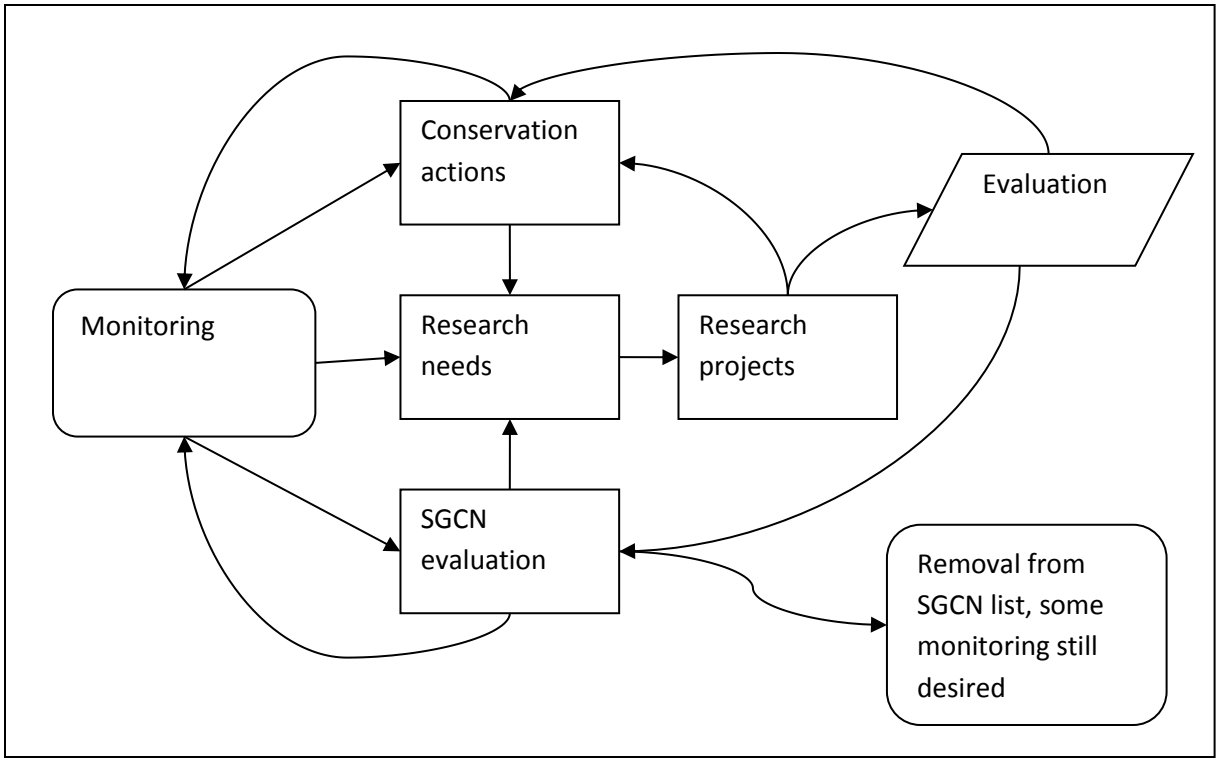

Figure 7- 2. Decision making process concerning SGCN

Additional Benefits

Additional potential objectives of the inventory and monitoring plans which may be able to be addressed through the monitoring data collection include the following (Objectives 3-5):

Objective 3: Strengthening Species Distribution Models

The Gap Analysis Program predicted species occurrences based upon given habitat classification and locations throughout the state of Iowa. Terrestrial GAP models are only available for birds, mammals, amphibians, and reptiles. Aquatic GAP models have been developed for fish. The terrestrial models were created by the use of a combination of

range maps and Wildlife Habitat Relationship models, which used 25 ancillary data characteristics (e.g., wetland buffer area, ecotone intersection areas, soil type, highway, elevation) combined with the 29 landcover classes (e.g., eastern red cedar forest, pine forest, evergreen forest, artificial high vegetation, artificial low vegetation, open water [from page 18 of the *Iowa GAP Report*, Kane et al. 2003]) to create predicted areas of occurrence for birds, mammals, amphibians, and reptiles.

In order to develop predictive species distribution models for taxa not included in GAP, or to update predicted distributions based on more recent land cover data, data from the MSIM program can be used. Information from the MSIM program includes geographic locations, species occurrence probabilities, and habitat parameters, which can then be used to build predictive mathematical models. With funding from a State Wildlife Action Plan Enhancement grant, we are using the predictive mathematical models to create predictive species distribution maps similar to GAP. Developing these maps is time consuming and requires a large amount of computing resources.

These spatial models, based upon landscape variables and microhabitat variables will be beneficial in the implementation of the revision. The maps will be based upon our most recent landcover data layer (from 2009). Using these predictive maps, we should be able to more effectively focus conservation efforts for priority SGCN. These maps will be peer-reviewed by our taxonomic experts and then the public lands within the predicted 'hot spots' for species occurrence will have specific management guidelines developed as well as site specific monitoring recommendations for both habitat and species changes.

This objective should help Iowa further prioritize and set goals for the Action Plan by advancing the utility of the IWAP in a couple of ways. First, the exercise will allow us to produce a density layer of hot spots by overlaying various predictive maps for SGCN which could help inform land protection. Second, individual species maps can be used to assist in focusing management actions suggested from the MSIM data microhabitat models.

Objective 4: Impact and Threat Assessment

The third required element for State Wildlife Action Plans includes, "descriptions of problems which may adversely affect species of greatest conservation need, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and their habitats." Therefore, the impact assessment objective would primarily be concerned with estimating the impact of threats to wildlife and habitats.

A passive approach to this objective would involve recording impacts that may occur within study sites while the monitoring program is on-going and correlating these impacts to changes seen with species population occurrence. It may be prudent to then initiate specific research projects on these areas to examine the result of the impact.

A more research-oriented, experimental sampling design for this objective would be to measure species presence, diversity, and/or populations in areas of 1) habitats lacking the specified threat, 2) areas where steps have been taken to ease/prevent the threat, and 3) areas where the threat is allowed to go forward un-impeded. It may be possible that this can be accomplished within the framework of MSIM, in some cases.

This objective and Objective 5 address the consequences of specific impacts and therefore, will require more intensively designed protocols. Species occurrence alone may not be sufficient to determine the impacts of the threats or of management programs.

Objective 5: Evaluation of Management Protocols and Restoration Programs (*Adaptive Resource Management*)

Regardless of what habitat management protocol is followed (e.g., burning, logging, re-planting, mowing, grazing, or the prevention of any human alterations), different species will be expected to respond in different ways. Within each management unit, it will continue to be important to evaluate the results of management decisions on specified groups of species. For example, long-term research to evaluate the effects of a variety of pasture management regimes (e.g., patch-burn grazing, early-intensive grazing, etc.) is underway on public and private lands in the Grand River Grasslands, a landscape critical for prairie-chickens and other SGCN in southern Iowa. Another project, at the Spring Run Wildlife Management Area, is now in a second phase to evaluate avian SGCN use of restored or recreated prairie and other grassland types in northern Iowa's prairie pothole region. Projects in Northeast Iowa's Driftless Area have evaluated the use of restored areas of open woodlands and goat prairies by birds, reptiles, and butterflies.

In some cases, the same protocols and procedures would be used for this objective as for Objective 4. However, as habitat management impacts result from planned programs, there are sometimes opportunities to design manipulative experiments or more formal applications of adaptive resource management protocols. Ideally, management regimes are outlined, and the assumptions underlying the planned management activities are clearly stated. Then, questions of interest are generated with regards to expected outcomes for target species, and potential impacts of the management on other species that may be of conservation concern. Then, (ideally) data can be collected for several years pre- and post-implementation of the management regime. Again, if species occurrence (or possibly density) was the parameter of interest, it may be possible to address this objective within the MSIM program, however, if more specific questions arise, (e.g., the effect of restoration on survival rates of a given species) then a more intensive sampling regime may be required.

Once the data have been collected and analyzed, decisions regarding the effectiveness of the actions studied can be made. Through this process of adaptive management, we can decide whether the action should be continued to be utilized or not. If it has been determined that the action helped the species targeted by the conservation action, then the action could be implemented elsewhere. Should it be determined that the action did not help the species, then that action would most likely not be implemented on other lands.

Adaptive Resource Management

The inventory and monitoring programs and research projects described in this chapter will support efforts to implement this Plan in an Adaptive Resource Management (ARM) framework (Vision Element #3). Figure 7-3 displays the steps in an ARM framework, which are organized into a loop rather than a sequential list. The loop framework helps conservationists conceptualize the process of management as a learning process that informs future management.

Figure 7- 3. Conservation Measures Partnership's Open Standards version 3.0 project management cycle

Long Term Effectiveness Monitoring of Conservation Actions

In addition to biological monitoring, monitoring the effectiveness of conservation strategies described within the Plan is an important component of implementation. Tracking the accomplishments of the IWAP so that political and financial support can be maintained over the 25-year implementation period is a priority of the Plan. A system for tracking accomplishments has been developed by DNR. In addition, for Plan Implementation projects funded through the Wildlife and Sportfish Restoration Program, Iowa has begun tracking programmatic accomplishments through the USFWS's system, called Tracking and Reporting Actions for the Conservation of Species (TRACS). It is our current understanding that the TRACS system will continue to maintain a public viewer online for stakeholder review and use.

Having information about what has been accomplished is important, but only one component of effectiveness monitoring. A working group formed by The Association of Fish and Wildlife Agencies developed an Effectiveness Measures Framework, which was designed specifically for effectiveness monitoring of projects funded through the State and Tribal Wildlife Grants (SWG) Program. The Effectiveness Measures Framework serves as a very helpful basis for tracking the effectiveness of all activities undertaken in support of SWAPs. The theoretical basis for the framework lies in the Open Standards for the Practice of Conservation, developed by the Conservation Measures Partnership.

The Effectiveness Measures Framework makes use of *results chains* to display the *theory of change* which links conservation actions through outcomes to ultimate impacts (Figure 7-4). Clearly identifying the theory of change for conservation actions is the key to measuring effectiveness. This is a key component of the Adaptive Resource Management cycle as explained above.

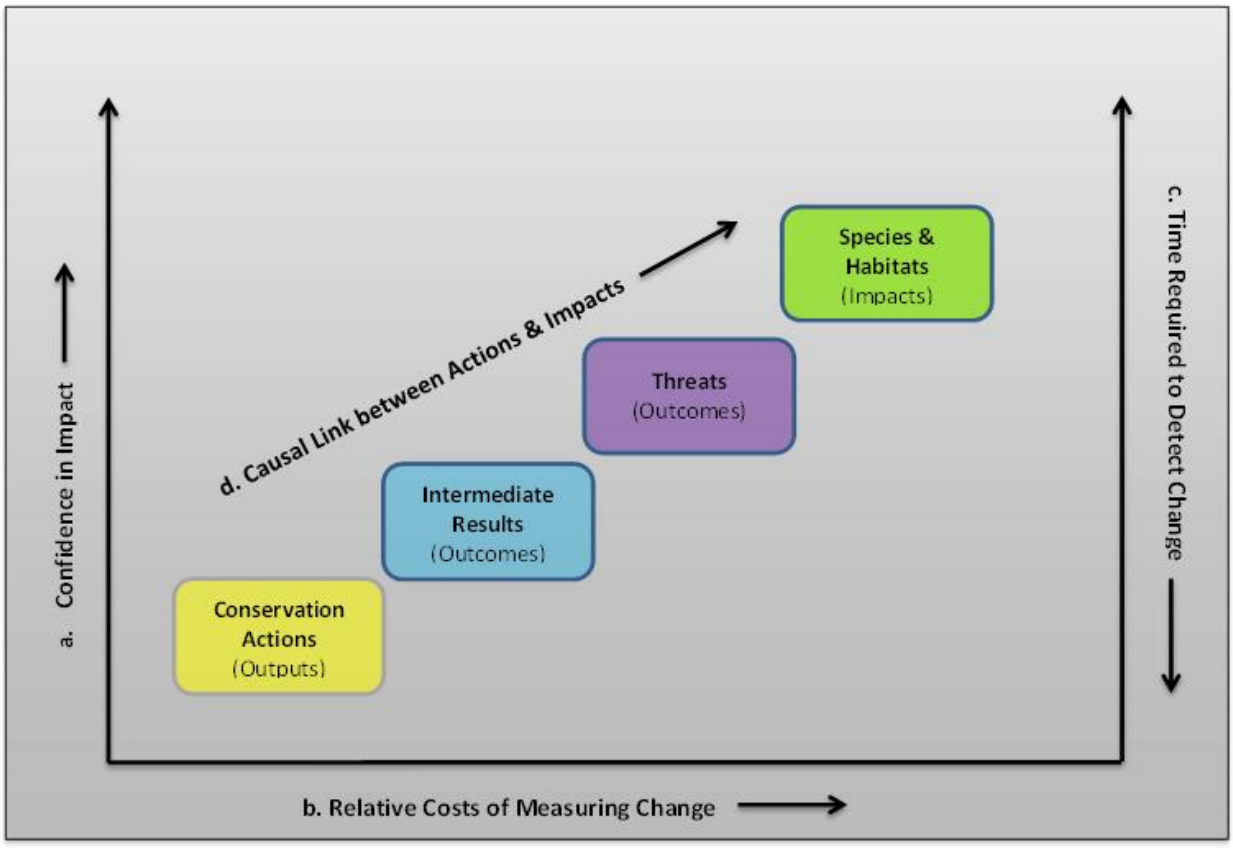

Figure 7- 4. Adapted from AFWA (2011) and the 2008 version of the Open Standards for the Practice of Conservation. This diagram illustrates the *theory of change* which links conservation actions to impacts.

The theory of change for overall Wildlife Action Plan effectiveness is displayed in **Figure 7- 5**. The ultimate goal of the Plans is to improve the conservation of wildlife and wildlife habitat. The pathways from development of SWAPs to eventual impacts may rely on certain assumptions (e.g., increased funding). Clearly stating assumptions at the outset makes the process of conservation transparent, and allows stakeholders and decision-makers to understand what will be required for the impact to occur. Identifying points along the path that require evaluation facilitates the process of Adaptive Resource Management.

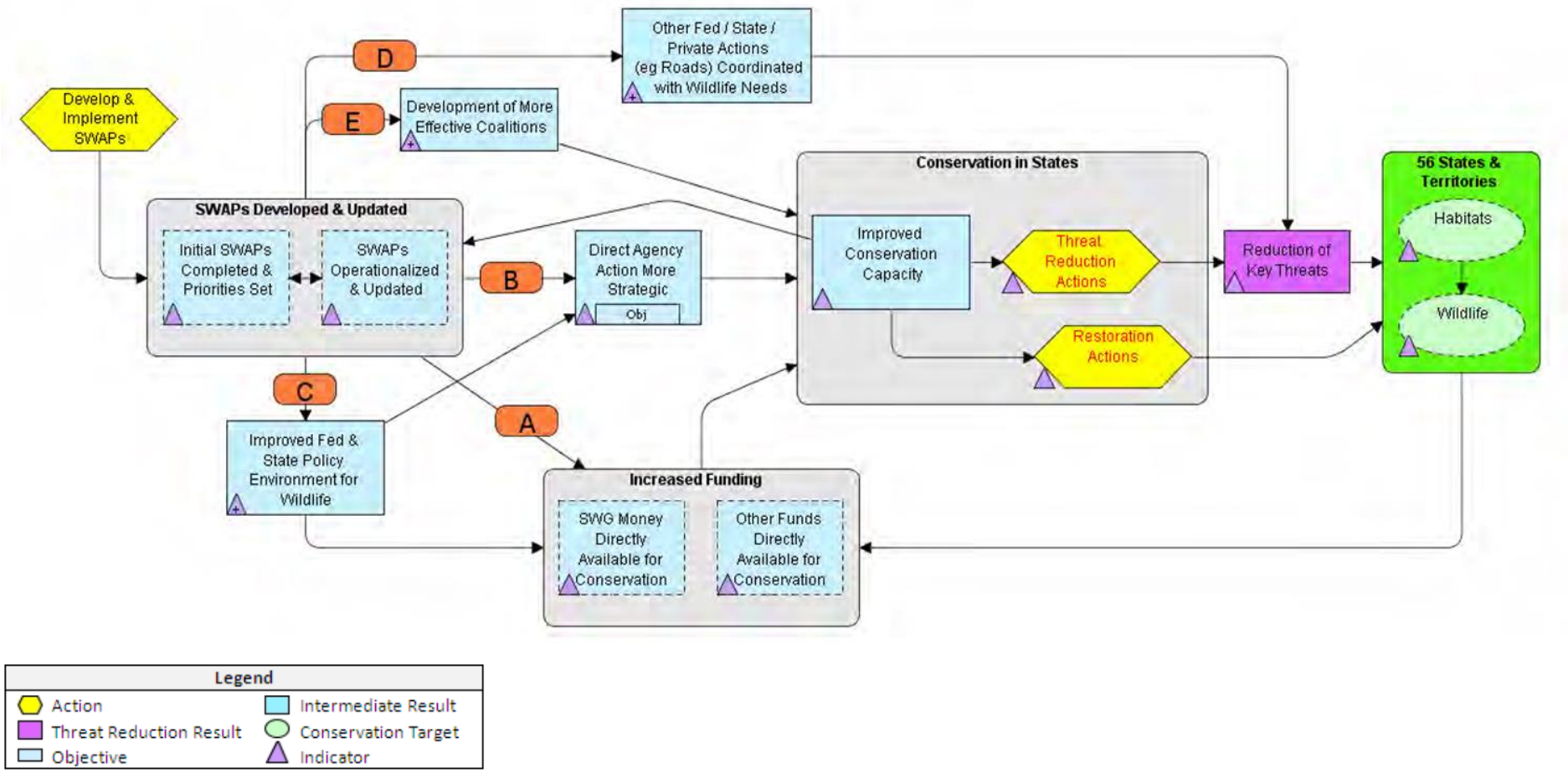

Figure 7- 5. Results chain for overall State Wildlife Action Plan effectiveness, from AFWA (2011)

Research Priorities

Statewide distribution and status information is a priority for all SGCN. Additional areas for research continue to be identified as the results of the inventory and monitoring program become available. DNR and other knowledgeable wildlife researchers regularly work together to identify other priority projects. The initial plan included lists of priority research needs, and progress on addressing these needs has been steady. For this version, the lists of priority research will remain more high-level or strategic to maintain their relevance through the 10-year timeframe of the Plan prior to the next required revision (Table 7-1). More detailed, specific, operational-level lists of research needs will be developed and revised as needed on a shorter, 1-2 year timeframe and posted to the IWAP website. Projects carried out to fulfill research needs on the lists should be rigorously designed from a statistical standpoint, and will require collaboration between researchers and wildlife managers.

Adapting Conservation Actions in Response to New Information or Changing Conditions

Iowa will use new information or changing conditions (e.g., money, politics, environmental catastrophes) to adapt our conservation action. When new threats or actions arise, they will be addressed in a manner that is in accordance with this plan and the approach and steps outlined herein. Periodic meetings of the Implementation Committee and its Working Groups and Subcommittees allow a collaborative approach to addressing changing conditions. At times, an ad-hoc committee may need to be established to work collectively to address a need on behalf of the larger Working Group or Committee.

The ultimate measure of success for the IWAP will be its impact on the wildlife resources of the state. Long term monitoring of all wildlife is necessary to demonstrate the reversal in declining trends of SGCN and to document that common species are remaining common. This can be accomplished only through application of rigorously-designed long term monitoring programs like the Multiple Species Inventory and Monitoring Program that is currently being used to track the status of Iowa's wildlife resources.

A formal review of the IWAP will be conducted every 10 years (see Chapter 9, IWAP Review). This review will include a review of the achievements, the status of wildlife and habitats, assess whether threats have been resolved or have intensified, and to gauge the public's acceptance of the IWAP and its achievements.

Table 7- 1. Research Needs for implementation of Iowa's Wildlife Action Plan

Topic	Further Description
Taxa-Specific	**Life history information, occurrence within Iowa, population trends, habitat associations for species**
Examples:	- Crayfish, terrestrial snails, dragonflies & damselflies o These taxa need more initial survey work to complete an inventory and establish basic distributions of species within Iowa o These taxa also need more research to inform population assessment, status, and habitat use of SGCN
	- Data Deficient Species o Species listed as Data Deficient in all taxonomic groups need initial survey work to complete an inventory and establish basic distributions of species within Iowa o Population assessment, status, and habitat use information for all Data Deficient Species
	- All SGCN o Identifying habitat requirements, limiting factors, effective conservation strategies
	- Taxonomic Groups to Potentially Add to IWAP o Basic information is needed for several taxonomic groups of conservation concern (e.g., bees, moths, aquatic snails, etc.) o Within a given taxa, more initial survey work is needed to complete an inventory and establish basic distributions of species within Iowa
Issue-Specific	**Effects of the following items on species occurrence, density, or reproductive success or other demographic factors**
Examples:	- Habitat Management o Methods or techniques o Management regimes (i.e., timing, duration, or frequency)

Topic	Further Description

	- Habitat Restoration or New Habitat Projects
	  ○ Pre-and-post effects of restoration
	  ○ Feasibility assessments for species re-introductions or re-locations

	- Landscape Ecology
	  ○ Evaluating connectivity between core habitat areas
	  ○ Evaluating landscape permeability
	  ○ Quantifying ecosystem functioning

	- Land Use
	  ○ Renewable energy development
	  ○ Farming practices
	  ○ Effects of urbanization on species

	- Climate Change
	- Invasive species
	- Farm Bill Programs
	- Wildlife diseases
	- Environmental contaminants
Area-Specific	**Research or monitoring projects which rely on spatial datasets**
Examples:	- Identifying critical habitat components ○ Landscape factors affecting species of greatest conservation need (structural features, landscape configurations, and amounts of habitat)

	- GIS and landscape modeling
	  ○ Continued development of the Bird Conservation Area and Amphibian and Reptile Conservation Area models to identify geographic focus areas for habitat protection, restoration, and management
	  ○ Continued predicted species distribution map development
	  ○ Assessments of land use and/or land cover change
	  ○ Monitoring amount, location, and quality of habitat

Human Dimensions	**Sociological research relating to wildlife and wildlife habitat**
Examples:	- Sociological research to evaluate Iowan's values, behaviors, or attitudes with regards to wildlife conservation programs - Studies to enhance understanding of patterns of participation in wildlife-associated recreation (e.g., barriers or opportunities to overcome barriers to participation) - Development and improvement of methods for stakeholder engagement

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Chapter Eight

Priorities for Conservation Actions

Required Element #4: Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions.

This Plan was developed to be a 25-year strategic plan. Specific operational priorities are beyond the scope of this Plan. Operational plans that identify shorter-term (1-5 year) priorities for implementing the conservation actions identified in Chapter 6 may be developed by individual entities contributing to the plan, or by IWAP Implementation Committee or its Working Groups or Subcommittees.

For example, using this Plan as a foundation, DNR's Wildlife Bureau has developed more specific plans for each of its three sections (Public Lands Wildlife Management, Research, and Private Lands Wildlife Management). This process has been valuable in focusing the Bureau's efforts. The process of stepping the IWAP visions and goals into a plan for a specific organization also makes it more explicit how various portions of the organization can most effectively contribute to the realization of the Plan's visions, and how these roles weave together to make an impact.

While this plan does not identify detailed near-term priorities, this first part of this chapter describes the broad-scale priorities for each of the six Vision Elements, and the second part depicts the geographic priorities of this plan, which culminate in **Map 8- 25** "High Opportunity Areas for Cooperative Conservation." Iowa needs to build a diverse, resilient habitat base to support sustainable wildlife populations. When the IWAP was originally developed, it established habitat protection, restoration and enhancement as the foundation for improving the status of SGCN. At the time, the Plan stressed that at least three general approaches need to be taken:

1) **Protect and enhance existing habitats that benefit SGCN**. This approach gives priority to areas of the state with existing habitat for SGCN or that can be suitable with habitat enhancements. Areas with the greatest existing species diversity should be targeted, land acquired or permanent conservation easements developed, and the appropriate management plans implemented. This approach is the most cost-effective way to benefit the most species in the short term. But SGCN are declining with the amount of existing habitat available today. Enhancing these habitats may slow the decline in local populations, but in the Steering Committee's view will not by itself reverse statewide or regional declines.

The greatest potential to apply this approach is for SGCN that inhabit wooded habitats and some grasslands. These existing habitats are most abundant in the Driftless Area, the Central Irregular Plains, the Loess Hills, and along the interior river systems (Map 2-1). The Central Irregular Plains, Rolling Loess Prairies, and Steeply Rolling Loess Prairie ecoregions have many acres of mostly cool season grasslands enrolled in the short term Conservation Reserve Program that could be permanently protected and enhanced to improve habitat for SGCN. Few if any wetlands or wetland-grassland complexes exist in private ownership.

2) **Develop new habitats for SGCN in areas where these habitats do not exist**. This approach would provide new habitat for SGCN but at a higher cost. Establishing new habitats and restoring populations will extend the range of these species, provide the potential for greater genetic diversity and interaction between populations, and reduce the chances of local population extinctions if travel corridors are also provided. It will also be necessary to meet the recreation goals (50% increase in wildlife-associated recreation in areas near home).

Partnerships between DNR, USFWS, Iowa County Conservation Boards and private conservation organizations have had many successes restoring wildlife habitats on agricultural land. Agricultural lands too steep or too wet for economical farming have been targeted for acquisition or protection, then wetlands and grasslands have been restored or grazed pastures allowed to revert to forest.

Opportunities to restore habitats for SGCN exist statewide. The Des Moines Lobe currently has the greatest acreage of restored wetland-grassland complexes in the state and nearly unlimited opportunities for further conservation activities. Similar opportunities exist on a more restricted basis in the Loess Prairies and the Eastern Iowa and Minnesota Drift Plains. Riparian wetlands can be restored along most of the interior river systems.

3**) Improving the status of aquatic SGCN will require a more broadly-applied conservation effort**. Habitat in rivers, streams, lakes, impoundments and wetlands can be improved only if soil erosion, siltation and all the associated problems are reduced (Chapter 5). Targeting areas to protect and restore habitats for terrestrial SGCN will help with this process but will not protect enough land by itself to help all aquatic systems. Vegetative cover must be returned to more of the landscape to hold soil in place. Existing soil-retention programs like terracing, buffer strips and no-till agriculture need to be expanded and new approaches explored to make soil conservation more widely acceptable and financially attractive to the farming community.

Targeting individual watersheds with a comprehensive conservation effort to improve the status of all SGCN and to serve as demonstration areas is the best initial approach to build support for more-widespread efforts. DNR in cooperation with Iowa Department of Agriculture and Land Stewardship (IDALS), Iowa's County Conservation Boards (CCBs), US Department of Agriculture's Natural Resources Conservation Service (NRCS) and Farm Services Agency (FSA), Iowa Soil & Water Conservation Districts, US Environmental Protection Agency (EPA) and local government entities has had success in restoring selected watershed to provide a variety of wildlife, recreational, social and economic benefits to local communities.

A blend of all three approaches will continue to be necessary to accomplish all the goals of the IWAP. The plight of all SGCN in Iowa is caused by the loss of native vegetation from the landscape that provided wildlife habitat and kept soil and associated products out of the waters. Protecting existing habitats is a good strategy to prevent further losses, but it alone will not return SGCN to their former range or raise populations to a viable level. Habitats for SGCN need to be restored in socially acceptable places. Widespread conservation practices will be needed to address water quality issues and are best approached on a watershed basis.

Priorities for Vision Elements

Wildlife Vision

Iowa will have viable wildlife populations that are compatible with modern landscapes and human social tolerance.

Goal 1

Common species will remain common.

Priorities: Continued monitoring will be necessary to detect downward trends in abundance or contractions of area occupied within the State. Current examples of common Iowa species experiencing recent population declines include Northern Flicker, Chimney Swift, Tiger Salamander, and Monarch butterfly.

The first goal is most likely to be achieved by taking a broad, habitat-based approach to conservation as opposed to highly localized actions targeting specific species. Conservation activities to address the first goal should be directed to regions of the state identified in the map of High Opportunity Areas for Collaborative Conservation (**Map 8- 25**). In these areas there are many opportunities to leverage funding, making each conservation dollar go further.

Goal 2

Populations of SGCN will increase to viable levels

Priorities: To achieve this goal the second approach to habitat protection must be taken - creating new habitats for SGCN through land acquisition and management and by taking specific conservation actions designed to improve the status of SGCN that need more intensive assistance. This will take a combination of habitat protection, habitat management and scientific inventory and monitoring.

The habitat acquisition issues are discussed under the habitat vision goals below. The inventory and monitoring issues are discussed in Chapter 7. Once the distribution and abundance of SGCN are more fully understood, conservation actions can be tailored to their recovery. Specific habitat management prescriptions can be defined to assist key species, populations may need translocation to newly created habitats or to isolated tracts of existing habitat, connections may need to be developed between habitat blocks, etc.

Goal 3

The abundance and distribution of wildlife will be balanced with its impact on the economic livelihood and social tolerance of Iowans.

Priorities: Past experience has shown that human social tolerance to wildlife must be cultivated and considered when implementing new conservation actions in a landscape dominated by private land. For example, concentrated populations of white-tailed deer and giant Canada geese have created problems for citizens in some circumstances, precipitating a need for the Wildlife Depredation Program. Wildlife management in Iowa always takes place in the context of relationships and being respectful of neighbors. Examples include managing water levels on public wetlands during periods of heavy rainfall to reduce the risk of flooding on adjacent private lands, weed management to minimize encroachment from public grasslands to private lands, and notifying local residents in advance of prescribed burns. Potential issues need to be considered when implementing the conservation actions outlined in this Plan and steps taken to minimize impacts on neighboring landowners.

Research on Iowan's Wildlife Value Orientations (WVO) and tolerances for certain species and conservation actions was conducted in 2012-2013 (Stephenson et al. 2013). Periodic follow-up on this project to track trends or changes in Iowan's WVOs and to address specific issues of current relevance would be helpful in achieving this goal.

Habitat Vision

Iowa will have healthy ecosystems that incorporate diverse, native habitats capable of sustaining viable wildlife populations.

Goal 1

By 2030, the amount of permanently protected wildlife habitat in Iowa will be doubled.

Priorities: Coordination with other wildlife and biodiversity conservation plans prepared by natural resource agencies and private conservation organizations should continue to be a high priority. Prioritization criteria used by these organizations differ and may include different classes of species or different regional boundaries. Their cumulative site priorities are important in identifying significant locations for future habitat protection actions through partnerships (**Map 8- 4** through **Map 8- 24**).

In the past, land acquisition efforts in Iowa were directed at purchasing the highest quality habitats available at the time funds were available. Too frequently this resulted in scattered small tracts of land that provided limited opportunity for biodiversity management, had little connectivity, and were difficult to manage logistically. Habitat blocks were too small to manage for more than one habitat class (e.g. grasslands or forest) on the area. If multi-species management was attempted the resulting habitat patches were too small to attract area-sensitive species. The Neal Smith National Wildlife Refuge is a notable example of a large-scale restoration (by Iowa standards) that is attempting to establish a functional tallgrass prairie ecosystem.

Since the 1980's habitat acquisitions have focused on the eventual development of major conservation areas of 3,000 - 5,000 acres in more or less continuous blocks. Experience has shown that areas of this size allow management for biodiversity between habitat classes and provide the ability to manage for multiple successional stages within one habitat class. This approach benefits multiple SGCN that need different successional stages on the same site or single species whose habitat needs change throughout the year. It also benefits game species that typically are more abundant in early successional stages as well as nongame. Partners In Flight has adopted a similar approach in designing Bird Conservation Areas, an initiative which Iowa has been implementing since 2001.

Expanding existing large core conservation areas to the desired size should be given priority over work in smaller areas. **Map 8- 3** shows the location of existing habitat complexes of 2,000 acres or larger that are in public ownership that could reach the 3,000-acre threshold with comparative ease. These are permanently protected conservation lands owned by DNR, county conservation boards, the federal government (US Fish and Wildlife Service – National Wildlife Refuges and Waterfowl Production Areas, US Army Corps of Engineers, National Park Service), The Nature Conservancy, Iowa Natural Heritage Foundation or protected under long-term federal wetland easements.

Land (or funding) is seldom available for acquisition in blocks of this size so initial purchases in a new geographical area should be screened for expansion potential. Conservationists working in target areas to acquire large tracts must exhibit patience. State government in Iowa relies on willing sellers to acquire or protect land. Projects of this size can take a decade or longer to complete.

Map 8- 3 also shows extensive areas of the state that do not have core habitat blocks to meet the habitat or recreation goals of this Plan. The Loess Prairies, Steeply Rolling Loess Prairies, and west-central portion of the Des Moines Lobe ecoregions are notably devoid of these areas, as is the northern third of the Eastern Iowa & Minnesota Drift Plains ecoregion. Smaller geographic areas without permanently protected conservation lands can be found in all the other ecoregions as well.

Not all habitat protection efforts can be vested in acquiring large core blocks of habitat. Once the distribution of more SGCN is better understood, key smaller tracts of habitat may be identified that are required for the protection of

exceptionally imperiled SGCN. Connectivity needs to be established between large core areas that are isolated from other tracts. A more dispersed approach may be needed to protect target watersheds and aquatic SGCN rather than concentrating efforts in one location. These decisions need to be made on a case-by-case basis.

Goal 2

Protected habitats will be diverse, representative, native plant communities in large and small blocks on public and privately-owned land and waters.

Priorities: While most terrestrial and aquatic habitat classes occur in every region of the state, certain habitat classes were historically more prevalent in specific landforms. Habitat-oriented conservation actions aimed at SGCN should primarily protect, restore, and enhance native habitats and native SGCN. Priority habitat classes by region are shown in **Table 8- 1**.

Habitat protection and management decision-makers, however, must be realistic in assessing changes that have occurred since pre-settlement times. Many native habitats have been displaced from their original sites. Habitat reconstruction or restoration activities should be focused in areas with the most potential for successful reestablishment of ecosystem processes and maintenance of ecosystem function.

Table 8- 1. Priority habitat classes by ecoregion

PRIORITY HABITAT CLASSES		
ECOREGION	**TERRESTRIAL**	**AQUATIC**
40a. Loess Flats and Till Plains	• Savanna • Grasslands • Shrublands	• Rivers • Streams • Ponds • Lakes (constructed)
47a. Northwest Iowa Loess Prairies	• Grasslands • Wetlands	• Streams
47b. Des Moines Lobe	• Grasslands • Wetlands • Riparian Forest • Savanna	• Rivers • Oxbows
47c. Eastern Iowa and Minnesota Drift Plains	• Grasslands • Wetlands • Riparian Forest	• Rivers • Streams (cold, cool or warm water)
47d. Missouri Alluvial Plain	• Forest	• Missouri River Channel • Oxbows
47e. Steeply Rolling Loess Prairies	• Grasslands • Shrublands • Savanna	• Rivers • Streams • Ponds
47f. Rolling Loess Prairies	• Grasslands • Shrublands • Savanna	• Rivers • Streams • Ponds • Lakes (constructed)

PRIORITY HABITAT CLASSES		
ECOREGION	**TERRESTRIAL**	**AQUATIC**
47m. Western Loess Hills	• Grasslands (northern 1/3) • Woodlands (southern 2/3) • Savanna	• Streams
52b. Paleozoic Plateau/ Coulee Section	• Open Woodland • Grassland • Forest	• Coldwater Streams • Rivers • Backwaters
52c. Rochester/ Paleozoic Plateau Upland	• Goat Prairie • Deciduous Forests • Open Woodland	• Coldwater Streams
72d. Upper Mississippi Alluvial Plain	• Riparian Forest	• Rivers • Backwaters

Management Vision

Diverse wildlife communities will be developed on public and private lands and waters through the use of adaptive ecological management principles.

Goal 1

Wildlife management will be based on science.

Priorities: Strategies within this vision stress educated partners working together. The following elements are key to success of this goal.

- Conservation actions adopted as part of the IWAP should be based on the best available science. Research, inventory, and survey needs for SGCN are identified in Chapter 7.
- Prior to implementation of management actions, the purpose, intended outcomes, and assumptions underlying the actions should be made explicit, and the possibility for evaluation of the action in an Adaptive Resource Management framework should be explored.
- Better communication must be developed between wildlife scientists, the staffs of government land management agencies at all levels, public land managers, and private landowners to assure that an adaptive approach is built into land management decisions.

Recreation Vision

More Iowans will participate in wildlife-associated recreation, and all Iowans will have access to publicly owned recreation areas to enjoy wildlife in its many forms.

Goal 1

The number of Iowans participating in wildlife-associated recreation (wildlife viewing, hunting, fishing, photography, hiking, outdoor classrooms, etc.) will increase 50 percent by 2030.

Priority: A broad and expanded base of support is needed to help ensure that wildlife and habitat management and protection efforts receive adequate attention and investment. The 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation in Iowa estimates that in 2011, 1.3 million people participated in wildlife-associated

recreation in Iowa. The report also estimates that in 2011 there were 522,000 resident anglers, 216,000 resident hunters, and 780,000 resident wildlife watchers sixteen years of age and older in Iowa.

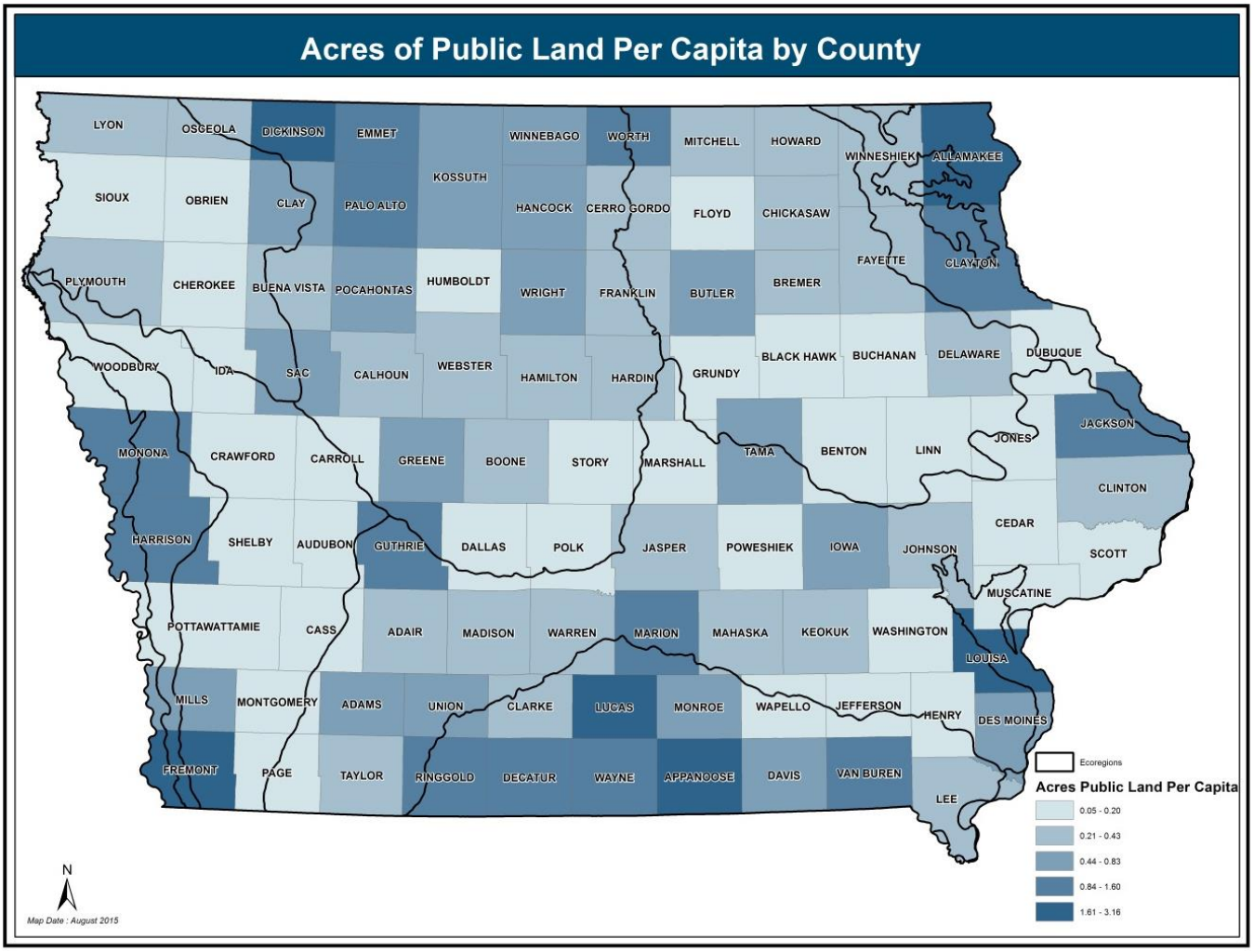
Continued development and expansion of opportunities for wildlife-associated recreation, combined with efforts to engage specific audiences will be critical.

Goal 2

Wildlife-associated recreation will be available to all Iowans on public lands near their home.

Priority: In a culture where time for leisure activities is limited, new participants in wildlife -associated recreation will need to find public lands on which to recreate close to home. While all Iowans deserve access to quality natural areas, the first priority should be given to acquiring and protecting public natural areas close to larger population centers. This will create an appreciation for wildlife-associated recreation among the greatest number of citizens in the early stages of the 25-year effort and generate support needed for completing the Plan. The current spatial arrangement of conservation lands relative to population centers are displayed below (**Map 8- 1**). The distribution of existing public lands is shown in **Map 8- 25**.

Map 8- 1. Distribution of Iowa's public land in relation to county population size



Education Vision

Iowans will respect wildlife for its many values and they will advocate effectively for conservation of wildlife and wildlife habitats.

Goal 1

Iowans will understand the relationships of:

- Land use, and its impacts on wildlife diversity and abundance
- land use, and its impacts on quality of life for all citizens
- land use, and its impacts on Iowa's economic sectors related to wildlife recreation
- wildlife diversity & abundance, and its impacts on quality of life in Iowa
- wildlife diversity & abundance, and its impacts on Iowa's economy
- quality of life for all citizens, and its impacts on Iowa's economy
- Iowa's economic decisions and their impacts on wildlife-based contributions to quality of life for all citizens
- Iowa's economic decisions and their impacts on wildlife diversity & abundance

Priorities: The conservation actions proposed to implement this vision incorporate national standards proposed by the Association of Fish and Wildlife Agencies. The relationships among the health of Iowa's lands and waters and its human and wildlife communities are complex and dynamic. Therefore, it will be important to continue efforts to coordinate with other sectors (e.g., education, tourism, economic development, regional planning, and public health organizations) in the development of conservation education programs and messages.

Funding Vision

Stable, permanent funding will be dedicated to the management of wildlife at a level adequate to achieve the visions of this plan.

Goal 1

Government (Federal, State, and County) and private conservation spending will be increased so that the goals of this Plan are reached by 2030.

Goal 2

Funding will be dependable, secure, and appreciated as a powerful economic and social investment.

Priorities: Of the six vision statements, reaching the Funding Vision goal is the highest priority. None of the other visions can be implemented in anything near the 25-year time frame without increased funding. An estimate of the costs and benefits for implementing the IWAP is included in Chapter 10.

No single conservation organization or stakeholder group has the power to attain the necessary funding on their own. An effort comparable to the Teaming With Wildlife coalition, inclusive all potential stakeholders will be necessary. A grass roots coalition of wildlife enthusiasts of all types - birdwatchers, bird feeders, hikers, back packers, hunters, anglers, photographers, etc. - is a start, but it should also include local government leaders whose communities stand to benefit from increased recreation revenues and improved quality of life. Only a broad-based coalition will have the strength necessary to obtain a sustainable, dedicated federal funding stream for all-wildlife conservation.

Lobbying must be done at the Federal level to convince Congress to supply basic funding to the states equivalent to the $350 million targeted in the Conservation and Reinvestment Act. Funding at the state level will be essential to obtain whatever level of non-Federal matching funds will be mandated by Congress.

Geographic Priorities

Map 8- 2 through **Map 8- 24** represent a broad array of wildlife and biodiversity plans, programs and priority areas prepared by natural resource entities. **Map 8- 25** displays a combination of these priorities. If the areas displayed as priorities in **Map 8- 25** could be conserved or restored such that they functioned as healthy ecosystems with intact ecosystem functioning, then we might expect that the visions of this Plan had been achieved: Iowa would have sustainable, connected networks of healthy, resilient, ecosystems to sustain viable wildlife populations and to provide accessible recreation opportunities and enjoyment for all.

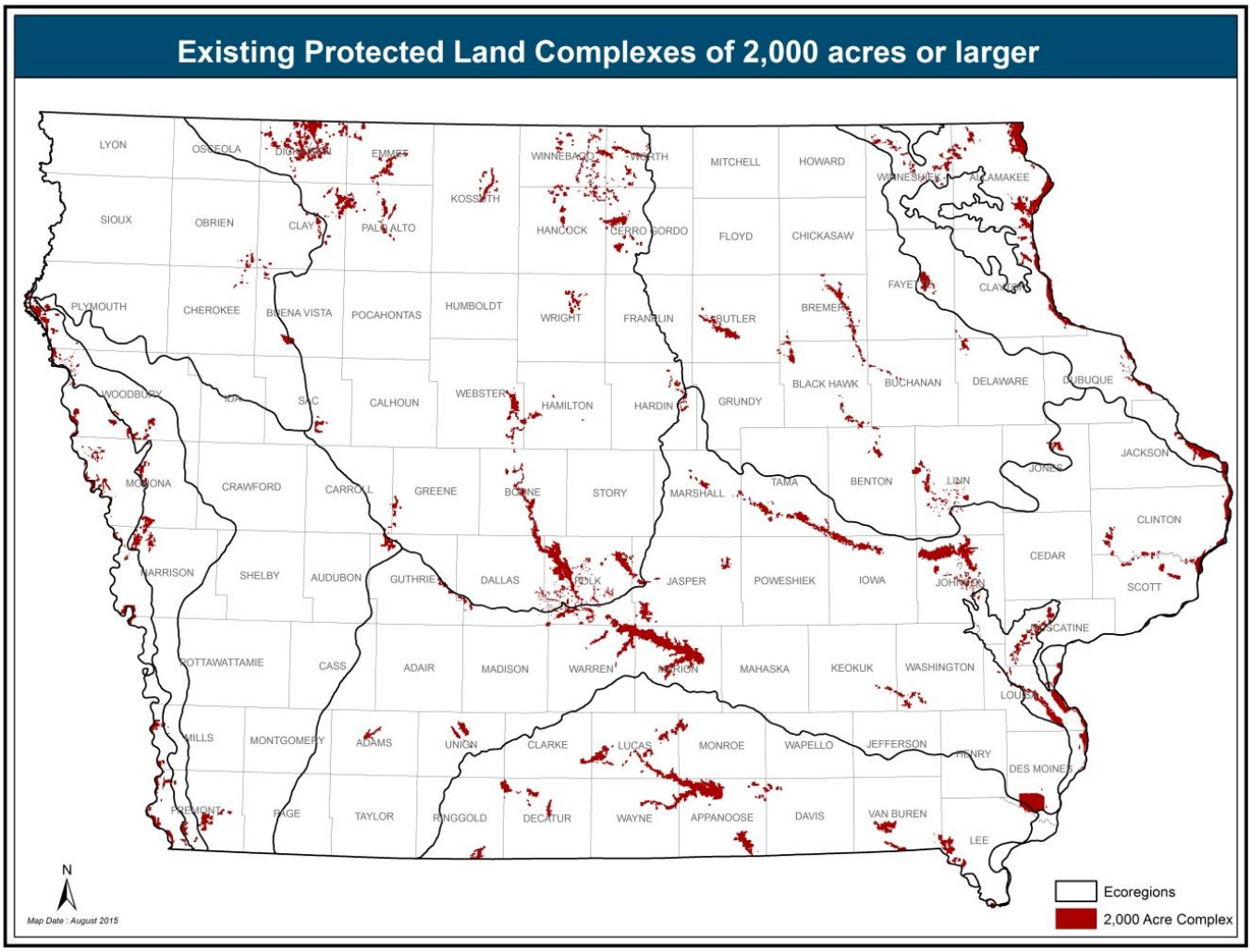
The purpose of displaying geographic priorities is also more practical than simply depicting a grand vision of one potential scenario for Iowa's future. **Map 8- 25** and the maps that comprise it are used in a variety of ways to inform the design and delivery of conservation programs. Conservation organizations use the map to determine where to pursue conservation projects with partners and most effectively leverage their limited dollars. Granting entities use the map to delineate priority areas for wildlife conservation work. Transportation or utility development planners can use the map to help them identify areas of importance to wildlife to avoid disturbance, or areas that would be good candidates for mitigation in the event of disturbance to wildlife or habitat elsewhere.

Process for Geographic Priority Map Updates or Changes

Because the IWAP is designed to serve as a living document that strategically guides conservation efforts across many sectors and entities, it is most useful when the information within the Plan is up to date. For this reason, occasional updates and/or corrections to layers that are presented below will likely be necessary prior to the next IWAP revision. For example, as additional Bird Conservation Areas are designated or shallow lake restoration priorities are added, the associated map may be updated and corrected in the shapefiles that underlie Map 8-25. As such corrections or updates occur, a notice will be posted to the IWAP website, and subsequent requests for the electronic shapefiles will contain the updated maps.

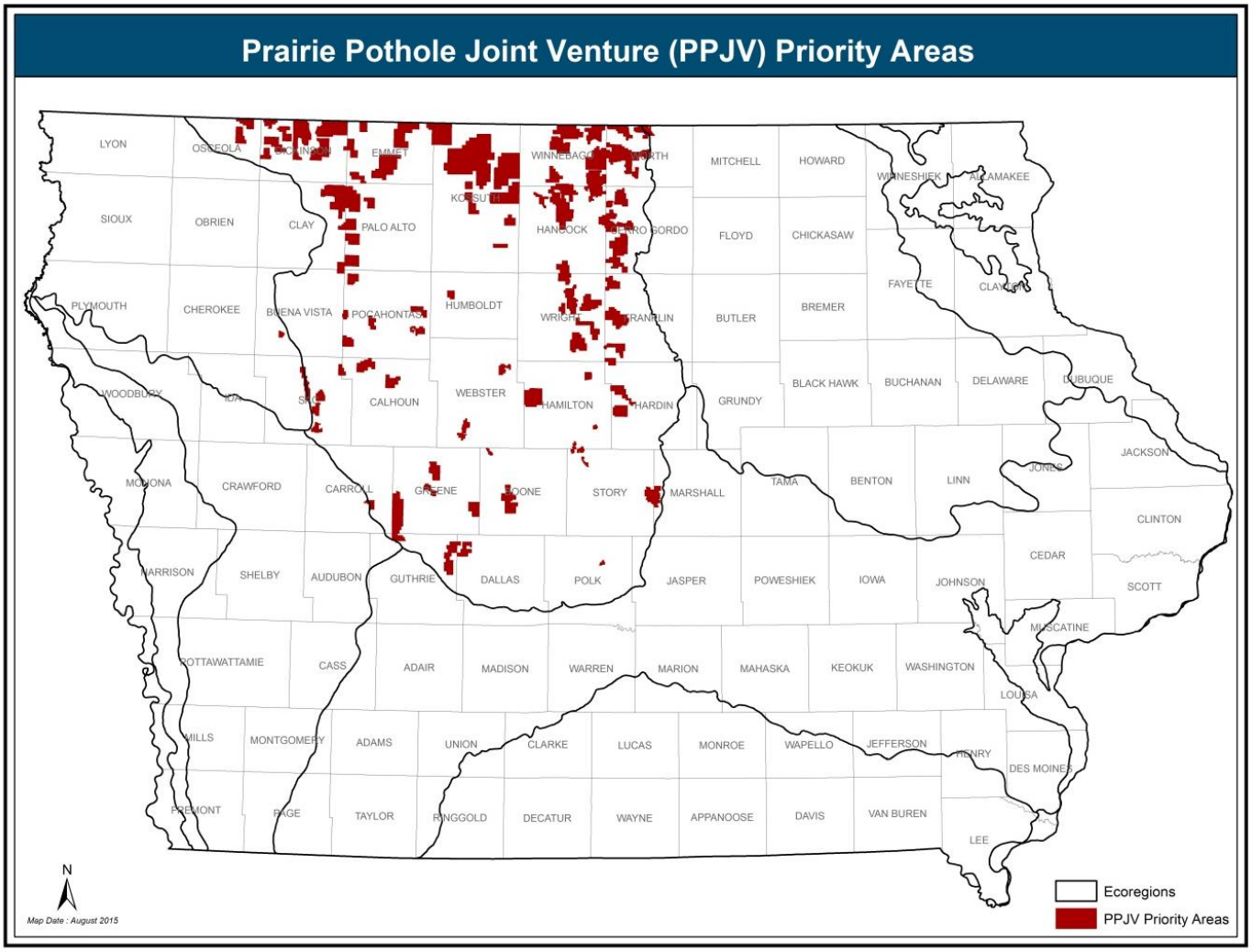
If, at a point prior to the next IWAP comprehensive review and revision, the Implementation Committee or its Working Groups decide that a full review of geographic priorities is warranted, then that review process will be coordinated by the Habitat Working Group, and will be submitted as a minor or major revision to the U. S. Fish and Wildlife Service for approval.

Map 8- 2. Existing protected land complexes of 2,000 acres or larger



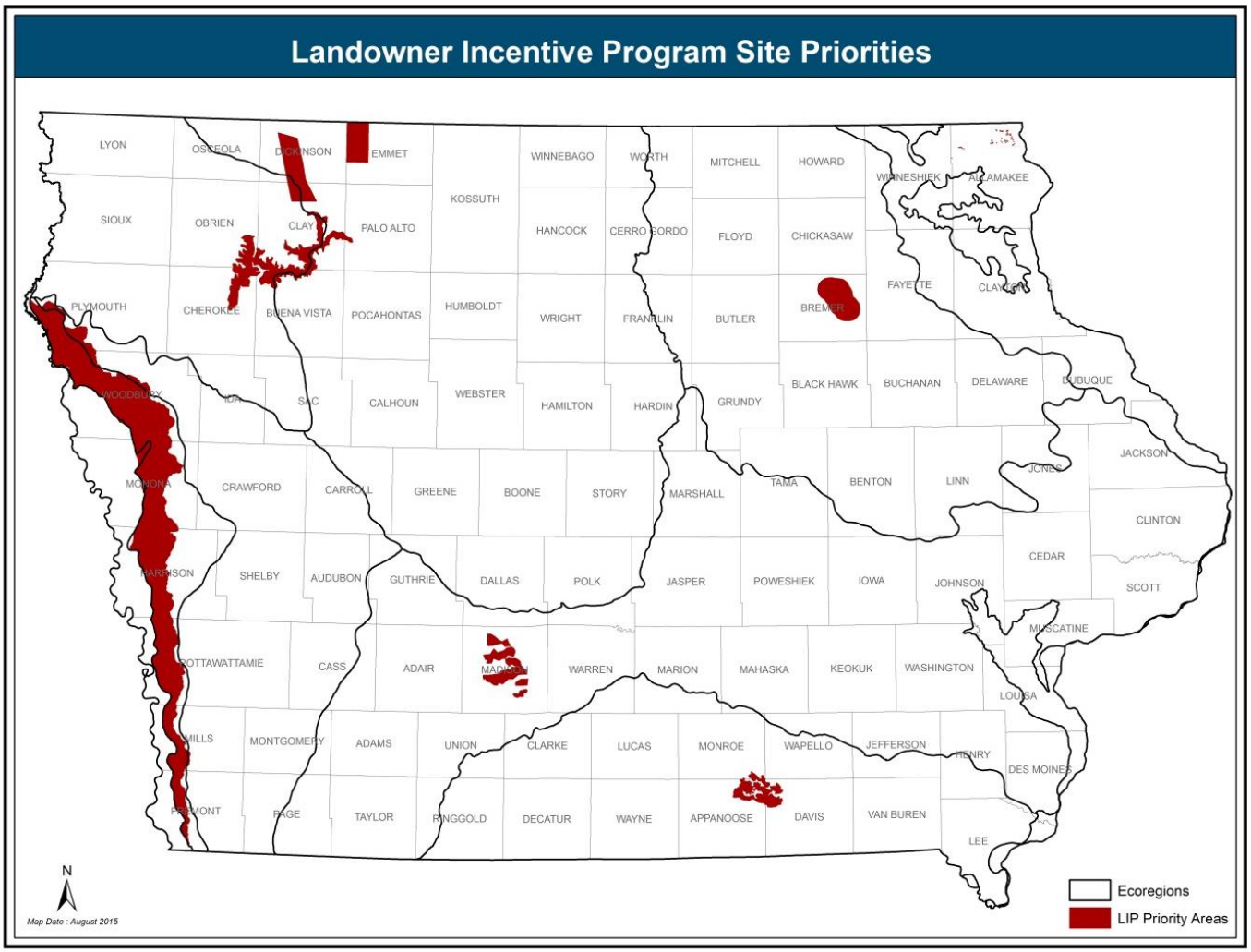
Map 8- 3. Prairie Pothole Joint Venture Priority Wetland Complexes

The Prairie Pothole Joint Venture of the North American Waterfowl Management Plan is an effort by government agencies and conservation organizations to protect and restore waterfowl habitat within the Prairie Pothole Region of the United States and Canada. Existing and restorable wetland complexes within the Prairie Pothole Region of Iowa have been identified and are shown below. Although initially targeted at waterfowl species, emphasis within the Prairie Pothole joint Venture has been extended to nongame species as well. Research sponsored by DNR and Iowa State University has demonstrated that a variety of birds and other SGCN have successfully re-colonized these restored habitats.



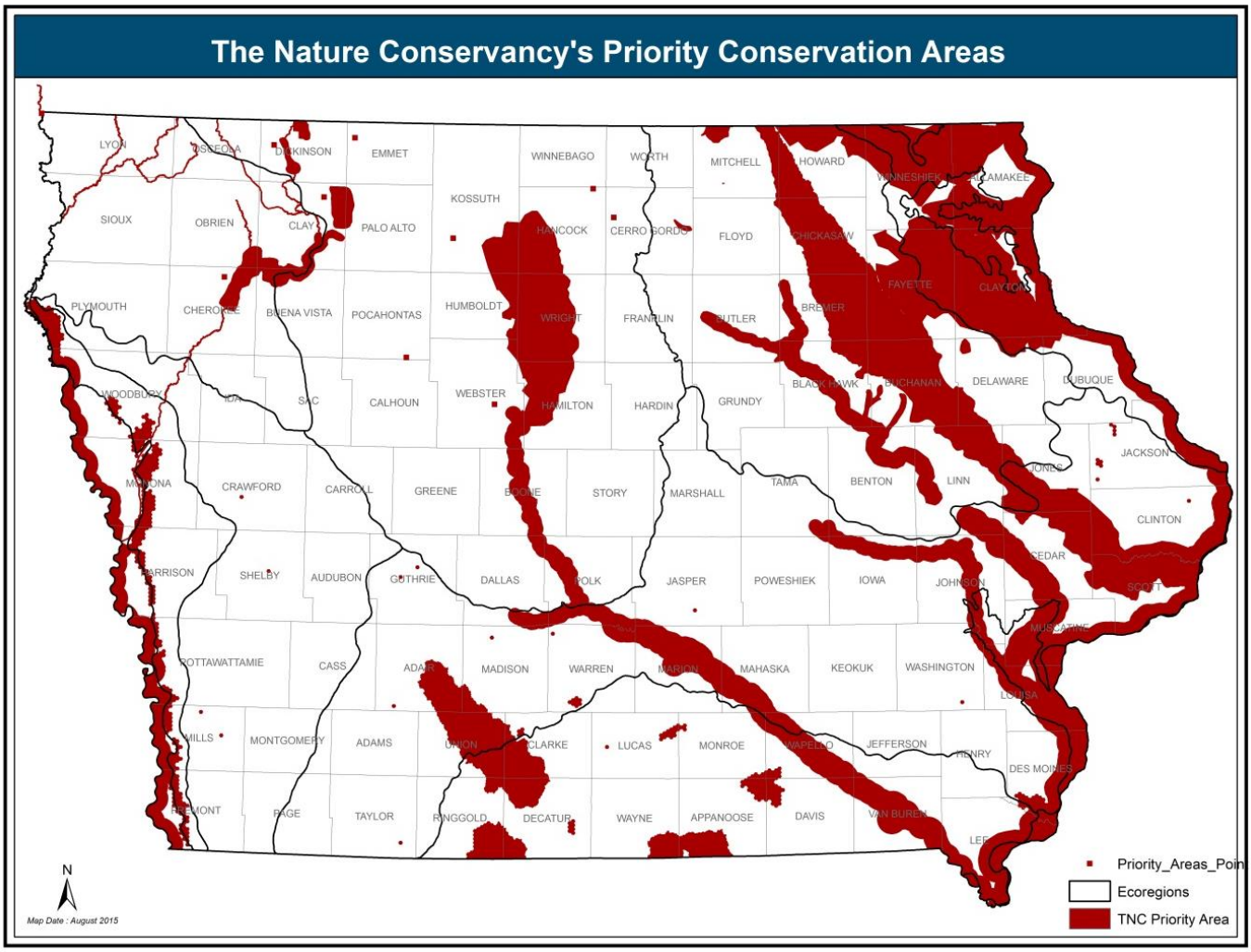
Map 8- 4. Landowner Incentive Program Site Priorities

The Landowner Incentive Program (LIP) was designed to protect and restore habitat for state and federally listed endangered and threatened plant and animal species on private lands. The program provided financial incentives and educational materials to private landowners willing to participate in the program. Scientists knowledgeable about Iowa's Threatened and Endangered species established site priorities. The identified sites include known and potential habitats for endangered and threatened species. Although LIP was discontinued and program work was completed in Iowa in 2010, this map layer is considered important in determining current and future Wildlife Action Plan priorities, because habitat work in these areas would benefit listed species and those SGCN that utilize similar habitats. For this map, LIP priorities which are now encompassed by other priority layers (e.g., Topeka Shiner Critical Habitat, BCAs, ARCA) have been removed to reduce duplication.



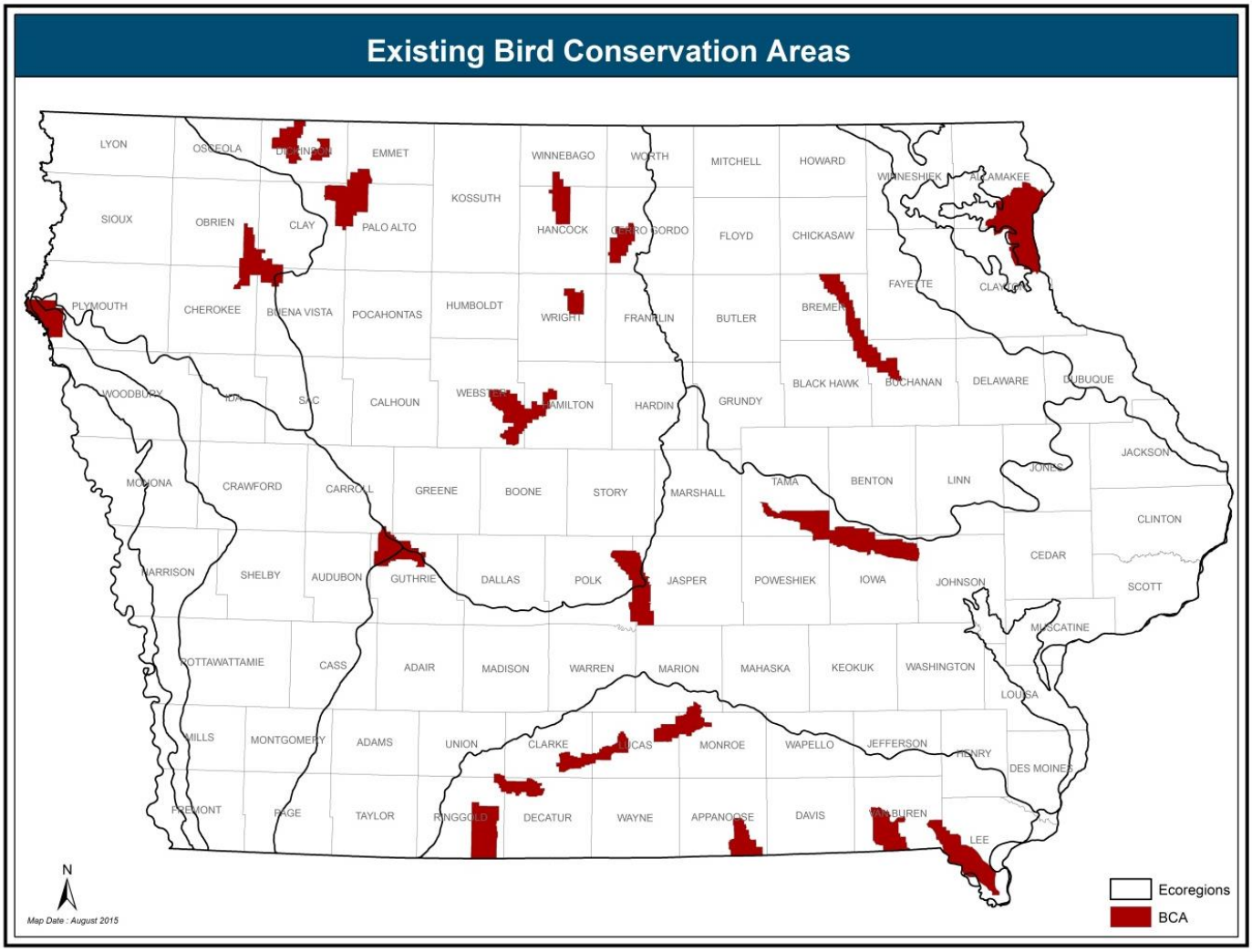
Map 8- 5. The Nature Conservancy's Priority Areas within Iowa.

This map reflects areas of biological significance based on The Nature Conservancy's freshwater and terrestrial ecoregional planning that took place between 1999 and 2008 including the Northern Tallgrass Prairie, Central Tallgrass Prairie, Prairie Forest Border ecoregional assessments, and the Upper Mississippi River Basin assessment. The assessments include analyses of plant, animal and natural community data, along with expert opinion and analysis of those places in each of the ecoregions, that if protected, will conserve the biodiversity in those ecoregions. Iowa represents a portion of each of those ecoregions. The Nature Conservancy currently has active efforts underway in these freshwater sites: Missouri River, Mississippi Rivers, Boone watershed, Cedar watershed and the Des Moines River. The Conservancy also is currently active in the Loess Hills, Little Sioux, Grand River Grasslands, Lower Cedar valley and the Driftless region.



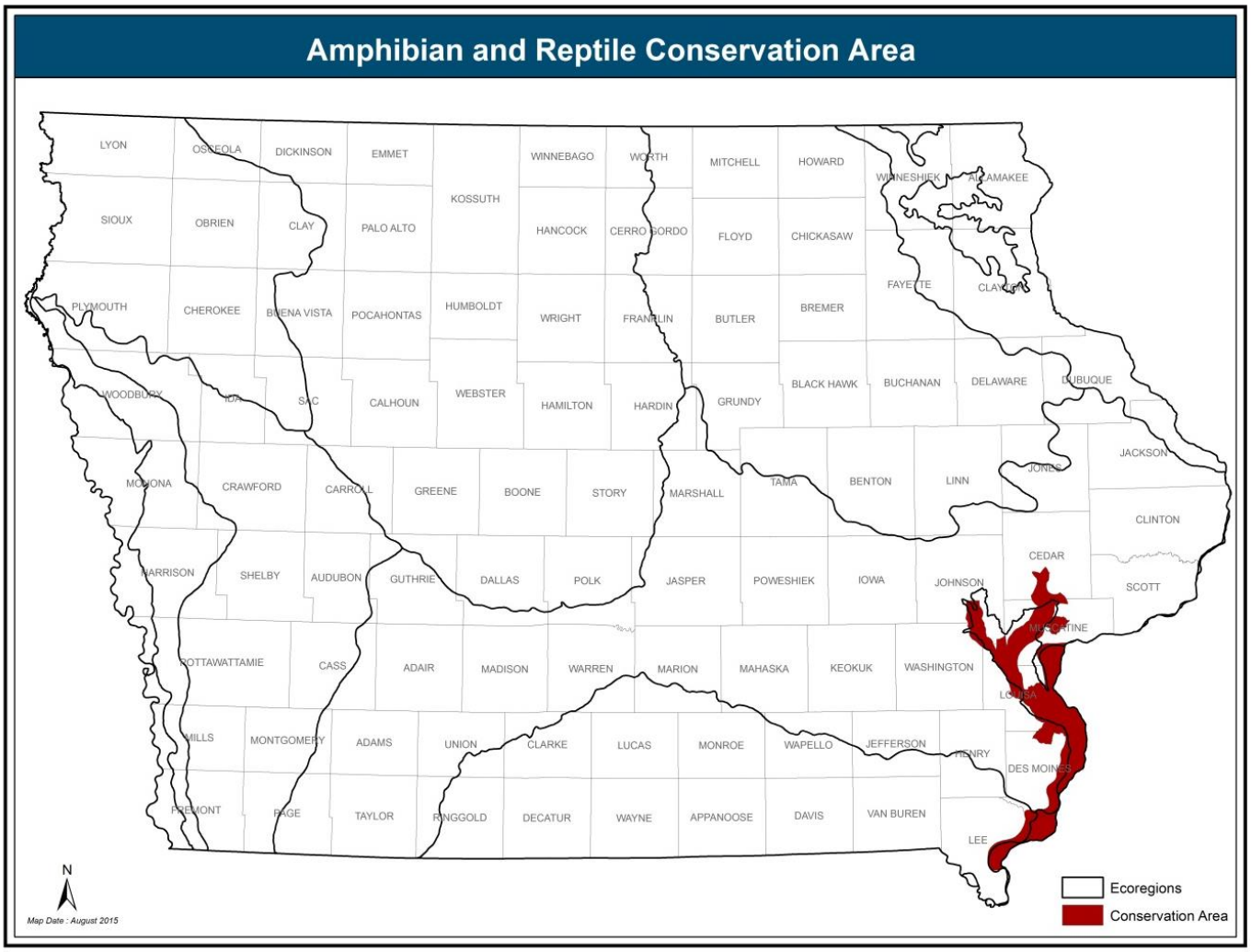
Map 8- 6.Bird Conservation Areas

Bird Conservation Areas have been designated by DNR as significant habitat complexes for birds generally following guidelines established by Partners-in-Flight. They are areas of 10,000 acres or more made up of a core area of permanently protected natural habitat surrounded by a matrix of public and private natural lands. This concept is backed by research that suggests viable bird populations require conservation efforts at a landscape-oriented level. While targeted specifically at birds, large tracts of natural habitat such as these have been identified throughout this Plan as providing significant habitat protection and restoration potential for SGCN.



Map 8- 7. Amphibian and Reptile Conservation Area

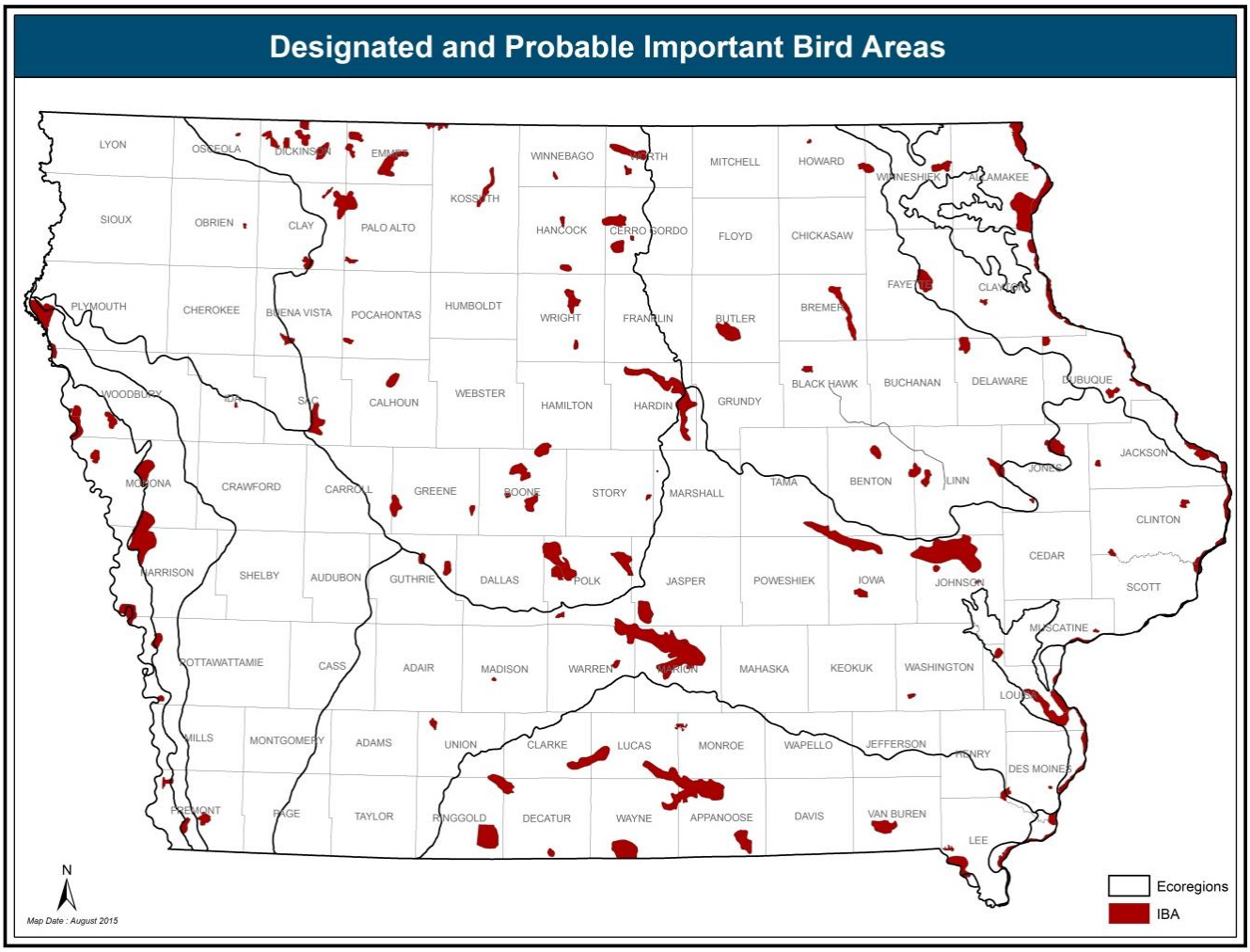
Iowa dedicated the nation's first-ever Amphibian and Reptile Conservation Area in 2007. The Southeast Iowa Amphibian and Reptile Conservation Area (ARCA) includes public and private lands in Iowa's Mississippi Alluvial Plain. Modeled on the Bird Conservation Area concept (see **Map 8- 8**) it spans approximately 470,000 acres. The area's diverse features—including riverbeds, grasslands, rock outcrops, streams, ponds and ephemeral wetlands—provide habitat for many species.



Map 8- 8. Iowa Audubon's Important Bird Areas

Iowa Audubon's Important Bird Areas (IBA) Program is a citizen-led, science-based and data-driven bird conservation initiative. Phase l of this long-term effort is the identification, recognition and prioritization of habitats that support the most seriously declining species of birds. A State IBA Technical Committee evaluated all data received on a habitat-by-habitat basis, and then voted to confer IBA recognition when criteria were met. Habitats that meet criteria are considered to be the most essential habitats. A total of 70 IBA's in 55 counties have been officially recognized in Iowa and 130 additional habitats have been nominated

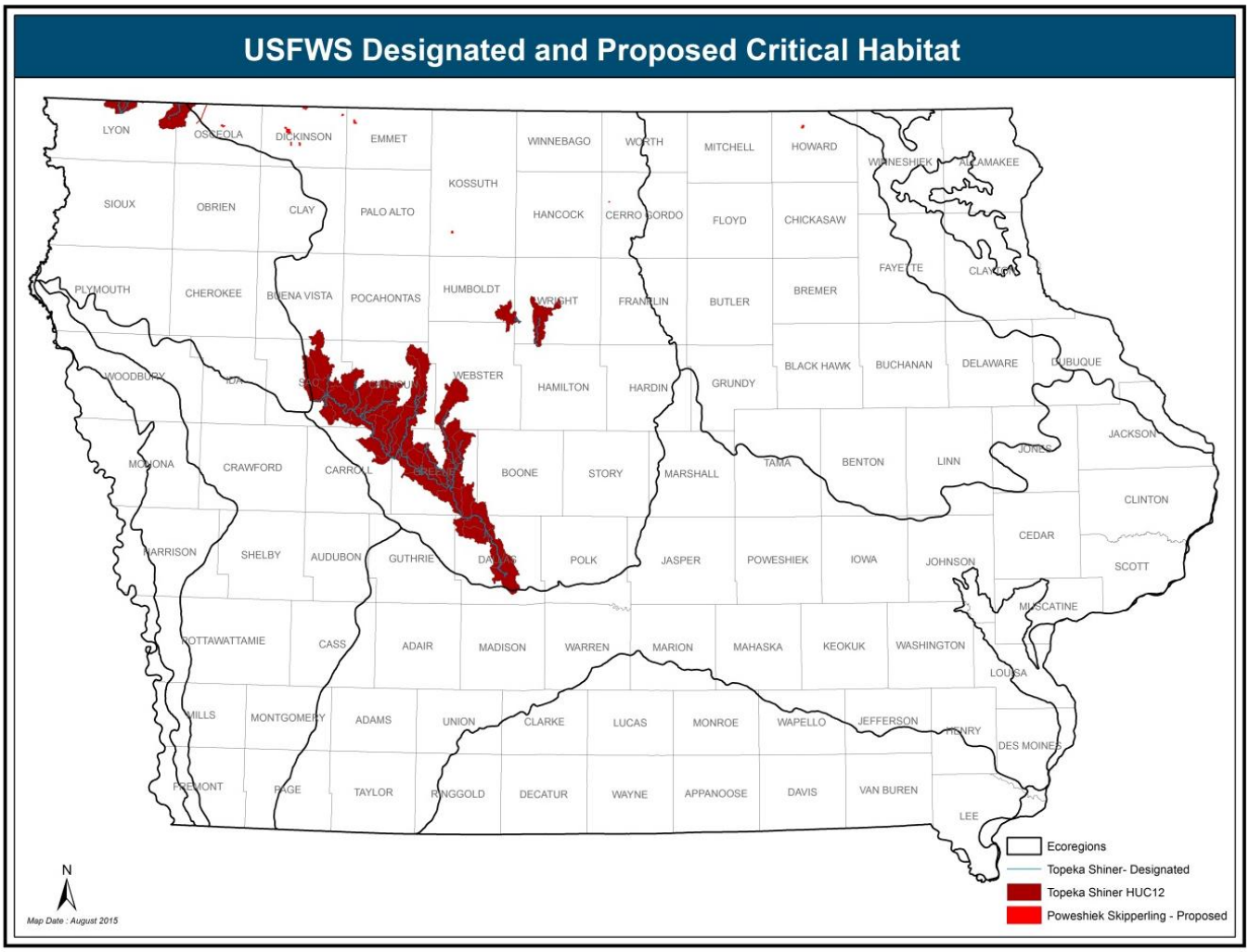
Phase 2 of the IBA Program is long-term monitoring of bird populations and habitat conditions, and organizing education programs at designated IBA sites where appropriate. Phase 3 is working with landowners and land managers to develop and implement long-term conservation plans to protect, restore, enhance and manage IBAs according to their environmental threats and conservation needs.



Map 8- 9. Designated Critical Habitat for Topeka Shiner and Proposed Critical Habitat for Poweshiek Skipperling

The Topeka Shiner, *Notropis topeka*, is a federally endangered species of minnow. This map shows known and potential critical habitat for Topeka Shiners in Iowa. The Poweshiek Skipperling (*Oarisma Poweshiek*) is a federally endangered species of butterfly. This map displays proposed critical habitat for Poweshiek Skipperlings in Iowa.

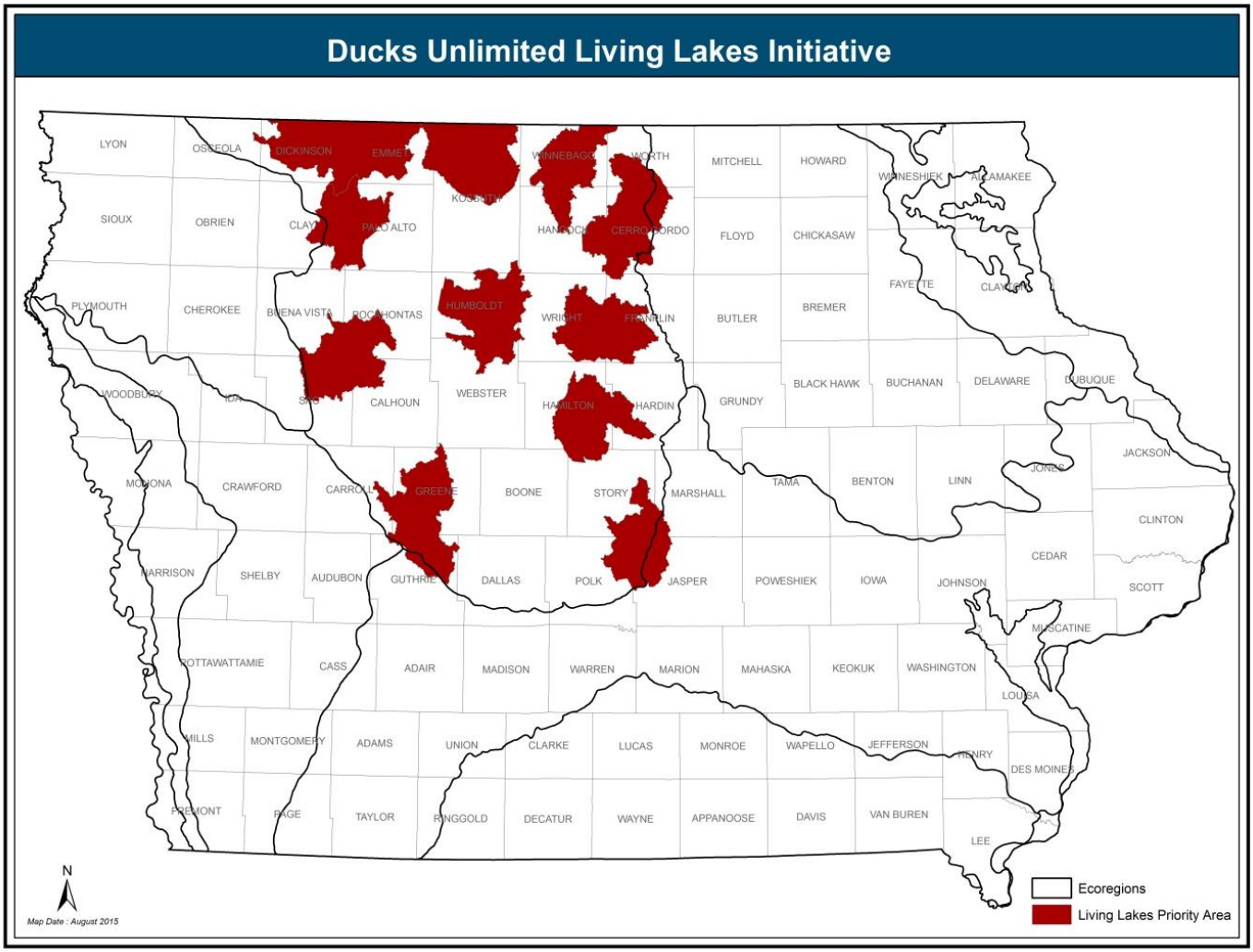
This habitat is essential for the conservation of these two species and may require special management and protection. All indicated areas designated as critical habitat are occupied by the species or have been documented at the site in the past (and for the Topeka Shiner, there are also short segments that provide critical links between habitats). An area is designated as critical habitat through the federal regulatory process. The designation does not set up a preserve or refuge and has no specific regulatory impact on landowners' actions on lands that do not involve federal agency funds, authorization, or permits. Although this map displays critical habitat for only two species, it can be used to help set priorities for conservation actions in for those part of the state.



Map 8- 10. Ducks Unlimited Living Lakes Initiative Emphasis Areas

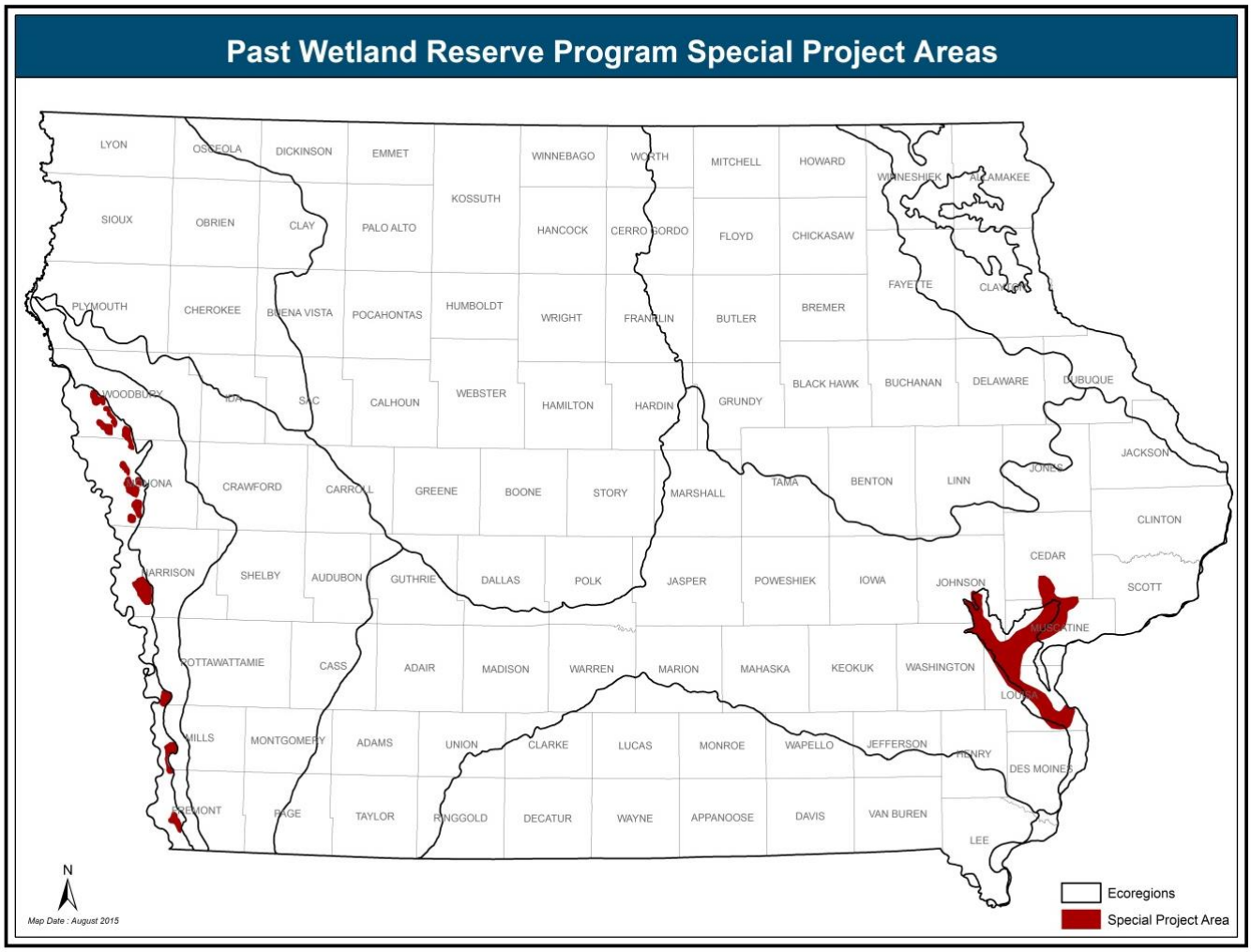
Ducks Unlimited Living Lakes Initiative Emphasis Areas represent an effort to provide high-quality feeding and resting areas for migratory birds as they cross the intensively farmed Des Moines Lobe. Research suggests migrating waterfowl are losing weight as they cross the Upper Midwest because of the lack of adequate food and they arrive on their Canadian breeding grounds in poor condition for nesting. This proposal would provide 3,000 - 5,000 acre wetland complexes at less than 75-mile intervals so that birds can move at a more leisurely pace and maintain their body condition.

The Emphasis Areas were defined in order to concentrate delivery into smaller geographic scopes and make much wiser conservation investments, rather than a traditional "shotgun approach" to habitat conservation. Iowa's shallow lakes monitoring efforts are a vital component of assessing before & after conditions to illustrate that these degraded systems can be "brought back to life."



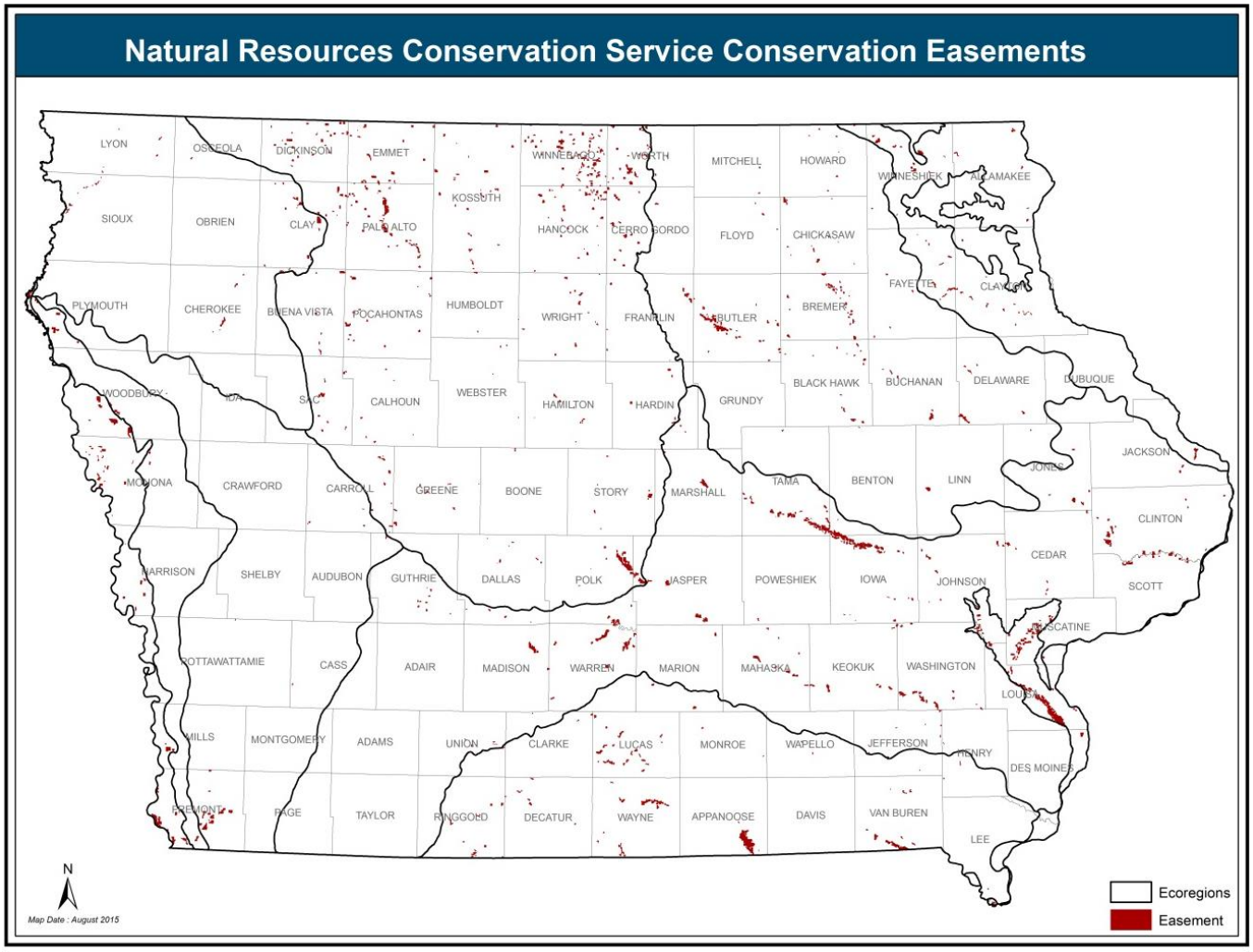
Map 8- 11. Past Wetland Reserve Program Special Project Areas.

Major flooding that covered Iowa and the Midwest in 1993 led to the passage of the Federal Wetland Reserve Act designed to get development and agriculture out of areas prone to flood and return them to their original wetland condition. DNR, in cooperation with NRCS and NGO partners have been able to acquire permanent easements on 100,000 acres in Iowa. This map identifies areas DNR has worked with landowners to enroll lands in WRP and acquire their residual value so that these lands could be managed for wildlife.



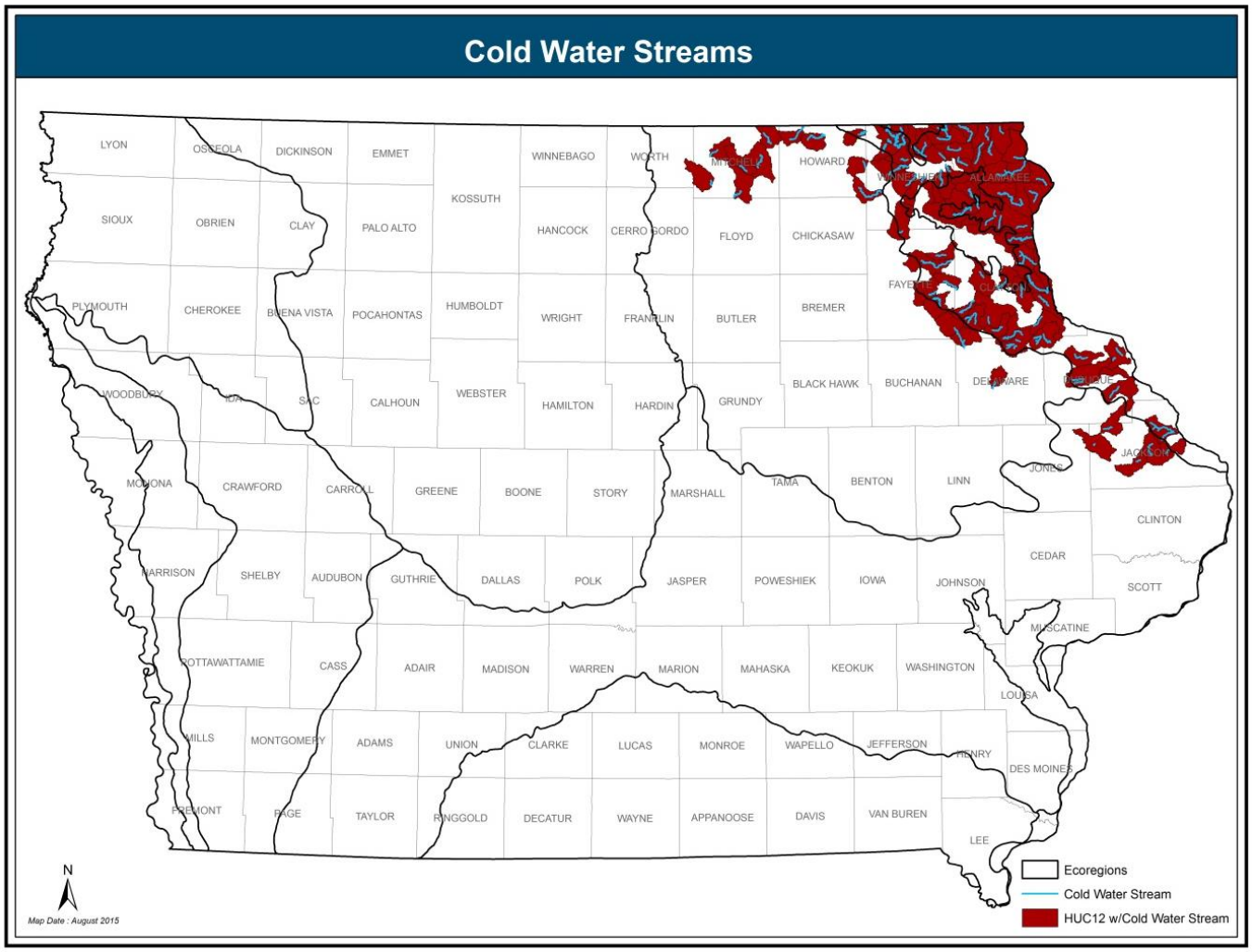
Map 8- 12. Natural Resources Conservation Service Wetland Easements

The USDA Wetlands Reserve Easement (WRE, formerly called WRP), Emergency Wetlands Reserve Program (EWP), and a few other wetlands restoration programs have helped slow the loss of wetlands in Iowa. Wetlands restoration is focused in the 35-county area in northcentral Iowa called the Prairie Pothole area, and along river and stream corridors throughout the state.



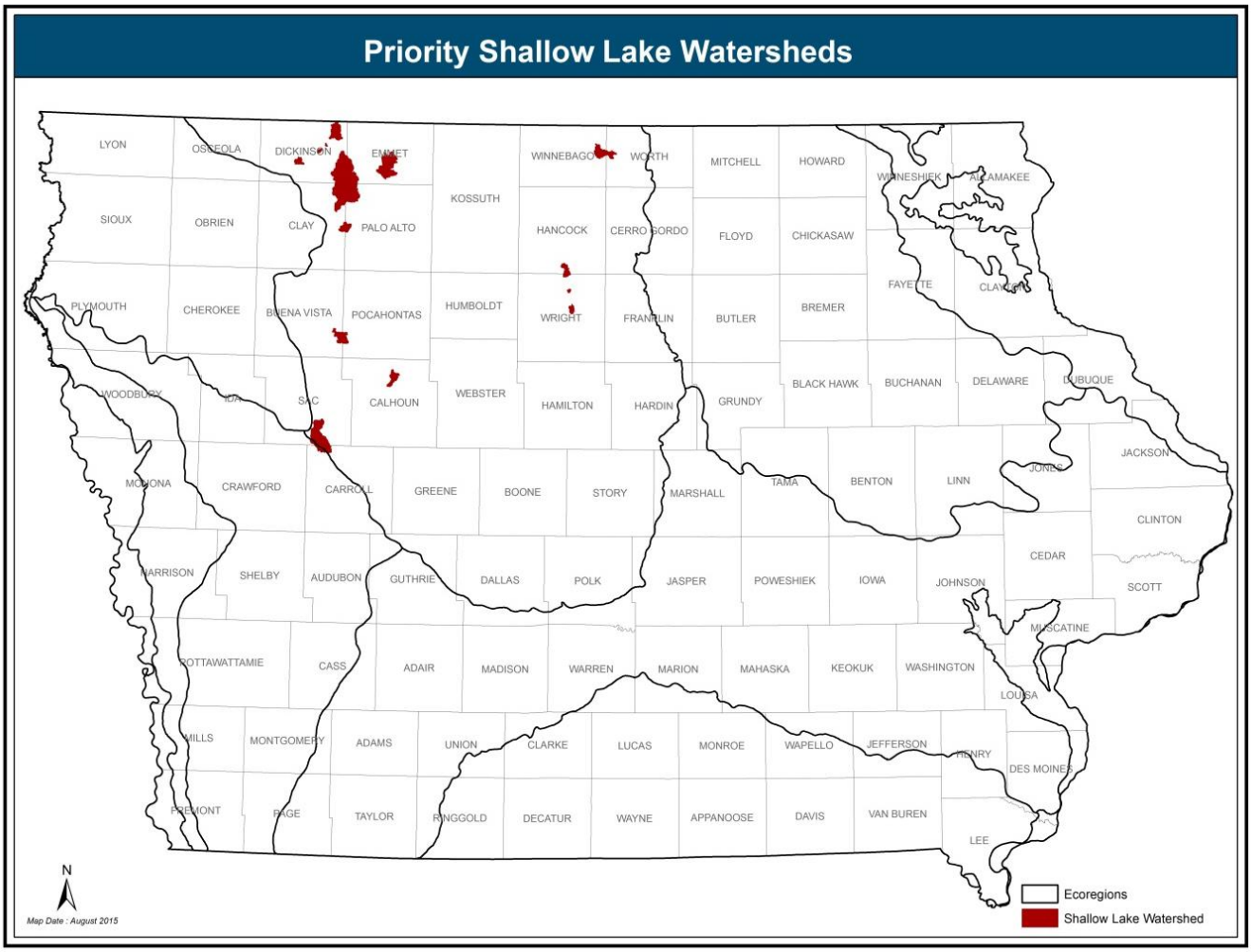
Map 8- 13. Watersheds with Coldwater Streams

The Driftless Area covers over 16,000 square miles across Northeast Iowa, Southwest Wisconsin, Southeast Minnesota and Northwest Illinois. The area escaped coverage by glacial drifts which covered much of the upper Midwest during the latter part of the Pleistocene epoch. Due to its unique karst geology characterized by sinkholes, caves and springs, the Driftless Area supports a high concentration of spring-fed, regionally significant coldwater streams. Coldwater streams are flowing waters with maximum summer water temperatures that are typically below 22°C. This map displays Hydrologic Unit Code (HUC) 12 watershed containing coldwater streams.



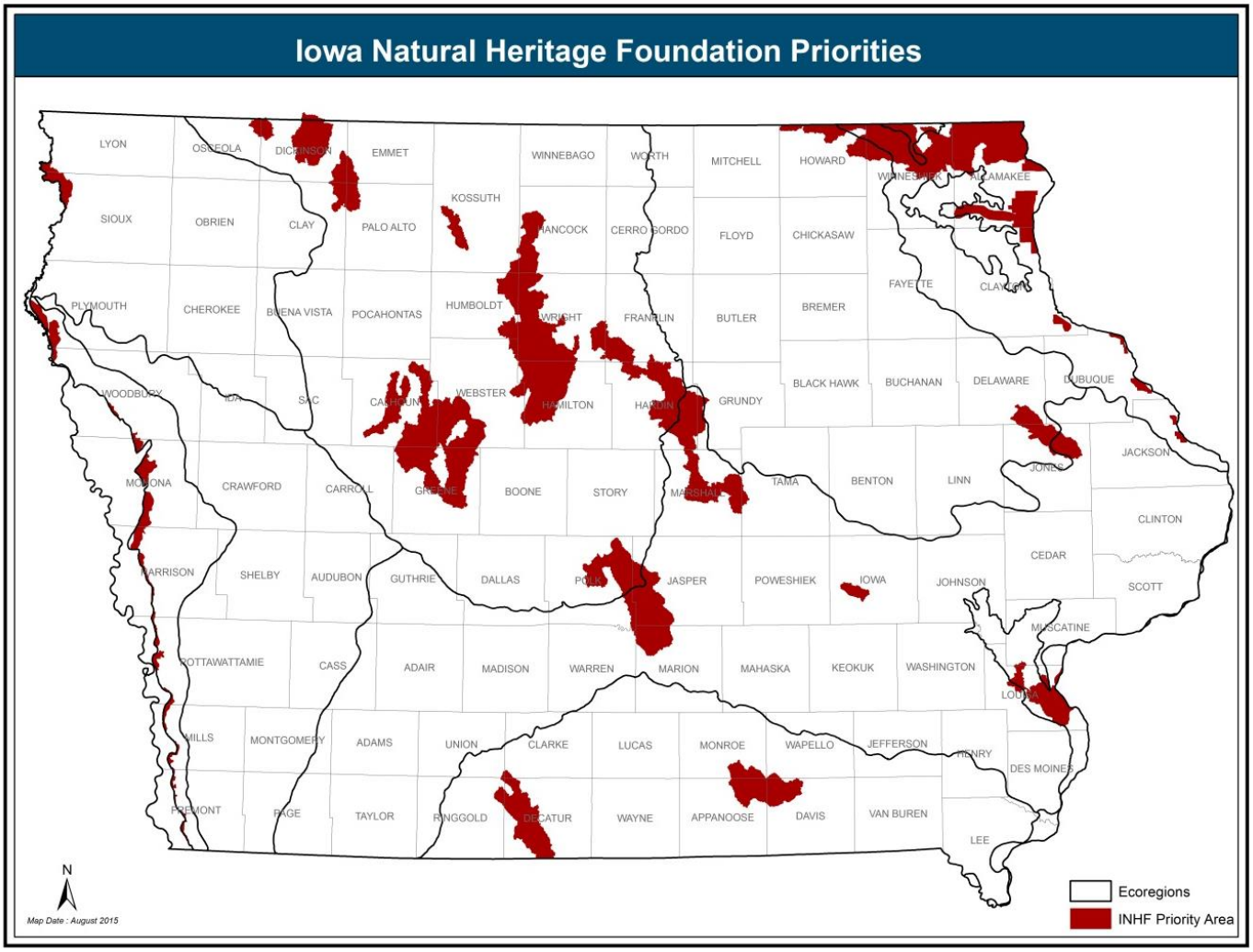
Map 8- 14. Priority Shallow Lakes

Ducks Unlimited and the Iowa DNR's Wildlife and Fisheries Bureaus developed a prioritized list of shallow lakes to be renovated over the next ten years, which is updated periodically as restoration projects are completed. Natural lakes in Northwest Iowa are mainly characterized as shallow, windswept systems that exhibit poor water quality. Significant watershed changes and the introduction of common carp in the late 1800's have forever made management of these water bodies a challenge. The current focus of the Shallow Lake Restoration Program is on shallow lakes that support both fishing and wildlife benefits. In addition, there is an emphasis on shallow systems above important natural lakes.



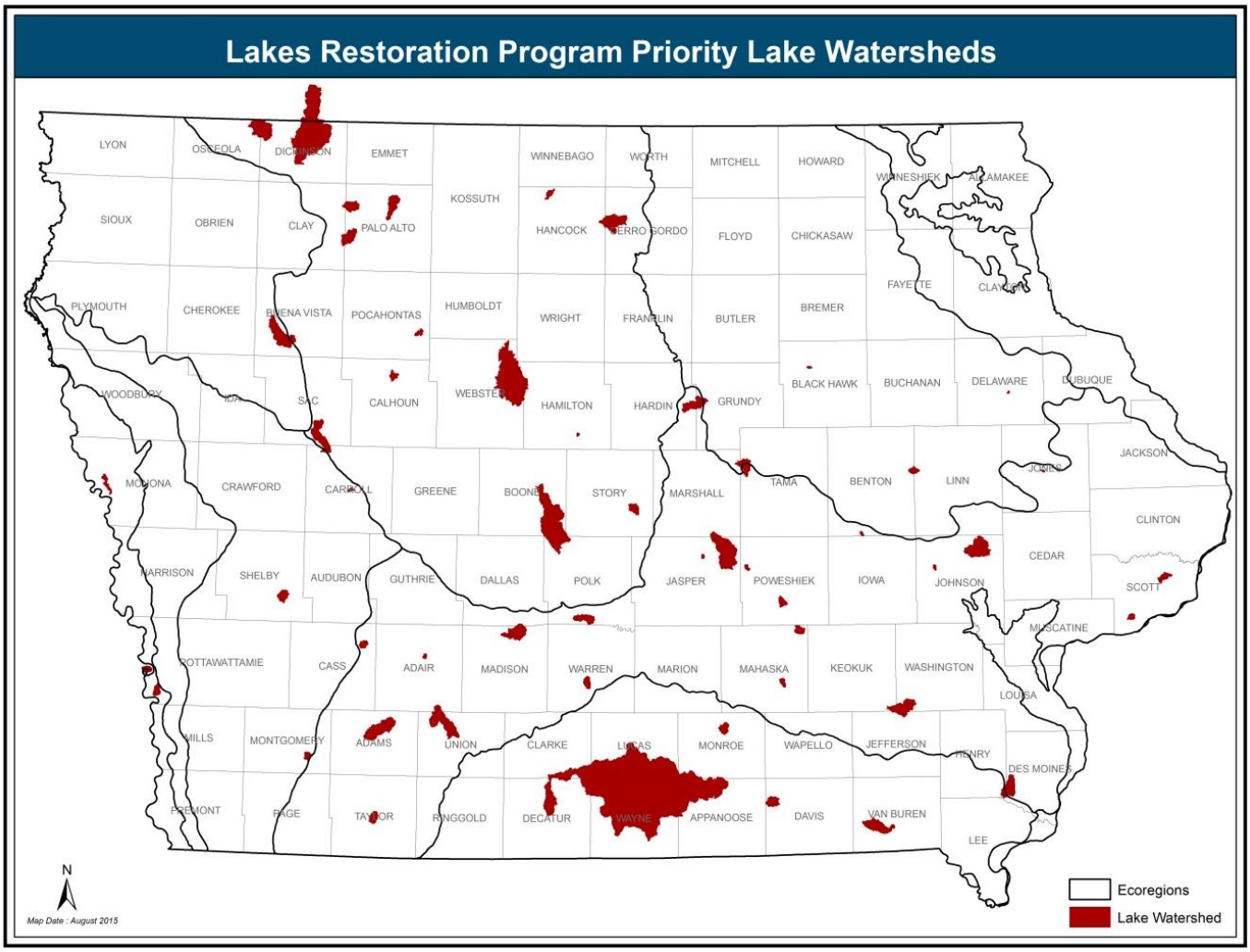
Map 8- 15. Iowa Natural Heritage Foundation Priorities

The Iowa Natural Heritage Foundation (INHF) is an accredited land trust. INHF is a member-supported organization and its priorities include protecting priority lands, connecting natural landscapes and natural corridors, restoring natural areas, and engaging Iowans with Iowa's natural heritage.



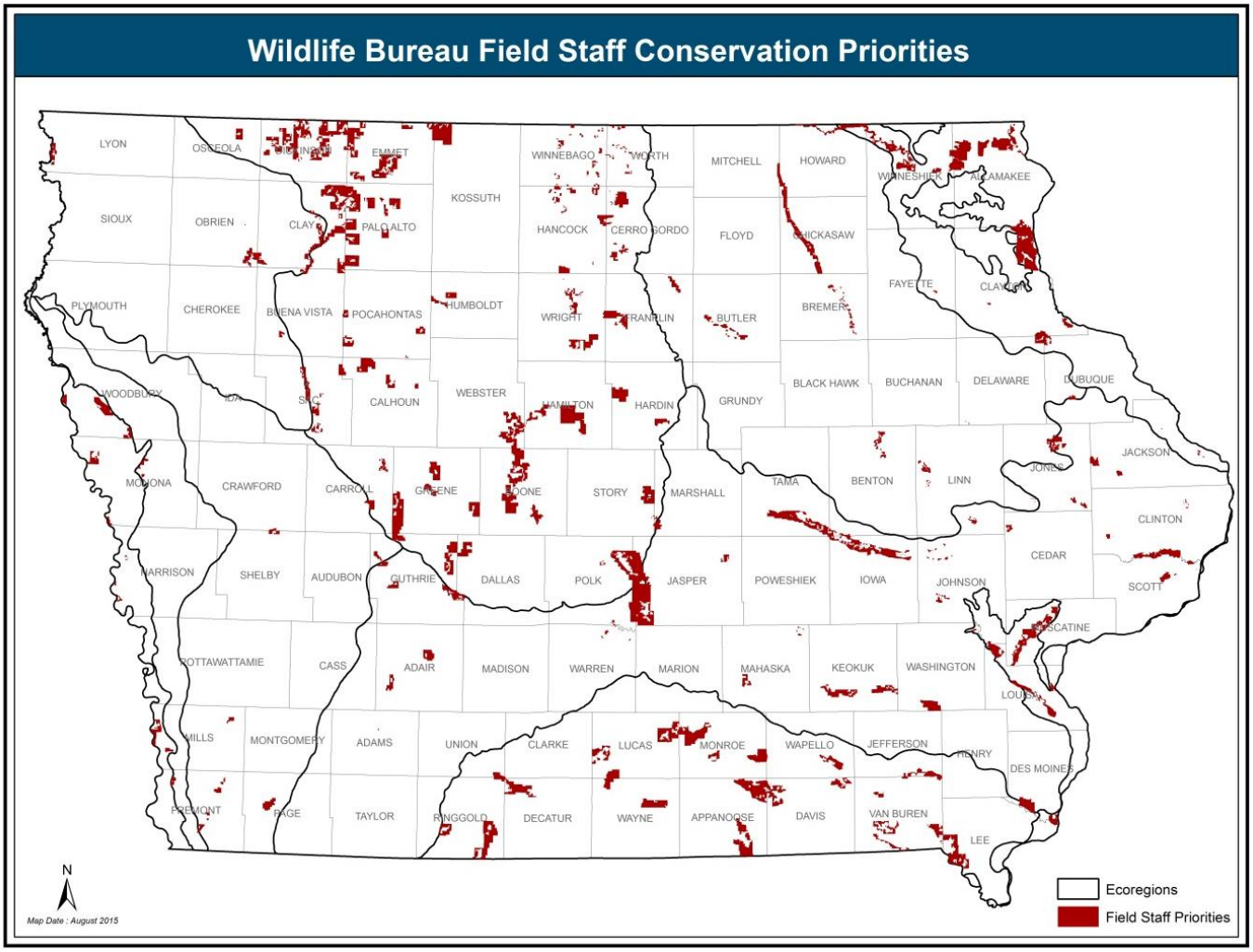
Map 8- 16. Lakes Restoration Program Priority Lakes Watersheds

2006 was a milestone year of intensified focus on Iowa's lakes. This emphasis was encouraged by the 2006 Infrastructure Bill (HF2782), which provides additional funding and requires the DNR to use a science-based approach to achieving lake water quality improvements. 127 of Iowa's principal public lakes were ranked for lake restoration suitability based upon a number of socio-economic, water quality, and watershed factors. The ranking process is used to maintain a priority list of thirty-five lakes for consideration as potential lake restoration projects. As of 2015, 22 lakes have been restored and are in a maintenance phase. An additional 23 restorations are in progress, and 14 lakes are in a planning/evaluation phase.



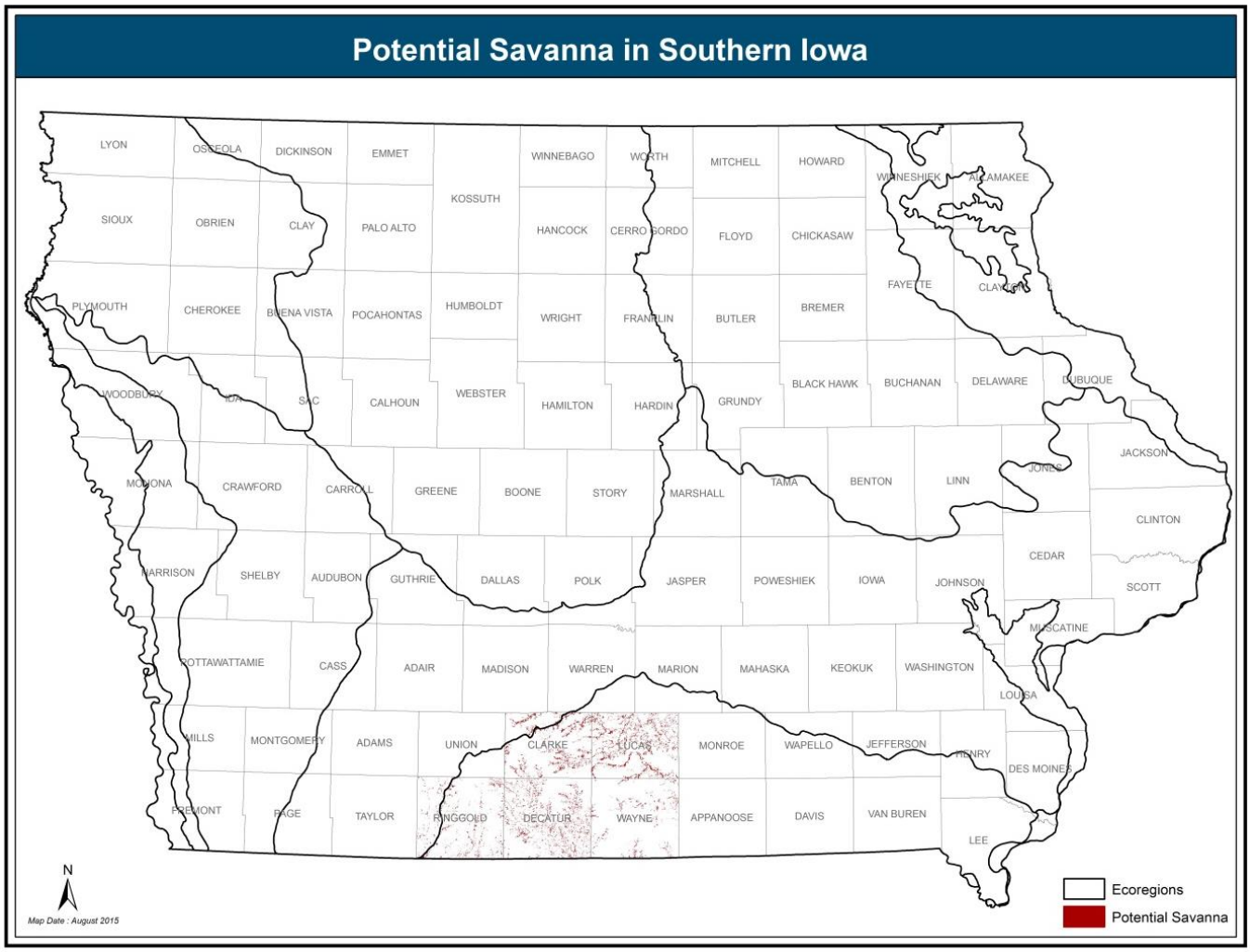
Map 8- 17. Habitat conservation priorities identified by Wildlife Bureau field staff

As the importance of habitat conservation on a landscape scale has become increasingly apparent, the DNR's Wildlife Bureau has placed an emphasis on the creation and maintenance of habitat complexes. This serves to provide core areas for wildlife to reproduce and maintain their populations and decreases the threats caused to populations by habitat fragmentation. With this in mind, in the mid-1990s the wildlife bureau field staff identified areas which serve as important habitat and are important to maintain as habitat, and also areas which would be most beneficial to wildlife populations if they could be restored to habitat through voluntary habitat improvement programs (such as Farm Bill conservation programs) or through easements, or acquisition from willing sellers. This is valuable information as it represents the habitat value assigned to individual areas by those who are intimately familiar with their local landscape.



Map 8- 18. Savanna Restoration Potential

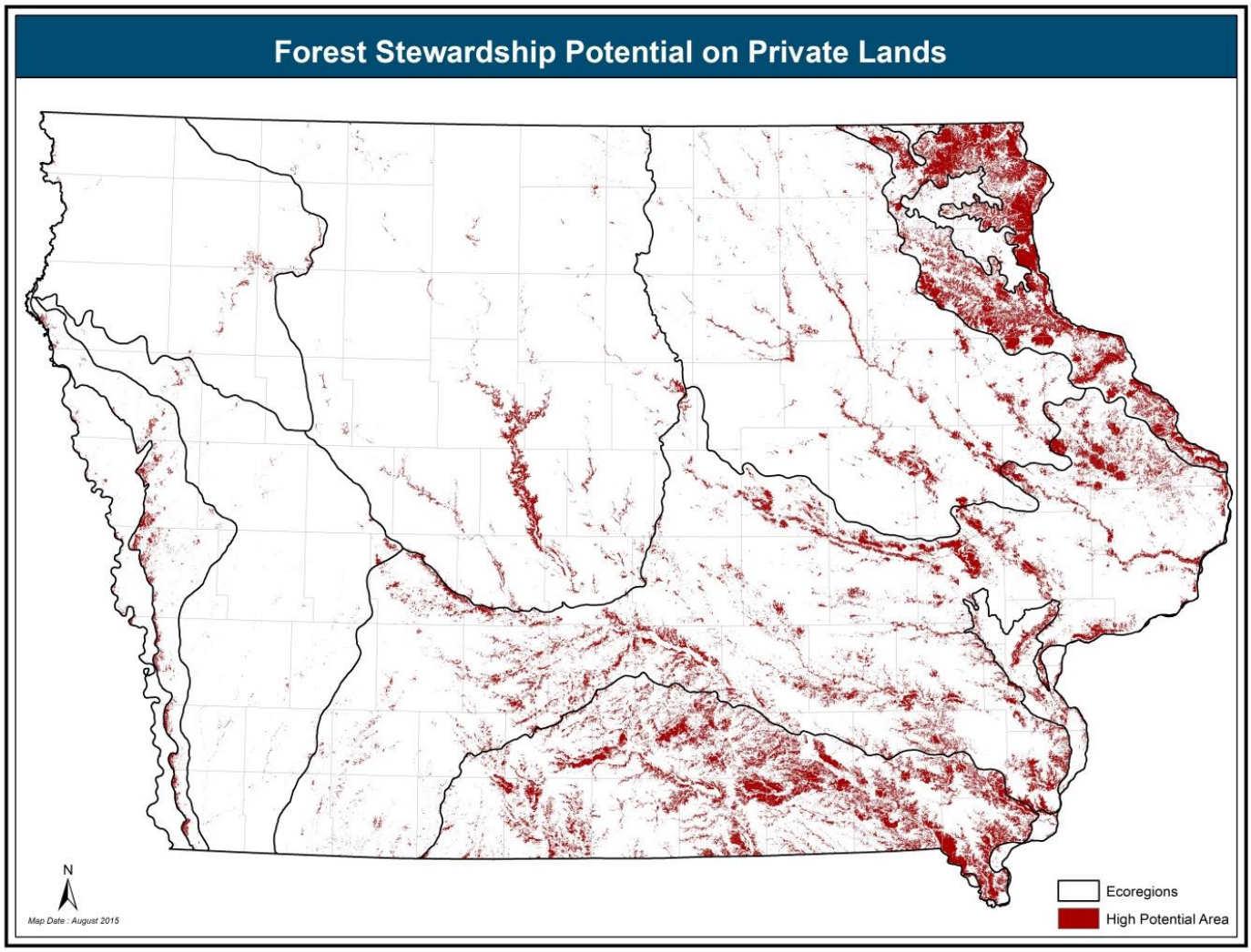
Savannah restoration potential was assessed within a five-county area in southern Iowa by the US Fish and Wildlife Service's Partners for Fish and Wildlife Program. The assessment was based upon soil type and current land cover type. This map is used by conservation partners in southern Iowa to prioritize savanna restoration work.



Map 8- 19. Forest Stewardship Potential

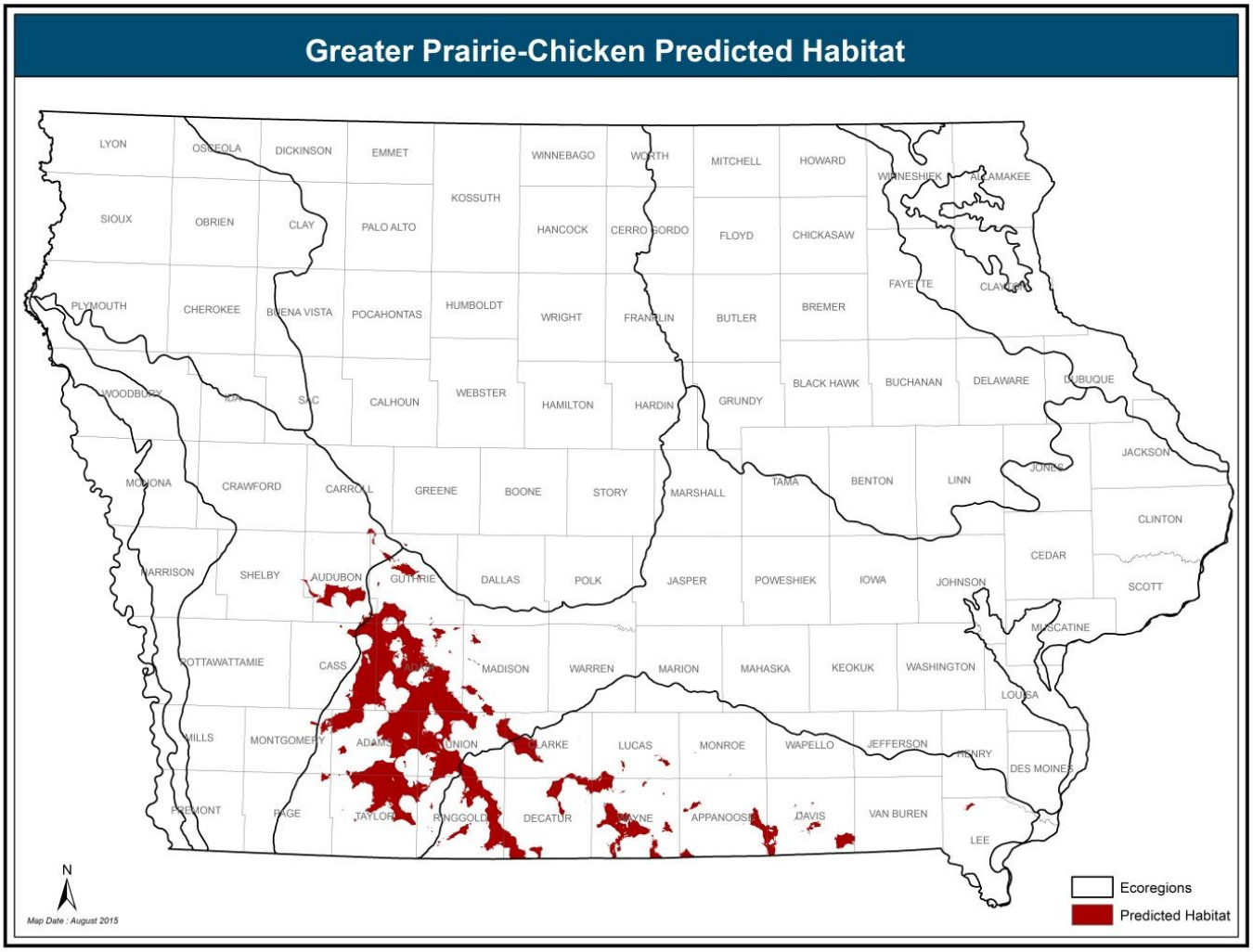
The Forest Stewardship Spatial Analysis Project (a partnership between the US Forest Service and the states) identified 12 factors which help identify the "Stewardship potential" of a given piece of land. The factors were differentiated into two groups: resource potential and resource threats.

Resource Potential Factors	Resource Threat Factors
Riparian Zones	Forest Health (Pest/Disease Risk)
Priority Watersheds	Development Level
Forest Patch Size	Wildfire Assessment
Natural Heritage Data (Forest Wildlife)	
Public Drinking Water Supply Sources (Priority Watersheds)	Iowa identified 3 additional resource potential factors:
Private Forest Lands	Forest Soils
Proximity to Public Lands	Forested Landscapes
Wetlands	Historic Forest
Topographic Slope	



Map 8- 20. Greater Prairie-chicken Predicted Habitat

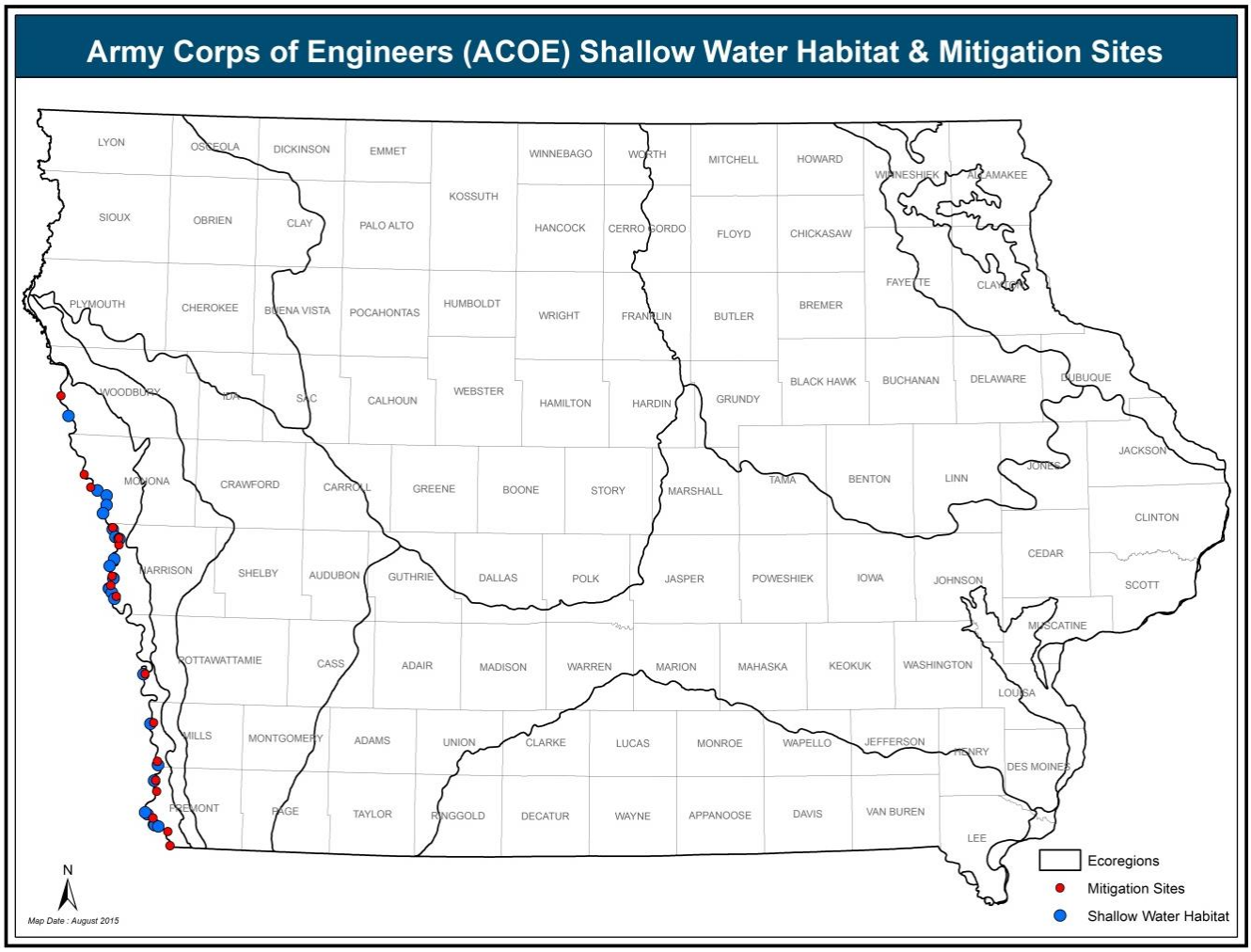
The US Fish and Wildlife Service developed a model for predicting suitable habitat for the Greater Prairie-chicken. Landscape suitability was mapped by applying a model developed for Northwest Minnesota to the 2001 National Land Cover Data for Iowa. Logistic regression was used to compare landscape characteristics between booming grounds and random sites. This map depicts only the highest level of suitability modeled. The model is based on the assumption that areas classified as hayland are equivalent to grassland habitat. In addition to providing information about the Greater Prairie-chicken, this map is included as a representation of the location of mid-grass habitat in amounts significant enough to support grassland species more generally.



Map 8- 21. US Army Corps of Engineers Habitat Restoration Sites

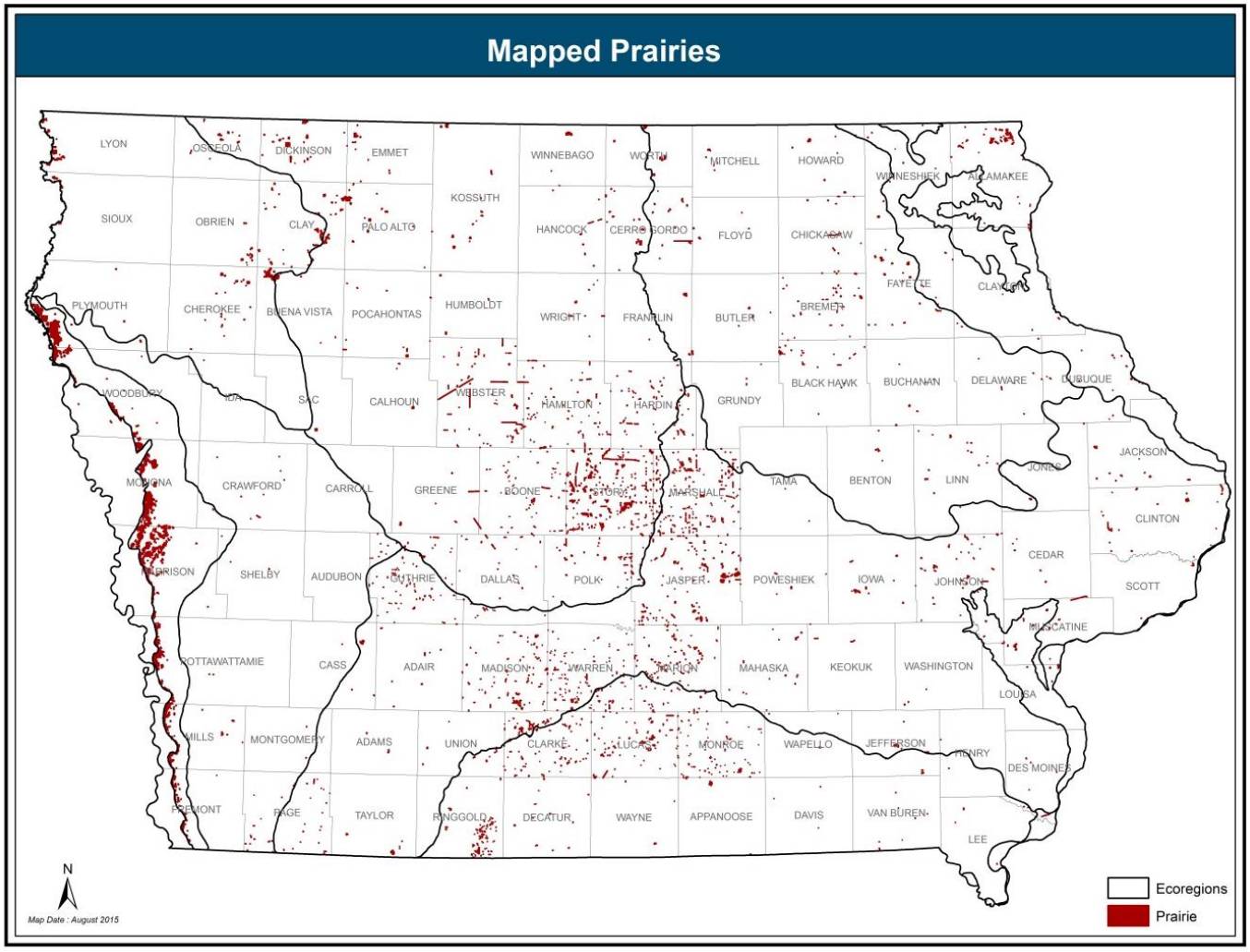
Mitigation Areas: On the Missouri River, there is an authorization to restore 20% of the habitat lost as a result of the US Army Corps of Engineers (USACE) Bank Stabilization and Navigation Project that occurred on the river. On the Iowa portion of the river, these mitigation areas are managed by the Iowa DNR as part of a formal agreement with the USACE due to impacts on Missouri River aquatic and terrestrial habitat from USACE activities. The Mitigation Project habitat restoration goal in Iowa is 23,725 acres.

Shallow Water Habitat Areas: USACE's Missouri River Recovery Program includes restoration and protection of shallow water habitat, in addition to other conservation activities. These shallow water habitat areas are important to three federally listed species (Pallid Sturgeon, Least Tern and Piping Plover) along the Missouri River. These habitat areas are also managed by DNR through an agreement with USACE.



Map 8- 22. Mapped Prairies

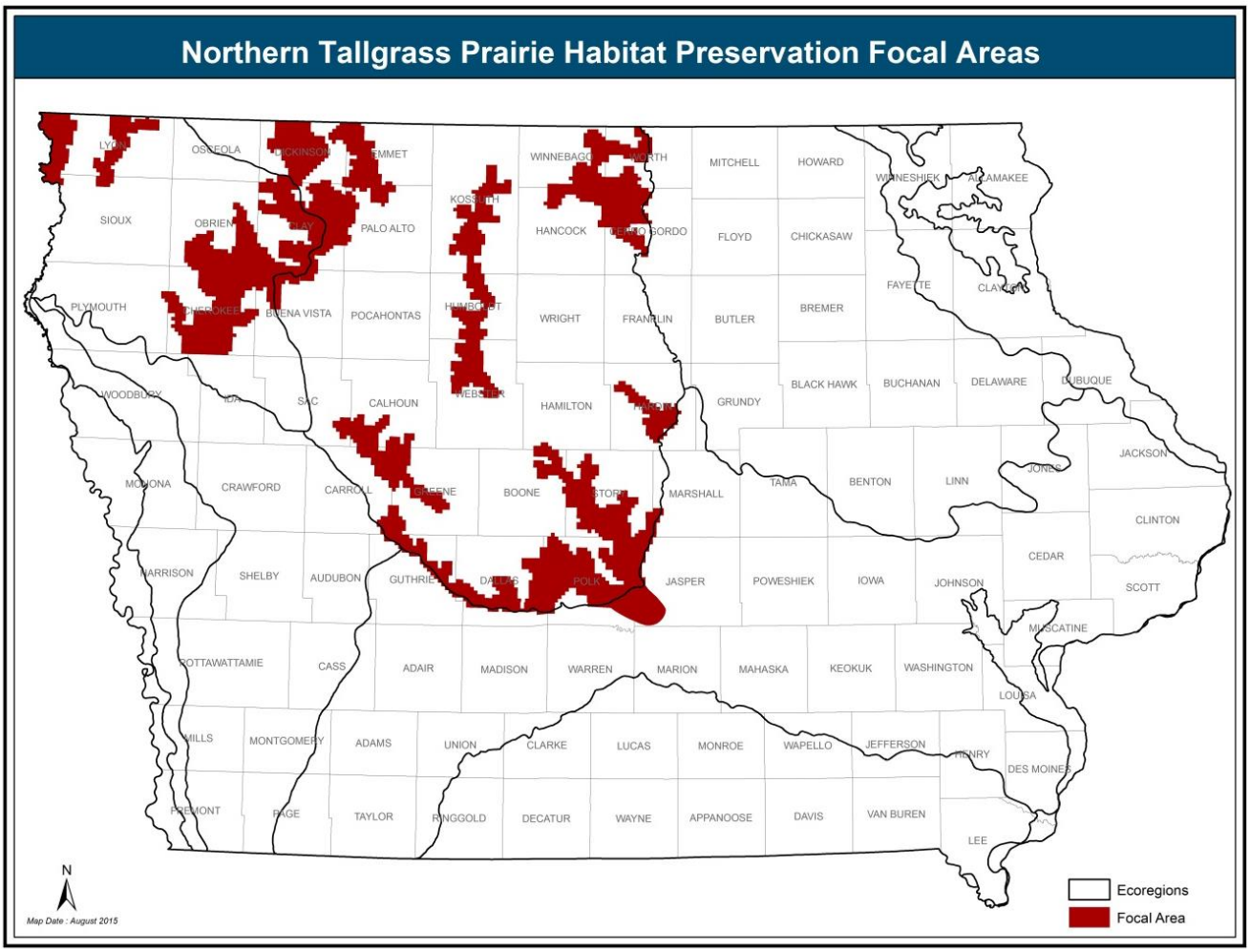
The DNR maintains a map of Prairie that includes both remnant and restored prairies of varying quality. This map represents incidental information about occurrence of prairies (as opposed to showing results of a full inventory, which has not been undertaken for Iowa). Also, please note that the size of each prairie mapped is smaller than it appears on the map; these areas are depicted in a larger format to make it possible to view them at the scale of a statewide map.



Map 8- 23. Northern Tallgrass Prairie Focal Areas

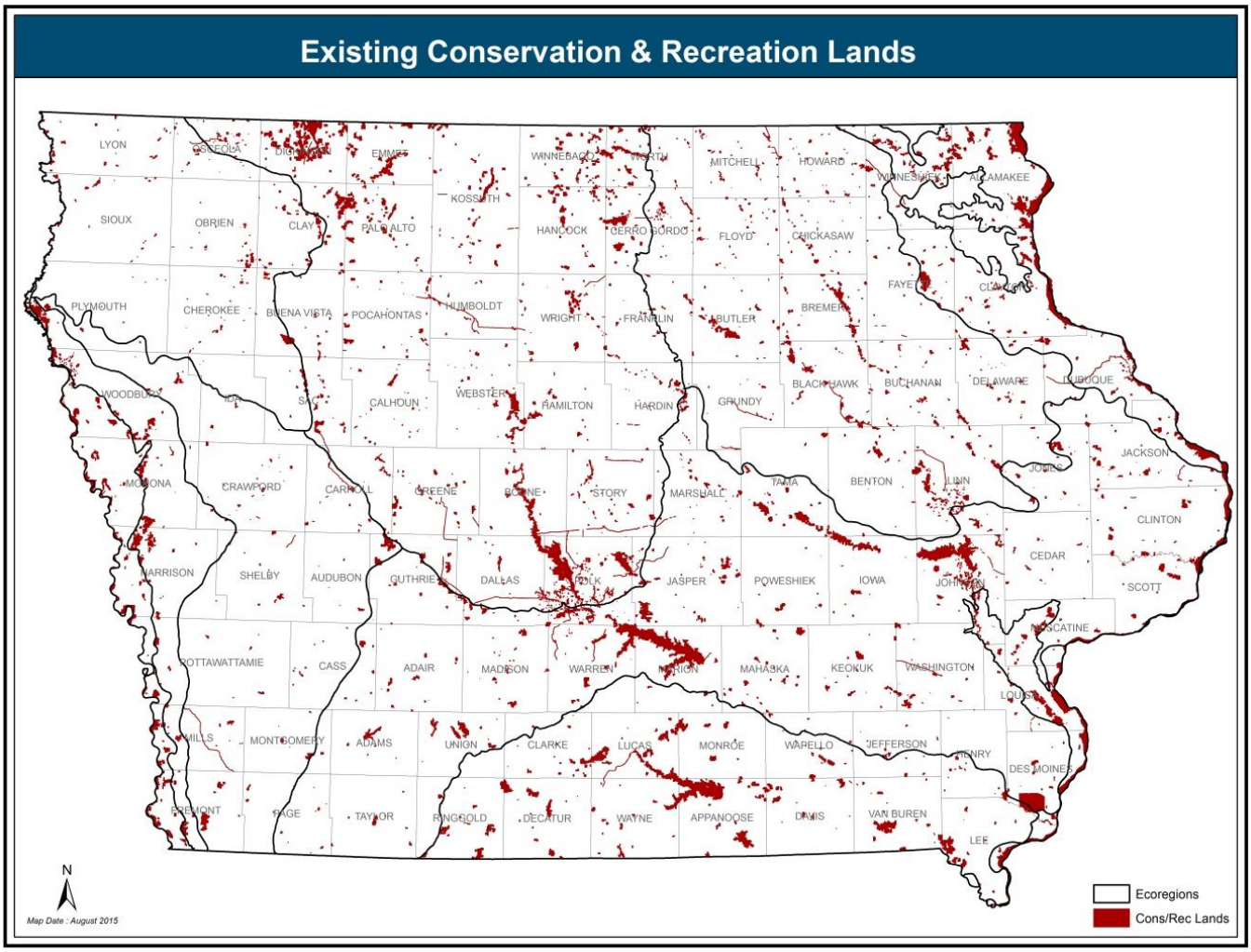
In order to protect a portion of the remaining native tallgrass prairie in Iowa and Minnesota, in 2000 Congress established the Northern Tallgrass Prairie Habitat Preservation Area (HPA). About 300,000 – 320,000 acres of native tallgrass prairie remain with the HPA. The goal is to protect 77,000 acres, which equates to 0.3% of the historic tallgrass prairie land area, across the HPA. The HPA stretches across 37 counties in northwest Iowa and 49 counties in the western third of Minnesota. The U. S. Fish and Wildlife Service (USFWS) works with partners including private entities, land trusts and other non-governmental organizations, and government agencies to protect and restore tallgrass prairie tracts within the HPA. These parcels become part of the USFWS's Northern Tallgrass Prairie National Wildlife Refuge (NTGP NWR). Therefore, the NTGP NWR is different from a typical refuge, as it is made up of scattered prairie parcels which are protected through fee title acquisition or through easements.

The Iowa Tallgrass Prairie Working Group developed a plan for tallgrass prairie conservation in Iowa in 2013. At that time, the Iowa portion of the NGTP NWR consisted of 352 acres of the total 5,255 acres within the Refuge. As part of the planning process, landscapes with the best potential for protection and restoration of native prairie were identified. These focal landscapes are displayed below.



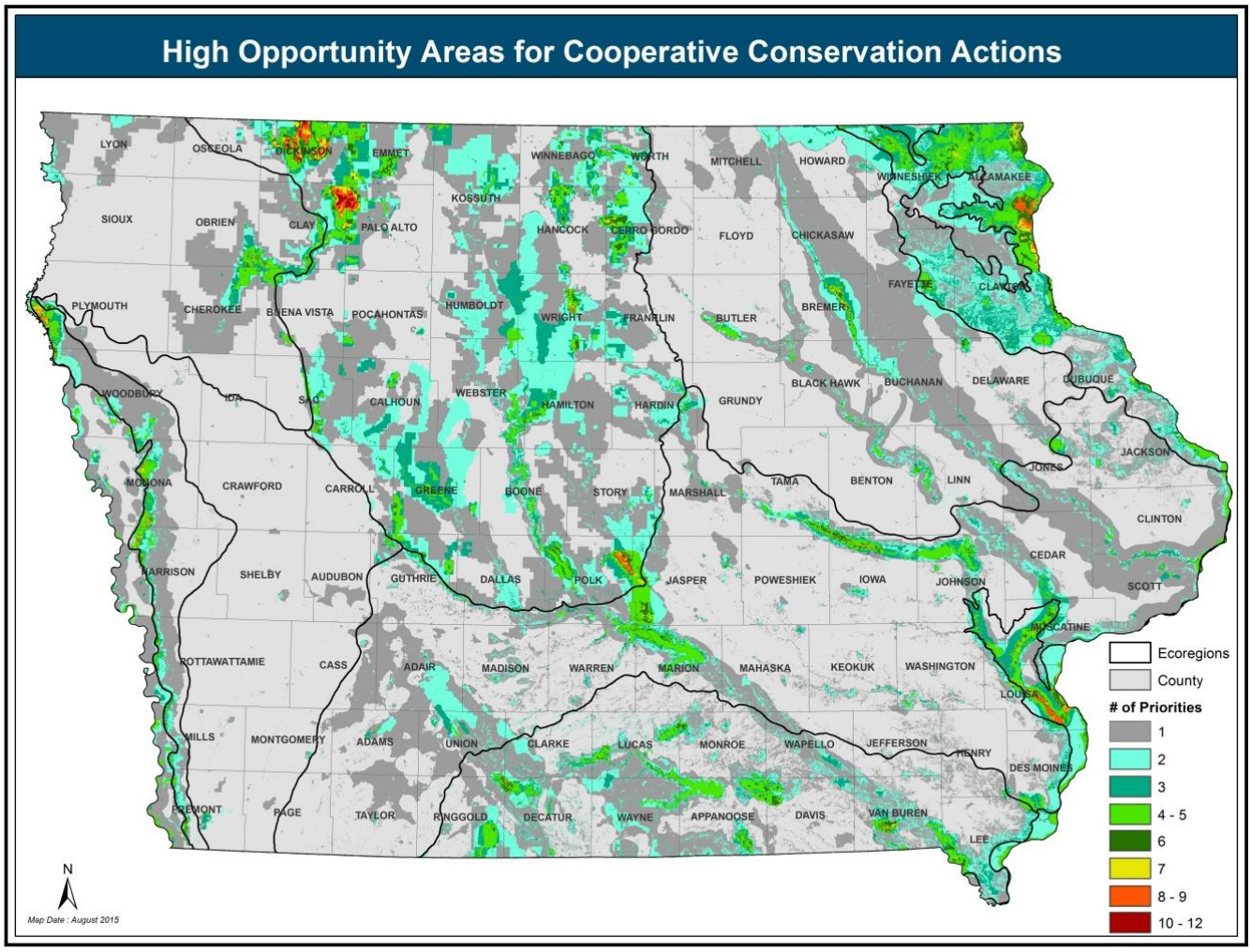
Map 8- 24. Existing Conservation and Recreation Lands

This map shows the extent of areas that are utilized for conservation and recreation purposes. These lands are owned by a variety of entities including Federal agencies, Iowa DNR, and County Conservation Boards, land trusts, and private landowners enrolled in the Iowa Habitat and Access Program.



Map 8- 25. High Opportunity Areas for Cooperative Conservation Actions

Map 8- 2 through **Map 8- 24** were combined to identify priority areas for conservation actions. The shaded areas on the map indicate areas identified as a priority for action by one or more of the plans referenced above. Darker shading indicates areas where progressively more of the plans have overlapping priorities and indicate where partnering to maximize the effect of resources should be possible.



References Cited in Chapter Eight

Salafsky, N, D Salzer, AJ Stattersfield, C Hilton-Taylor, R Neugarten, SHM Butchart, B Collen, N Cox, LL Master, S O'Connor, and D Wilkie. 2008. *A standard lexicon for biodiversity conservation: unified classifications of threats and actions.* Conservation Biology 22:897-911.

Stephenson, AL. 2013. *Assessment of wildlife value orientations, state agency credibility, and tolerance for mountain lions in Iowa.* Thesis, Iowa State University, Ames IA.

Chapter Nine

Plan Review, Coordination, and Implementation

Required Element #6: Description of procedures to review the plan at intervals not to exceed ten years;

Required Element #7: Plans for coordinating the development, implementation, review, and revision of the plan with federal, state, and local conservation agencies and Indian Tribes that manage significant areas of land or water within the State, or administer programs that significantly affect the conservation of species or their habitats.

Wildlife Action Plan Review and Revision

Comprehensive review/revision is required at least every ten years. In addition, more frequent and/or less comprehensive revisions can be conducted at any time. Too-frequent revision cycles can stress the capacity of the Implementation Committee and its working groups, but changing conditions may necessitate updates to the Plan at points between required ten-year revisions. Between 2005 and 2015, this Plan underwent one major revision (2012), and one comprehensive review and revision (2015). The meaning of these terms is explained below:

Comprehensive Reviews –

- Required ten years from date of last approved comprehensive review,
- States must demonstrate evidence that the entire plan, including all Eight Required Elements, was assessed by the State Fish & Wildlife Agency, stakeholders, and the public,
- Any decision not to revise certain sections should be based on a review and resulting agreement that the section(s) remain current and relevant to the revised sections.

Major Modifications –

- May occur at any time and does not re-set the ten-year timeline,
- No requirement for review of entire plan or all Eight Required Elements,
- States must demonstrate evidence of coordination among relevant agencies during the revision, and that the revised portion(s) of the Plan was reviewed by the public.

2015 Comprehensive Review and Revision Process

Work on the 2015 comprehensive review began in the fall of 2012, when DNR notified the USFWS of its intent to review and revise the IWAP, and the Implementation Committee gathered for a revision kickoff meeting. In 2013, surveys of conservation partners both internal and external to DNR were conducted to gather input on which portions of the Plan needed the most attention during the revision process. Respondents were also queried about their desired level of involvement in Plan development and/or implementation.

Survey Results

The two issues most frequently identified as “very important” issues to address for the revision were updating the list of SGCN and setting goals for protection and restoration of habitats. When asked to rank the Eight Required Elements in terms of which needed the most attention during the revision process, respondents prioritized Element 1 (species distribution and abundance), Element 4 (conservation actions), and Element 7 (coordination with partners).

External partners were asked whether the Plan still resonates within their organization. Responses were generally positive, with 75% responding “yes,” and 6% responding “somewhat.” Sample comments received include:

"The plan is useful and pertinent."

"Yes, it is still relevant and used in identifying resources of concern, along with other documents."

External partners were asked "What are the benefits to your organization from being engaged in the IWAP?" Sample responses include:

"Helps us identify where we implement practices/habitat for certain species."

"Partnering to share information and strategies in protecting and restoring wildlife species."

External partners were also asked "what other benefits would your organization hope to gain from involvement, that have yet to be realized?" Sample responses include:

"Bringing Natural Resources importance more to the forefront of Iowans."

"I think refinement and clearer strategies would be desirable."

New Approaches Used in 2015 Revision

The 2015 revision instituted a process to assess the conservation status of all native, extant species (see Chapter 3). This work was conducted by the taxonomic subcommittees of the Wildlife Working Group. This process was lengthy, requiring 2-5 meetings for each subcommittee and could not have been accomplished without the dedication and hard work of individuals and organizations volunteering their time and expertise. The process was beneficial in ensuring that the same suite of criteria were applied to each species within each taxonomic group, as well as identifying which specific factors were associated with inclusion of a species on the list of SGCN.

These subcommittees also participated in the process of evaluating the threats to wildlife, described in (Chapter 5). This process was different than the original threat assessment because it separated the scope from the severity of each threat, and categorized threats based on a standardized hierarchy developed by Salafsky et al. (2008). Compiling the resulting information and updating the maps and text was handled by DNR for the most part, with input provided by conservation partners outside the agency on a frequent basis.

Coordination

No single entity – government conservation agency, private conservation organization or research institution – can implement all conservation actions in this Plan even if full funding is achieved. To access all the energy, expertise and enthusiasm that will be needed, an IWAP Implementation Committee with representatives from all stakeholder organizations was formed.

The first version of this Plan identified the need for such an Implementation team, and further recommended:

- Responsibility for identifying an Implementation Team chairperson, solicitation of team members and coordination of its activities should be vested in DNR as the statutory agency responsible for managing the state's wildlife resources.

- Team members should represent state, Federal, county and local government wildlife and land management agencies and conservation organizations.
- Team members should have sufficient authority to speak for their agency or organization and be able to commit resources to carry out agreed-upon actions.

These recommendations were carried out. In addition, subsequent recommendations made by the Implementation Committee with regards to committee structure have been executed. Members of the Implementation Committee as of 2015 are identified in Appendix 1, as is the list of Working Groups and Subcommittees which complete the Implementation Committee structure.

Coordination during Development of Original Version of IWAP

Consultation was held with numerous government and private conservation organizations in the development of the IWAP - directly through their participation in the planning or review process or indirectly through review of wildlife conservation plans they had developed that included Iowa's SGCN. Participants the Advisory Group are listed in Appendix 2.

Guidance on Plan content and preparation was received from the US Fish and Wildlife Service, the Association of Fish and Wildlife Agencies, and the National Advisory Acceptance Team (NAAT). National Plan coordination meetings were attended by Iowa DNR staff in 2003 (Mesa, AZ and Madison, WI). The One Year Out conference held in Nebraska in 2004 was especially helpful. An interstate coordination meeting between representatives from Iowa, Missouri and Kansas was held early in the planning process to help identify interstate implementation efforts. A Plan status meeting with USFWS staff in February of 2005 and an early review of a Plan draft by USFWS staff also helped focus development of the final Plan.

Coordination during Plan Implementation and Comprehensive Review and Revision

The purpose of the Implementation Committee is to coordinate to the extent possible the many actions of government agencies at all levels that impact wildlife and its habitats in Iowa. A list of those agencies that have had input into Plan development or should be included in Plan implementation is provided below. Creation of the Implementation Committee is not intended to add another layer of bureaucracy or usurp the statutory authority, budget authority, or mission of any agency or NGO that seeks to improve the status of Iowa's wildlife. Cooperation with the IWAP is and should remain completely voluntary.

The mission of the Implementation Committee is to identify common priorities and interests, solidify working agreements, and focus members on conservation actions that meet the goals of the IWAP in the most financially efficient and timely manner possible. The Committee and its Working Groups also review progress toward IWAP visions, goals, and actions; identify barriers to progress and seek solutions that cross agency and organization lines.

Working Groups and their Subcommittees provide the level of deliberation and expertise necessary to develop operational plans to fulfill the goals and visions of the IWAP. Members should continue to include wildlife, recreation and outdoor education scientists; land and water managers, and experts in implementing programs in these fields. Working Group members should continue to have the technical expertise to:

- Review and explore program and planning options;
- Develop conceptual operational plans for conservation agencies, NGOs and private citizens to participate in;
- Develop and critically review technical proposals;
- Provide peer review for cooperating agencies operating plans;

- Develop conservation action and funding priorities for the Implementation Committee to consider;
- Identify strategic and operational plan shortcomings and recommend improvements.

Interagency Cooperation

Cooperation between agencies and organizations that manage public conservation lands in Iowa is essential to the successful implementation of IWAP. Federal, State, and local agencies which manage significant conservation land and water areas within Iowa include Iowa Department of Natural Resources (DNR), Iowa County Conservation Boards (CCBs), US Army Corps of Engineers (USACOE), and US Fish Wildlife Service (USFWS). All have working relationships at both the state and local levels.

Many of the recommended conservation actions must be carried out on private land. The US Department of Agriculture (USDA) provides funding and technical assistance to landowners for land conservation projects through its Natural Resource Conservation Service (NRCS) and Farm Services Agency (FSA). Farm conservation programs and projects in Iowa are often delivered through partnerships involving agencies such as USDA, DNR, Iowa Department of Agriculture and Land Stewardship (IDALS), Soil and Water Conservation Districts (SWCDs), as well as non-profit organizations such as Pheasants Forever. DNR has permanent positions on Iowa's USDA State Technical Committee and subcommittees that provide input into wildlife-friendly programs like WRE, CRP, and EQIP. Traditionally, NRCS and DNR have jointly funded DNR's Private Lands Program, which uses USDA funding to establish wildlife habitat on private land. DNR Private Lands Wildlife Biologists are co-located in NRCS offices to promote close interaction between the DNR, USDA staff and private landowners. All of these avenues should continue to be utilized to promote the concepts and management recommendations identified in this Plan.

Iowa has four US Army Corps of Engineers Reservoirs in the state. These reservoirs not only hold back flood waters but also comprise of thousands of acres of habitat including lake, upland and wetlands. Both the DNR wildlife and fisheries staff work with the USACOE to manage not only the water habitat for fish but also through long term leases to develop the habitat in the upper limits of the reservoirs for wildlife.

Iowa's eastern and western borders are defined by major river systems. DNR fisheries and wildlife staff are heavily involved with cooperative projects that involve the border rivers - Upper Mississippi River Conservation Committee (UMRCC), Mississippi Interstate Cooperative Resource Association (MICRA), MICRA Paddlefish/Sturgeon Recovery Work Group, Fish and Wildlife Work Group, Fish and Wildlife Interagency Committee, Upper Mississippi River National Wildlife and Fish Refuge and Port Louisa National Wildlife Refuge Comprehensive Conservation Plans (CCP), Upper Mississippi River Restoration Program (UMRR): including Upper Mississippi River Restoration Coordinating Committee (UMRR-CC), Long Term Monitoring (UMRR- LTRM), Habitat Rehabilitation and Enhancement Projects (UMRR-HREP), and Analysis team. Water Level Management Task Force, and Mississippi River Mussel Coordination Team.

DNR fisheries personnel are involved with the Missouri River Natural Resources Committee (MRNRC), the MRNRC Fish Technical Committee, Missouri River Mitigation Committee, Master Manual Review Committee, MICRA, MICRA Paddlefish/Sturgeon Recovery Work Group, USFWS Fish Passage Grants, and USACE Missouri River Recovery Program. They also coordinate fisheries issues with the eight MRB states to develop Missouri River recovery and ecosystem restoration plans.

Iowa DNR fisheries research personnel are coordinating shallow lakes management investigations with Minnesota DNR and Wisconsin DNR. Iowa DNR fisheries culture personnel work with drug (fish disease) issues with many state

and federal agencies. Iowa DNR staff is represented on the Topeka shiner recovery team that includes representatives from the US Fish and Wildlife Service, National Park Service, SDGFP, Kansas Department of Wildlife and Parks, Minnesota DNR, Missouri Department of Conservation, South Dakota State University, University of Minnesota, and private consultants. Fisheries biologists with Topeka shiner populations in their management areas in Iowa work with the USFWS on critical habitat and habitat restoration on private land.

Aquatic nuisance species (ANS) issues are addressed by Iowa DNR fisheries personnel with support from several partnerships including the ANS Task Force, AFWA Invasive Species Committee, Mississippi River Basin Panel on ANS, Missouri River ANS Work Group, Midwest Invasive Plant Network, and Upper Mississippi River Asian Carp Coordination Team.

DNR staff also serves on a number of national and regional committees including:

- Association of Fish and Wildlife Agencies and associated Committees
- Flyway Councils
    - The Mississippi Flyway Council
    - Mississippi Flyway Council Technical Section
    - Mississippi Flyway Council Nongame Technical Section
- Joint Ventures
    - Prairie Pothole Joint Venture Technical Committee and Board,
    - The Upper Mississippi River and Great Lakes Region Joint Venture Board,
- Landscape Conservation Cooperatives (LCCs)
    - Upper Midwest & Great Lakes LCC Steering Committee and Work Groups
    - Eastern Tallgrass Prairie and Big Rivers LCC Steering Committee and Topic Groups
    - Plains & Prairie Pothole LCC
- Midwest Association of Fish and Wildlife Agencies (MAFWA) Technical Working Committees
    - Midwest Deer and Turkey Study Group
    - Midwest Furbearer Group
    - Midwest Private Lands Working Group
    - Midwest Public Lands Working Group
    - Midwest Pheasant Study Group
    - Midwest Wildlife and Fish Health Committee
    - Midwest Climate Change Technical Committee
    - Midwest State Wildlife Action Plan Technical Committee
    - Midwest Aquatic Habitat Conservation Committee
    - MAFWA Hunter & Angler Recruitment & Retention Committee
- Midwest Coordinated Bird Monitoring Partnership
- National Bobwhite Conservation Initiative

All provide opportunities for review of plan activities and integration of conservation actions in other wildlife programs.

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Chapter Ten

The Costs and Benefits of Sustaining Iowa's Biodiversity

Background

The costs of reaching the goals outlined in this Plan exceed the historic levels of conservation funding in Iowa. Hunters and anglers have funded most wildlife conservation. National and state trends indicate that the number of participants in hunting and fishing is declining. To reach the goals established in this Plan a broader spectrum of Iowans must invest in conservation. Supporting the Wildlife Action Plan will benefit the health of wildlife and people. Investing in cost-effective conservation will safeguard Iowa's natural resources for the generations to follow.

Annual Costs

The annual cost to double the amount of permanently protected acres to 4% of Iowa by 2030 is estimated to be $88 million (**Table 10- 1**). Costs to implement the habitat management, research and surveys and other activities needed to implement the Plan are listed in Table 10-2. Combining habitat protection, habitat management, survey and research costs brings the total funding needed annually for implementation of this Plan to approximately $133 million. The annual funding shortfall for implementation of this Plan is about $104 million (Table 10-3).

Tracking Progress toward the Land Protection Goal

Land protection is a combination of land purchases and conservation easement purchases. Iowa DNR buys land *only* from willing sellers, and *only* at or below appraised value. Conservation easements can last for any number of years, depending on the easement program. For example, some Farm Bill conservation programs such the Wetland Reserve Program (WRP) or Emergency Wetland Program (EWP), provide funding only for permanent easements. Iowa currently has 179,425 acres enrolled in the WRP and EWP easement programs (about 40% of which are now also in public ownership).

When this Plan was first developed in 2005 it was estimated that approximately 604,000 acres were publicly-owned, and that approximately 650,000 acres of Iowa were permanently protected for conservation purposes. While the DNR maintained a GIS database of conservation and recreation lands, all entities protecting land were not uniformly able to submit their data on land protection efforts on a regular schedule. Having the Plan in place highlighted the importance of compiling this information across organizations. In the intervening decade, Iowa has improved its estimates through a combination of technological advances and increased coordination among conservation entities.

In 2015, the number of publicly-owned conservation acres is estimated to be 895,000. If private WRP and EWP easements are added, then the estimated number of permanently protected acres is 1,002,655. If the ~32,000 acres of private conservation easements are included, then total would be 1,034,655.

Rate of Land Protection

Considering both DNR and Federal agency land protection efforts, approximately 36,700 acres of land have been protected from 2005-2014, a rate of approximately 3670 acres/year.

Conservation easements through WRP & EWP have totaled about 61,300 acres in that same time period (approximately 40% of which is accounted for in the state/federal estimate above). More difficult to calculate is the number of acres protected by the 99 different County Conservation Boards, but about 10,000 acres is a reasonable

estimate (a rate of approximately 1000 acres/year). Thus, in the past decade, approximately 83,500 acres of land in Iowa have been permanently protected through a combination of fee-title purchase and easements.

Challenges to attainment of the original habitat goal remain considerable. The *original* goal to achieve permanent protection of 4% of Iowa's acres in 25 years would have required a rate of 31,600 acres protected per year. The rate over the past decade has been much more modest: approximately 8350 acres/year (considering both easements and acquisition). The *remaining* habitat needed to double the amount of land permanently protected in Iowa to 1,440,000 acres (4% of Iowa) would require a rate of land protection of ~29,300 acres/year. That rate is about 3.5 times the current pace of land protection in Iowa. At the current rate of 8350 acres protected per year, it will take 53 years to protect the remaining 440,000 acres needed, meaning that the habitat goal is more achievable by 2070 than 2030.

The cost per acre of land has influenced the amount of land protection that can be accomplished with a limited budget. The average cost/acre of land protected over the last ten years has been just under $2000, and the trend over that period was that the cost of land protection roughly doubled. In 2005, farmland values in Iowa averaged $2900/acre. In 2014, average farmland values were closer to $8000/acre (CARD, 2015). These cost-per-acre estimates aren't directly applicable to the types of lands acquired for conservation purposes, as public conservation land in Iowa is marginal for agricultural uses, with an average corn suitability rating (CSR) of 32.1. The cost of farmland is presented here to illustrate the demand for land in Iowa as well as the variability of that demand over relatively short periods of time, all of which influence the cost of land protection.

Table 10- 1. Cost to Double the Amount of Permanently Protected Conservation Land in Iowa by 2030

Habitat Protection Needs	**Acres and Dollar Amounts**
Acres in Iowa	36,000,000
Acres Protected by 2030 (4% of Iowa)	1,440,000
Current Acres Permanently Protected (Public Ownership + Private Wetland Easements)	1,000,000
Additional Acres Needed	440,000
Cost/acre (2014) for marginal land	$3,000
Total Cost	$1,320,000,000
Cost/Year (15 years)	$88,000,000
Existing Sources of Funds (estimated based on mean contributions to land protection over past 10 years)	
Dedicated Funds	
Iowa Habitat Stamp	$1,200,000
Iowa Migratory Bird Stamp	$50,000
REAP License Plate Fund	$250,000
Sub-total	$1,500,000
Appropriated Funds (subject to debate or use for other purposes)	
Federal NAWCA	$1,000,000

Federal Farm Bill Conservation Easement Programs	$10,000,000
Federal SWG	$150,000
US FWS Land & Water Conservation Fund	$150,000
Wildlife & Sport Fish Restoration (Pittman-Robertson)	$1,000,000
REAP Public-Private	$340,000
REAP Open Spaces	$1,500,000
Sub-total	$14,140,000
Non-State and Federal Donations	
CCB's (using Habitat Stamp, REAP and 25% match)	$2,000,000
INHF/PF/DU/NWTF/TNC & Individual Landowners	$1,000,000
Sub-total	$3,000,000
Available Per Year	$18,640,000
Annual Shortfall	$69,360,000

Table 10- 2. Cost to manage public lands, provide technical assistance to private landowners, and conduct research & monitoring needed for wildlife population management, in accordance with this Plan's goals.

Wildlife Habitat Management & Science	Dollar Amounts
Public Land Management	$30,000,000
Private Lands Assistance	$7,000,000
Education	$1,500,000
Recreation	$1,500,000
Science & Monitoring	$5,000,000
Total Annual Needs	$45,000,000
Existing Funds	
Public Land Management	$8,000,000
Private Lands Assistance	$1,000,000
Science & Monitoring	$1,500,000
Total Available	$10,500,000
Annual Shortfall	$34,500,000

Table 10- 3. Estimated funding needs over next 15 years (2015-2030) for full implementation of Plan.

Combined Annual Costs	Dollar Amounts
Needs – Land Protection	$88,000,000
Needs – Habitat Management & Science	$45,000,000
Annual Needs Combined	$133,000,000

Funds Available – Land Protection	$18,640,000
Funds Available – Habitat Management & Science	$10,500,000
Annual Funds Available Combined	$29,140,000
Annual Shortfall – Land Protection	$69,360,000
Annual Shortfall – Habitat Management & Science	$34,500,000
New Funds Needed Annually:	
Total	$103,860,000

Benefits of Sustaining Biodiversity in Iowa

Economic Benefits

Outdoor recreation opportunities are important to Iowans. Iowa State Parks receive over 25 million visits annually, and County Parks are estimated to receive a comparable number of visits (Otto et al. 2007). Outdoor recreation is also an important economic sector. Otto et al. (2007) evaluated the economic impact of four outdoor recreation amenities in Iowa for which there was usable data (state parks, lakes, county parks, and trails). They estimated that these four amenities received 50 million visits annually, generating $2.63 billion of spending. This is a conservative estimate, as it doesn't include use of wildlife areas, water trails, national wildlife refuges, or a variety of other outdoor amenities. A report that includes a wider variety of outdoor recreation types, compiled by the Outdoor Industry Association, estimates that outdoor recreation generates $6.1 billion in consumer spending in Iowa, supports 75,000 jobs, generates $1.7 billion in salaries and wages, and $433 million in state and local tax revenues (OIA 2012).

A 2013 analysis conducted by Southwick & Associates called "The Conservation Economy in America" estimated the total direct investment in fish and wildlife conservation, and the resulting economic contributions for each state in the nation. The report also provides estimated 'multiplier effect' and 'conservation rebate' levels for each state, which are defined below:

> *Multiplier Effect*: economic activity beyond direct expenditures for conservation, which are the result of the direct expenditures. This includes output, jobs, and income for business and employees that are a part of the supply chain for the businesses receiving the initial direct expenditures.
>
> *Conservation Rebate*: Tax revenues to local, state, and federal governments which result from economic activity generated by the initial investment.

Based on 2010 spending levels, this report estimated Iowa's total direct investment to be $534.6 million (which includes all fish and wildlife conservation-related expenditures by federal state and local governments and private organizations). Iowa's multiplier effect was estimated to be 1.29. In other words, a dollar spent on fish and wildlife conservation in Iowa can be expected to yield $1.29 in economic activity. Thus, Iowa's economic output was estimated to be $689 million. In addition, Iowa's conservation rebate was estimated to be $62 million to local, state, and federal coffers.

Whether the analysis focuses on fish and wildlife expenditures or outdoor recreation more broadly, the resulting message is consistent: conservation is a solid investment in Iowa.

Other Benefits

Nature provides many benefits and services to people (clean air, clean water, food, crop pollination, medicine, aesthetics, relaxation, recreation, etc.), some of which cannot easily be translated into monetary values. Below are some examples of the types of benefits provided by natural communities in Iowa:

Wetlands

- Groundwater recharge
- Flood attenuation
- Hunting opportunities
- Aesthetics
- Nutrient removal (clean water)
- Habitat for diverse plant and animal communities
- Reduction in flashiness of hydrologic system

Forests

- Habitat for diverse plant and animal communities
- Recreational opportunities (hiking, camping, hunting, etc.)
- Aesthetics
- Generation of wood products
- Carbon storage
- Air quality

Grasslands

- Soil quality
- Water quality
- Carbon storage
- Aesthetics
- Habitat for diverse plant and animal communities
- Recreational opportunities

> "Someday we may need this prairie flora, not only to look at but to rebuild the wasting soil of prairie farms. Many species may then be missing. We have our hearts in the right place, but we do not yet recognize the small cogs and wheels."
>
> -Aldo Leopold,

These benefits are sometimes referred to as "ecosystem services." The values of ecosystem services are not regularly captured in monetary terms, but frameworks are being developed (Daily et al. 2009). Hopefully, future analyses of the return on investment for conservation expenditures will incorporate more ecosystem services, in order to more accurately capture the costs and benefits of conservation investments.

Conclusion

Iowa citizens are strongly in favor of investments in conservation. In a 2013 bipartisan, statewide survey of voters, 97% of respondents agreed (76% strongly agreed) with the following statement (FM3 and POS, 2013):
"We need to ensure that our children and grandchildren can enjoy Iowa's land, water, wildlife and natural beauty the same way we do."

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Chapter Eleven

Implementation Highlights: The First Ten Years

Introduction

The ultimate purpose of the Wildlife Action Plan (Plan) is to improve the status of wildlife populations and their habitats, allowing people to continue enjoying Iowa's natural resources for years to come. This is a huge effort that requires cooperation between many stakeholders, including private land owners, conservation entities, and lawmakers.

In Chapter 6, six visions for Iowa are described, as well as the conservation actions required to achieve those visions. Conservation organizations across the state have taken many different approaches to preserve and protect Iowa's wildlife by conducting projects intended to implement the goals of the Plan. The purpose of this chapter is to highlight a small portion of the work that has been done to improve the status of Iowa's wildlife populations and to get Iowa's citizens more involved in the effort.

Implementing the IWAP through Cooperative Natural Resources Management

Vision #1: Iowa will have viable wildlife populations by the year 2030

Achieving this vision requires keeping common species common and increasing populations of Species of Greatest Conservation Need to self-sustaining levels. In order to do this it is necessary to have current knowledge on the distribution and abundance of wildlife populations, particularly Species of Greatest Conservation Need. This information helps managers understand how their work is affecting wildlife and identifies species that need more conservation focus than others. In the past, substantial effort has been put towards monitoring game populations, however, knowledge is still lacking about many of the non-game species across the state, including some Species of Greatest Conservation Need. The Multiple Species Inventory and Monitoring Program and the Volunteer Wildlife Monitoring Program are two major sources of information about non-game species. As managers gain more knowledge about the status of Iowa's wildlife and the challenges they face, actions can be taken to help populations that are in decline through specific habitat management and protection actions, as well as reintroduction of species, where appropriate.

The Multiple Species Inventory and Monitoring Program

The largest effort directed towards increasing knowledge about the status of Iowa's non-game wildlife is the Multiple Species Inventory and Monitoring (MSIM) program. Seasonal field technicians are employed each year through a partnership between Iowa State University and the Iowa Department of Natural Resources to survey for fish, mussels, crayfish, amphibians, reptiles, dragonflies, damselflies, birds, butterflies, and mammals (Figure 11- 1-Figure 11- 3), as well as to conduct habitat assessments across the state (see Chapter 7 for a more detailed description of the program). The MSIM program has produced 10 years of data thus far, and continues to inform wildlife experts on the status of Iowa's wildlife populations. This information helps ensure that conservation management is appropriate and effective.

Figure 11- 1.
Mussel Surveys

Figure 11- 2.
Fish Surveys in Ledges State Park

Figure 11- 3.
In 2014 a technician recorded the extremely rare Olympia Marble butterfly (left), a state Special Concern species. In 2012 the Stream Cruiser (below) and the Springtime Darner were recorded in Iowa for the first time after being discovered during MSIM field work.

MSIM crews help document Species of Greatest Conservation Need such as the Black-billed cuckoo (above) and the Eastern Hognose Snake (right).

Citizen Science: The Volunteer Wildlife Monitoring Program

A second way that wildlife is being monitored in the state is through the Volunteer Wildlife Monitoring Program. This program gets citizens who are interested in Iowa's wildlife involved in the monitoring effort and makes it possible to track a larger number of species than the Iowa Department of Natural Resources would be able to keep up with on its own. Figure 11- 4 displays a portion of the volunteer brochure, available on the DNR website.

Figure 11- 4. Brochure for the Volunteer Wildlife Monitoring Program

WHAT'S REQUIRED

Assignments involve recording what you observe on a form at the assigned location and reporting the observances on-line.

Volunteers must attend a training workshop before beginning assignments. These are offered annually in three locations across the state, usually on Saturdays or in the evening. Held in partnership with the local County Conservation Board, workshop content emphasizes biology, conservation, habitat description and how to perform the monitoring.

At the workshops for Raptor or Colonial Water Bird nest monitoring, you'll learn bird watching basics and bird identification, as well as how to find and map a nesting site. Bird nest volunteers must have binoculars and/or a spotting scope.

Frog and toad surveyors are provided a CD with frog and toad calls to learn their distinctive voices. Surveyors must pass a frog and toad call test offered on the Internet before beginning surveys. Eighty-one routes are set up in Iowa by the North American Amphibian Monitoring Program, in which Iowa participates, or you may set up your own route.

Why are volunteers needed to monitor raptors, colonial waterbirds, and frogs and toads?

Raptors (hawks, eagles, falcons and owls) and Colonial Waterbirds (herons, egrets night-herons and cormorants) are two groups of top predators particularly sensitive to environmental changes. Not only are they fascinating to observe, they are important animals to monitor.

Amphibians are currently in global decline and face many environmental stressors. These melodious inhabitants of Iowa's wetlands have been surveyed in Iowa since 1991. Now that the DNR has joined the North American Amphibian Monitoring Program, our data will be used at regional and national levels too.

WHAT YOU'LL GAIN

Learn more about Iowa's wildlife, identify their calls, search out their habitat, and understand their challenges and contributions to the ecosystem. You'll feel more connected to Iowa's outdoors.

You'll be able to share your experiences with friends and family, even invite them along on your observation routes, and grow the number of people who value our ecosystem.

You'll enjoy meeting others who share your passion for protecting Iowa's wildlife.

Bolstering Iowa's Wildlife Populations through Relocation and Reintroduction

"Wildlife conservation programs have returned adaptable wildlife like deer and wild turkey to our forests, Canada geese and trumpeter swans to our wetlands, bald eagles and peregrine falcons to our skies, and river otters to our streams." – IWAP Chapter 6

Efforts to restore wildlife populations through relocation and reintroduction have been going on in the state since the early 1900s. They began with game species and eventually expanded to non-game species as well. Reintroduction and relocation has continued under the Plan, including the ongoing Greater Prairie-chicken restoration efforts in southern Iowa. The Greater Prairie-chicken was an abundant nesting species in Iowa up until about 1900. Their decline is attributed to a combination of habitat loss and excessive hunting pressure. Since the 1980s multiple reintroduction attempts have been made to bring back the Greater Prairie-chicken population in Iowa. Between 2012 and 2015 more than 350 birds were translocated from Nebraska to the Grand River Grasslands area, which includes portions of Ringgold County, Iowa and Harrison County, Missouri (**Figure 11- 5**). Land in this region is primarily used for pasture and hay which provides the large tracts of grassland habitat that the Greater Prairie-chicken requires. Public lands in this area are also managed specifically for Greater Prairie-chicken habitat. Between 2005 and 2015 the number of confirmed Iowa breeding sites, or leks, has fluctuated between two to five. The most recent count in 2015 was five active leks, with 55 birds detected across Ringgold and Decatur counties.

"[Iowa] was once a land of unparalleled wildlife abundance and diversity. Early settlers discovered, however, that underneath Iowa's prairies lay the finest farmland in the world. In less than a century the prairies were plowed and with them went flocks of prairie chickens, herds of bison and elk and the cougars, gray wolves, black bear and bobcat that preyed on them. Wetlands were drained and flocks of waterfowl numbering in the millions that nested here were diminished to a tiny fraction of their former numbers. Most of the forests were cleared, the white-tailed deer and wild turkey disappeared and once-uncountable flocks of passenger pigeons became extinct."

- IWAP Chapter 6

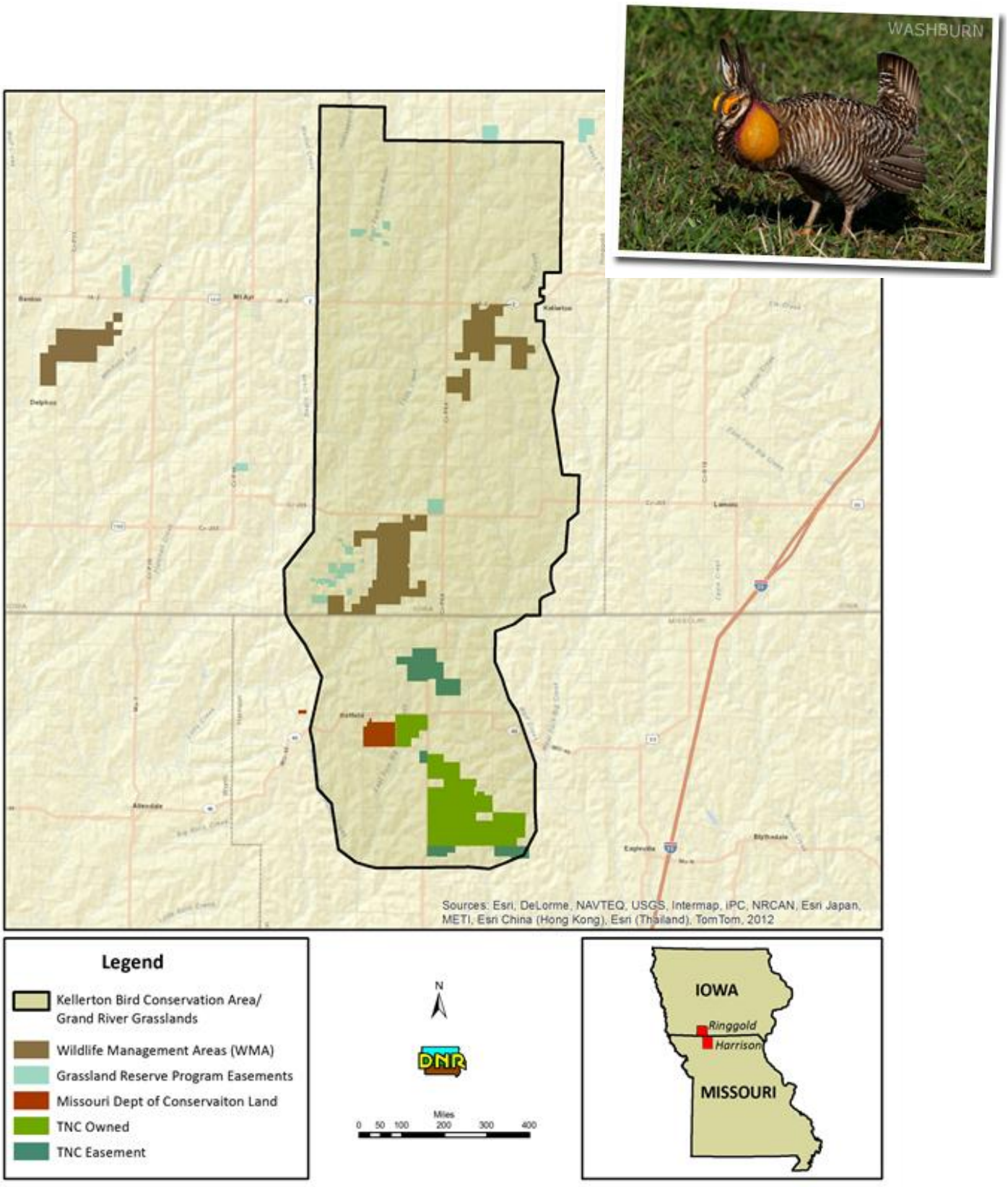


Figure 11- 5. Grand River Grasslands and Kellerton Bird Conservation Area
Through relocation and appropriate habitat management, Greater Prairie-chickens (upper right) are slowly making a comeback within the 70,000 acre Grand River Grasslands. This area includes both public and private land that provides the extensive grassland habitat necessary to support the Greater Prairie-chicken population.

Vision #2: Provide healthy ecosystems that incorporate diverse, native habitats capable of sustaining viable wildlife populations.

The second vision of the Plan requires permanently protecting, restoring, and reconstructing habitat across the state. This goal could not be achieved without cooperation between natural resource agencies and non-government organizations to identify important habitat types, landscapes, and travel corridors in all regions of the state. Work has already been done to identify high opportunity areas for conservation actions (Figure 11- 6). These areas are determined based on combined data from various conservation entities across the state on the regions that contain key habitat for wildlife. Prioritizing conservation efforts in those areas is important for providing high quality habitat for wildlife. It is equally important to provide private land owners with technical guidance that demonstrates how to benefit wildlife while still meeting owners' land-use goals.

Iowa's Bird Conservation Areas

The Bird Conservation Area (BCA) program was established in 2001 by the Wildlife Diversity Program of the Department of Natural Resources as part of the North American Bird Conservation Initiative (NABCI). NABCI is a broad collective of national and international bird conservation efforts directed towards reducing the serious declines in North American avian species that have been observed over the last two decades. Although the BCA program was established before the Plan was written, it has been an exemplary mode of Plan implementation, serving to achieve multiple Plan goals.

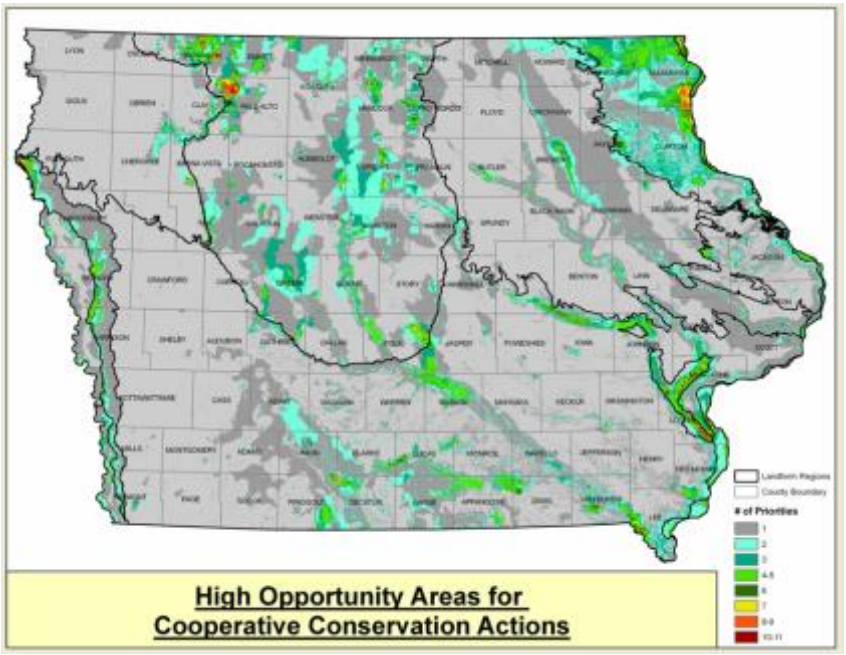


Figure 11- 6. Areas in Iowa that have been designated as Conservation Priorities by various conservation entities. BCAs are one layer within these high priority areas.

There are no legal regulations that come with establishment of a BCA. Rather, these places serve to encourage and focus protection in areas where birds and other wildlife are most likely to benefit. The BCA model was adapted from the Wisconsin Department of Natural Resources and Midwest Partners-In-Flight Working Group large-scale landscape recommendations. This model is based on research suggesting that viable bird populations require habitat spread across a large landscape. Under this model a BCA must be at least 10,000 acres in size, with a minimum area of 2,000 acres at the core being permanently protected. In addition to the core area, blocks of habitat greater than 40 acres need to be scattered throughout the complex (Figure 11- 7). A portion of these blocks are on public land that is managed for bird habitat. Private pastures, easements, prairie remnants, and land that is idle, or land enrolled in a Conservation Reserve Program (CRP) can also help meet the habitat requirements within the BCA.

NABCI designated three bird conservation regions in Iowa: Eastern Tallgrass Prairie, Prairie Potholes, and Prairie-Hardwood Transition. Iowa now has at least one Bird Conservation Area in each of the three regions (Figure 11- 9) that serve to conserve woodland, savanna, wetland, and grassland habitat. Many of the BCAs also align with the High Opportunity Areas for Cooperative Conservation. Signs posted in each BCA (Figure 11- 8) indicate the partners that

have worked together to protect and manage land in the area. Seven BCAs have even been strategically positioned to extend up to a state border in order to encourage partnership with other states.

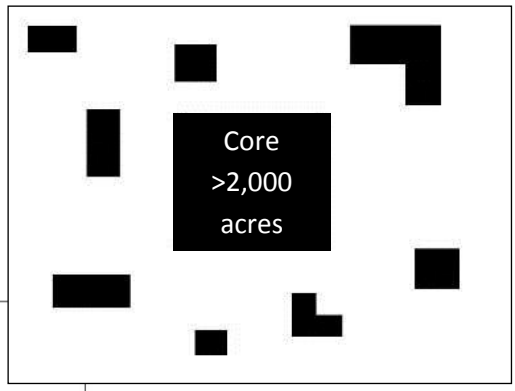


Figure 11- 7. Bird Conservation Area Model. White portions represent private land. Black boxes indicate protected public land with habitat managed for birds. The entire complex is at least 10,000 acres.

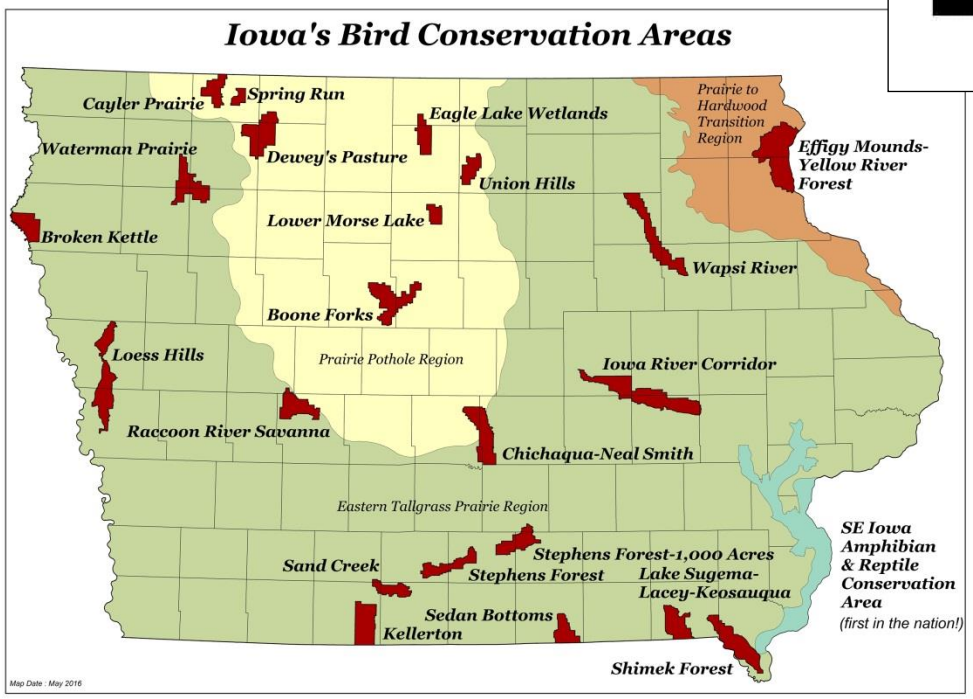


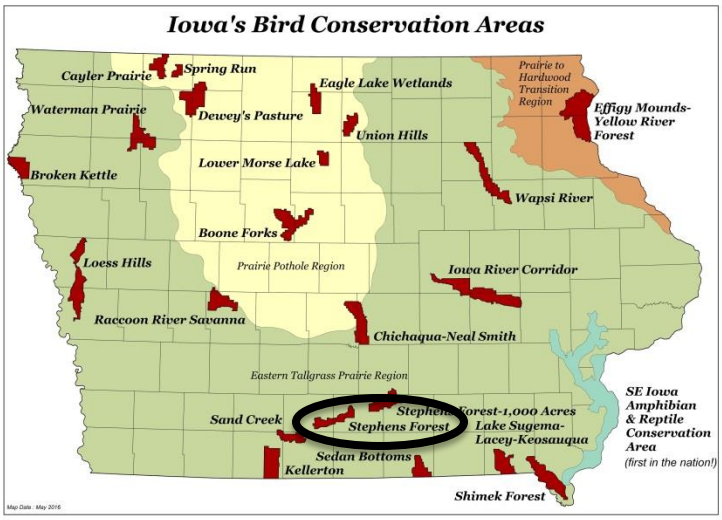
Figure 11- 9. Iowa's Bird Conservation Areas. There is at least one BCA in each of the three bird conservation regions designated by the North American Bird Conservation Initiative.

Figure 11- 8. BCA Signs. Each sign includes names of the major partners that contribute to land protection or land management in the area. Partnership is an essential part of establishing BCAs across the state.

Partnerships with Private Landowners

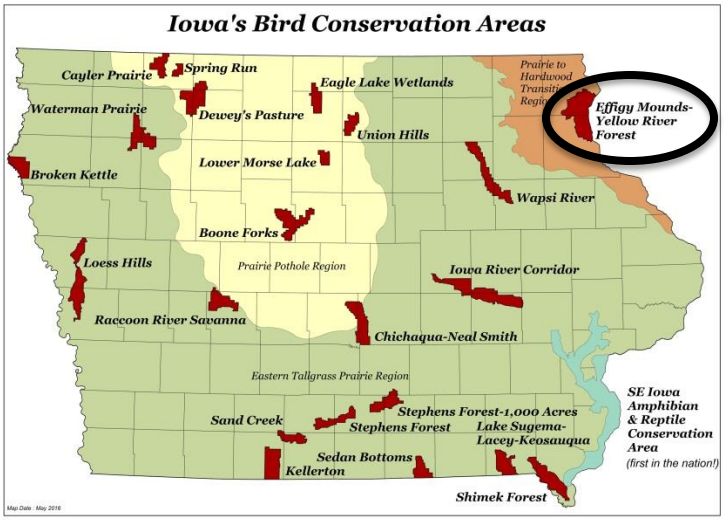
Oak Woodland and Savanna Restoration in the Stephens State Forest BCA

Cooperation with private land owners is an important part of successful wildlife conservation. Public education and assistance efforts are often conducted in high priority areas in order to help interested individuals increase the quality of wildlife habitat on their land. These education efforts are conducted by a variety of conservation entities.



In 2010 a program was implemented in the Stephens State Forest BCA that provided education to private land owners as well as technical assistance, custom management guides, and cost-share assistance. The educational component consisted of identifying landowners within the BCA and mailing them information about the historical prevalence of oak woodland and savannah habitat in Iowa and the importance of these habitats for wildlife. Landowners were encouraged to indicate in a questionnaire if they would like more information or technical assistance for improving their land for wildlife. A workshop was then held to demonstrate oak habitat management practices for interested landowners. A field day was also coordinated to educate volunteer firefighters on prescribed burning, a key element required for increasing oak regeneration, with the goal of getting fire departments to help landowners implement a prescribed burn on their property. Personnel from the Department of Natural Resources, the US Fish and Wildlife Service, the Natural Resources Conservation Service, and the National Wild Turkey Federation provided guidance to interested landowners on how to improve their woodlands and savannas. Approximately 90% of Iowa's forests are privately owned; therefore projects like this that involve voluntary participation of private land owners are extremely important for protecting and preserving habitat in Iowa. Funding for this program was provided by The Southern Iowa Oak Savanna Alliance, the US Fish and Wildlife Service, and The Iowa chapter of the National Wild Turkey Federation. Additional funding was contributed from the proceeds from the sale of Natural Resource License Plates.

Mature Forest Preservation in the Effigy Mounds-Yellow River State Forest BCA



Public education and land protection has also been conducted in the Effigy Mounds Yellow River State Forest BCA in northeast Iowa. This BCA was further designated as an Audubon Society Globally Important Bird Area due to the relatively large population of Cerulean Warblers in the area. Cerulean Warbler populations are declining precipitously and have been designated as a Species of Global Conservation Concern. This species depends on large stands (many thousands of acres) of mature old growth forest (Figure 11- 10). Creating new forest habitat provides benefits for this species in the future, however

maintaining the current existing population requires preserving old growth forest that is already on the landscape. A private land owner education and outreach initiative was conducted in northeast Iowa to help maintain and improve mature forest on private lands. The Iowa Department of Natural Resources also purchased 485.5 acres within the BCA, providing protection for forest habitat that is predicted to support approximately 500 breeding pairs of Cerulean Warblers. This land acquisition was made possible by match contributions from seven non-governmental organizations: the Iowa Natural Heritage Foundation, Iowa Audubon, Hawkeye Fly Fishing Association, The Iowa Driftless, Nebraska, and North Bear Chapters of Trout Unlimited, and Dubuque Fly Fishers. This habitat will also benefit other bird Species of Greatest Conservation need in the area including the Wood Thrush, Worm-eating Warbler, Golden-winged Warbler, Veery, Black-billed Cuckoo, Prothonotary Warbler, and Kentucky Warbler. In addition, the land within these newly protected areas includes rare algific talus slope habitat that supports the Iowa Pleistocene snail, a federally listed endangered species. The project was part of a larger conservation effort within the Driftless Area of the Upper Mississippi River Basin that includes the Wisconsin and Minnesota Departments of Natural Resources, The US Fish and Wildlife Service, the US Army Core of Engineers, and the Upper Mississippi and Great Lakes Joint Venture.


Photo Credit: Jerry Oldenettel

Figure 11- 10. Cerulean Warblers (right) require large stands of mature forest like that in the Effigy Mounds-Yellow River Forest BCA (below)

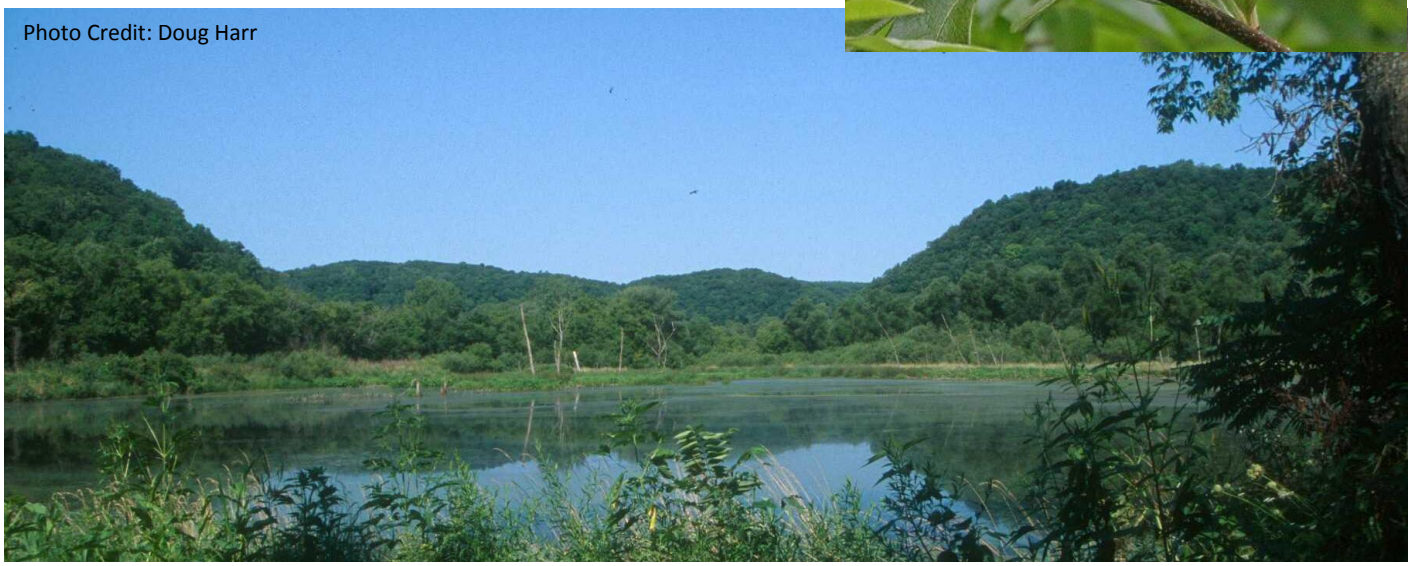


Photo Credit: Doug Harr

Aquatic Habitat Improvement in the Boone River Watershed

In addition to the work being done in Bird Conservation Areas around the state, many other projects have been conducted that achieve the goal of protecting, restoring, and reconstructing habitat through cooperation with partner conservation agencies and private landowners. The Fisheries Bureau of the Iowa Department of Natural Resources works with The Nature Conservancy, Iowa Soybean Association, and the US Fish and Wildlife Service to restore oxbow habitat on the Boone River Watershed. An important component of this project is landowner support since many of the oxbows are on private property. The Nature Conservancy conducts outreach and holds meetings to inform land owners of the goals and benefits of the restoration projects. This project improves aquatic habitat for fish, reptile, amphibian, and bird species that depend on backwater areas and improves water quality in the restoration area (Figure 11- 11). This restoration project is part of a larger effort to restore watersheds in Iowa and in the Midwest. The Nature Conservancy created an action plan for the improvement of the Boone River Watershed in 2008. This watershed is part of the Mississippi River Basin Initiative of the US Department of Agriculture that is meant to reduce nutrient and sediment loading in aquatic areas.

Figure 11- 11. Images from before (left) and after (below) restoration at Peterson Oxbow in Wright County. Improved water quality makes this habitat suitable for multiple species of wildlife.

Vision #3: Develop diverse wildlife communities through science based adaptive ecological management.

Sustaining the diversity of wildlife within the state requires managing for a variety of native habitat types. Prairie once covered over 80% of Iowa's landscape. Trees, shrubs, and wetlands were interspersed within the expanse of grassland, creating a wide variety of habitat that supported a huge diversity of wildlife. Now, less than 0.1% of this native prairie habitat remains. Land managers strive to create habitat diversity and connectivity across the state in order to provide high quality habitat and winter cover for many different species (Figure 11- 12-**Figure 11- 15**). This improves the survival and reproduction of species of conservation concern and helps increase local populations of wildlife. The management plans implemented across the state use methods that have been successful in the past to

support healthy wildlife populations and also incorporate innovative approaches to solve ecological problems in a variety of ways.

Figure 11- 12. In northwest Iowa, upland soils are often dry and easily eroded. Managers used a xeric shortgrass prairie seed mix that performs best in drier soils to restore prairie habitat at Jemmerson Slough (right) in Dickinson County.

Figure 11- 13. During a restoration project at Four Mile Lake (left) in Emmet County, managers used a hydric seed mix which is suitable for enhancing wet marsh habitat.

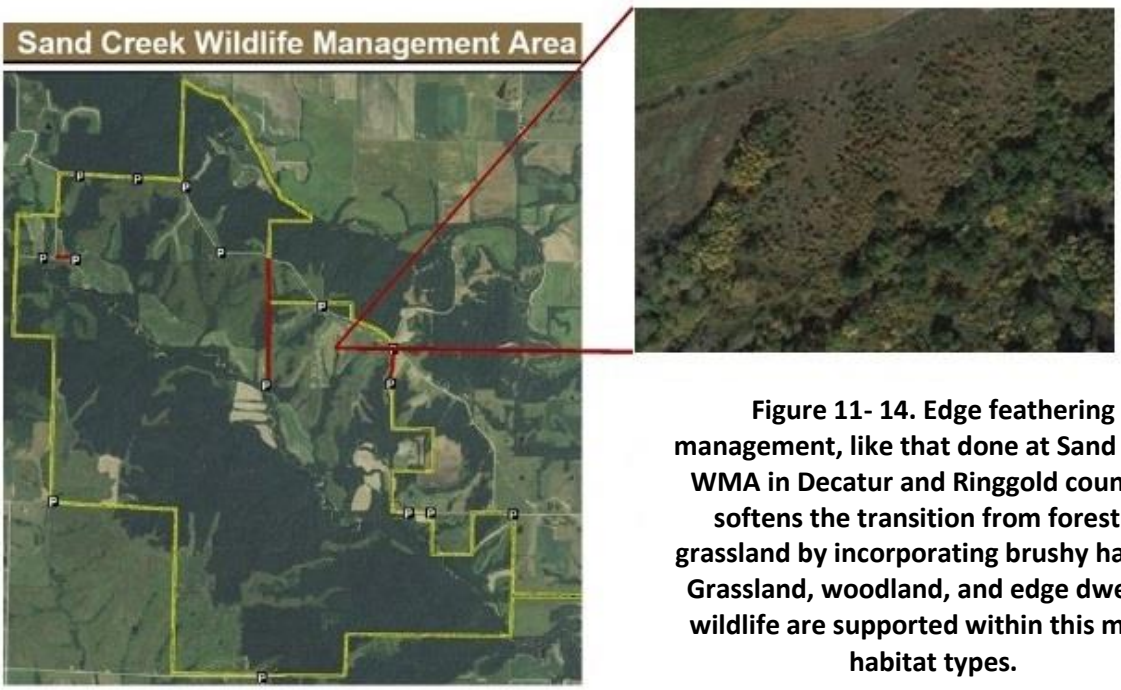


Figure 11- 14. Edge feathering management, like that done at Sand Creek WMA in Decatur and Ringgold counties, softens the transition from forest to grassland by incorporating brushy habitat. Grassland, woodland, and edge dwelling wildlife are supported within this mix of habitat types.

Figure 11- 15. Dickcissels (middle) are an obligate grassland species that require a mix of grass and forbs for foraging and breeding. Sedge Wrens (right) breed and forage in wet areas with thick growths of sedges and grasses. Restored prairies like Jemmerson Slough and improved wetlands like Four Mile Lake that are planted with diverse seed mixes provide important habitat for these Species of Greatest Conservation Need. Edge feathering, like that at Sand Creek WMA provides key habitat for the Blue-winged Warbler (left) which prefers shrubby openings on the edges of woodlands.

Restoring native habitat is only one component of wildlife management. With much of the landscape being used for agriculture, it can be difficult for species to find areas that fit their specific needs. For instance, reptiles require places to hibernate through the winter and areas to bask during cool periods in order to regulate their body temperature. The Grand River Unit in southern Iowa repurposed a large pile of unused riprap at the headquarters in order to construct a snake hibernaculum and basking area (Figure 11- 17). A long trench was dug and the riprap was placed in the trench. It was then covered with soil, leaving rock exposed to the south for the entrance and basking area. The snakes crawl in through the spaces in the rocks and make their way underground where they will be protected from freezing in the winter. A similar structure was built for snakes at McCoy Wildlife Management Area in Boone County Iowa (Figure 11- 17) and a turtle hibernaculum was created there as well (Figure 11- 18). These structures were created based on designs provided by the Natural Resources Conservation Service which employs engineers to create a wide variety of designs for conservation efforts.

Figure 11- 16. Hole dug at McCoy WMA that was filled with logs to provide a hibernaculum for snakes (above). The hole was filled and the south side was covered with rock to provide an entrance (below).

Figure 11- 17. Snake hibernaculum at the Grand River Unit in Southern Iowa constructed out of riprap (below). Snakes enter through the rocks and are able to access spaces underground between the soil and buried rock.

Exposed rock faces south and also provides basking areas.

Figure 11- 18. Turtle Hibernaculum. In the winter reptiles must hibernate underground or underwater to prevent their bodies from freezing. This wooden structure provides a secure wintering area for turtles.

Another important component of land management is invasive species control. Invasive species tend to spread aggressively and take over an area. When this happens they choke out native plants, reducing species diversity and making habitat less suitable for wildlife. Invasive plant species are often removed from an area through chemical sprays or mechanical approaches which include pulling plants by hand and mowing. These approaches have varying levels of effectiveness depending on the hardiness of the plants and the persistence of treatments. Purple Loosestrife is a plant native to Europe and Asia that can take over wetland areas and reduce native emergent vegetation that is characteristic of healthy wetland habitat (Figure 11- 19). At the Little Storm Lake Wildlife Management Area in Buena Vista County, managers took an innovative approach to controlling a Purple Loosestrife invasion by releasing a beetle (*Galerucella pusilla*) that eats the leaves of this species and eventually kills the plant (Figure 11- 19). This reduces the

amount of time managers have to be out on the land dealing with this issue and as the beetles reproduce they can be used on different infestation sites and can be shared with other wildlife management units.

Figure 11- 19. Purple loosestrife infestation at a wetland (above). Both larva (right) and adult beetles (far right) defoliate purple loosestrife and eventually kill the plant

Vision #4: More Iowans will participate in wildlife-associated recreation, and all Iowans will have access to publicly owned recreation areas to enjoy wildlife in its many forms.

Vision #5: Iowans will respect wildlife for its many values and they will advocate effectively for conservation of wildlife and wildlife habitats.

Outreach and education are fundamental for increasing citizen respect and appreciation for wildlife and their habitats. Providing opportunities for people to experience wildlife first hand is one of the best ways to pique their interest in outdoor recreation and demonstrate the benefits of having healthy and diverse wildlife populations. Getting people involved in outdoor activities also contributes to the state's economy and increases public health. Iowa State University Extension's Master Conservationist Program reached out to Iowans with experience in natural resources to send letters relating to conservation in Iowa. The following is an excerpt from an essay entitled "The Importance of Wildlife Diversity to Iowa's Economy" submitted by Doug Harr, former Wildlife Diversity Program coordinator for Iowa DNR, and current Iowa Audubon President:

> "There's little doubt that ring-necked pheasants, white-tailed deer, walleye and large-mouthed bass contribute to Iowa's economy….Unrecognized until the past few years, however, is the economic contribution of all the wildlife in Iowa not considered game or sport fish. In fact, the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation indicated that wildlife viewing contributes approximately $304 million dollars annually to Iowa's economy – actually exceeding the $296 million brought in by hunting…
>
> …this speaks to the necessity for preserving as wide a diversity of wildlife as possible…
>
> Through many nature centers… birding trails… [and] the high-visibility efforts to re-establish… creatures that had nearly or completely disappeared, citizens again have the opportunity to see and enjoy the incredible diversity and beauty that wildlife brings to our landscape. This brings along a greater citizen commitment to conservation… As more citizens take advantage of this diversity, they will need places to go and equipment to see, photograph and enjoy that wildlife, the importance of their expenditures to Iowa's economy is bound to rise."

Iowa has over 450 state-managed wildlife areas and numerous county wildlife areas, state forests and other public areas across the state that are open to the public for hunting, wildlife viewing, and other outdoor reaction activities. The DNR website offers a user friendly, interactive map of these areas in their Hunting and Recreation Atlases (Figure 11- 20 and Figure 11- 21). Through these programs people can search for public areas near their home or favorite vacation spot in the state and learn more about what opportunities are available at each location.

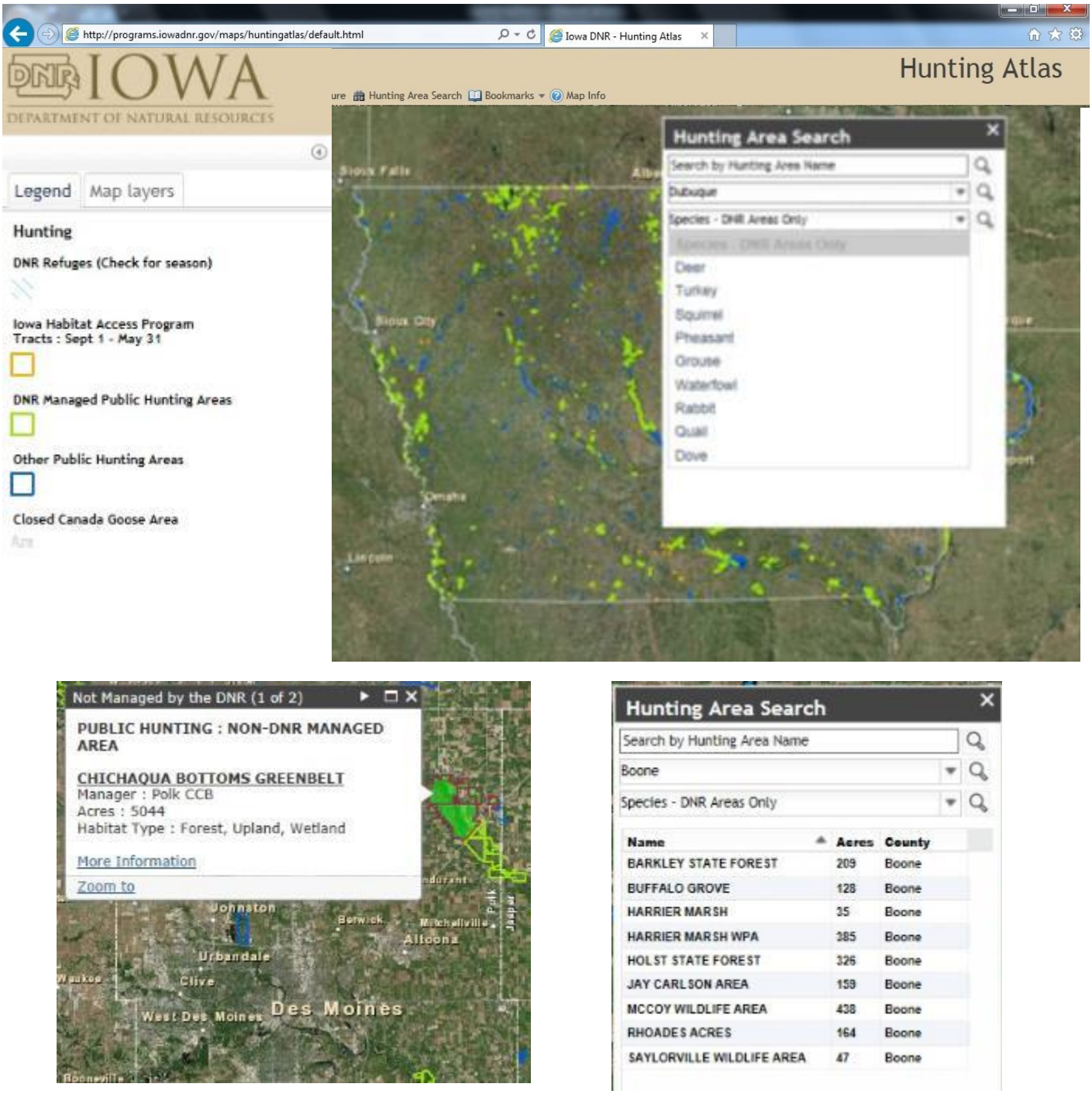


Figure 11- 20. The hunting atlas has information about public land with hunting in the state. Search options allow users to find out where they can hunt certain game species (top) as well as locate hunting areas in a specific county (lower right). The zoom tool allows user to locate hunting areas in specific regions as well. Clicking on a wildlife area will give more detailed information about the location (lower left). http://www.iowadnr.gov/Hunting

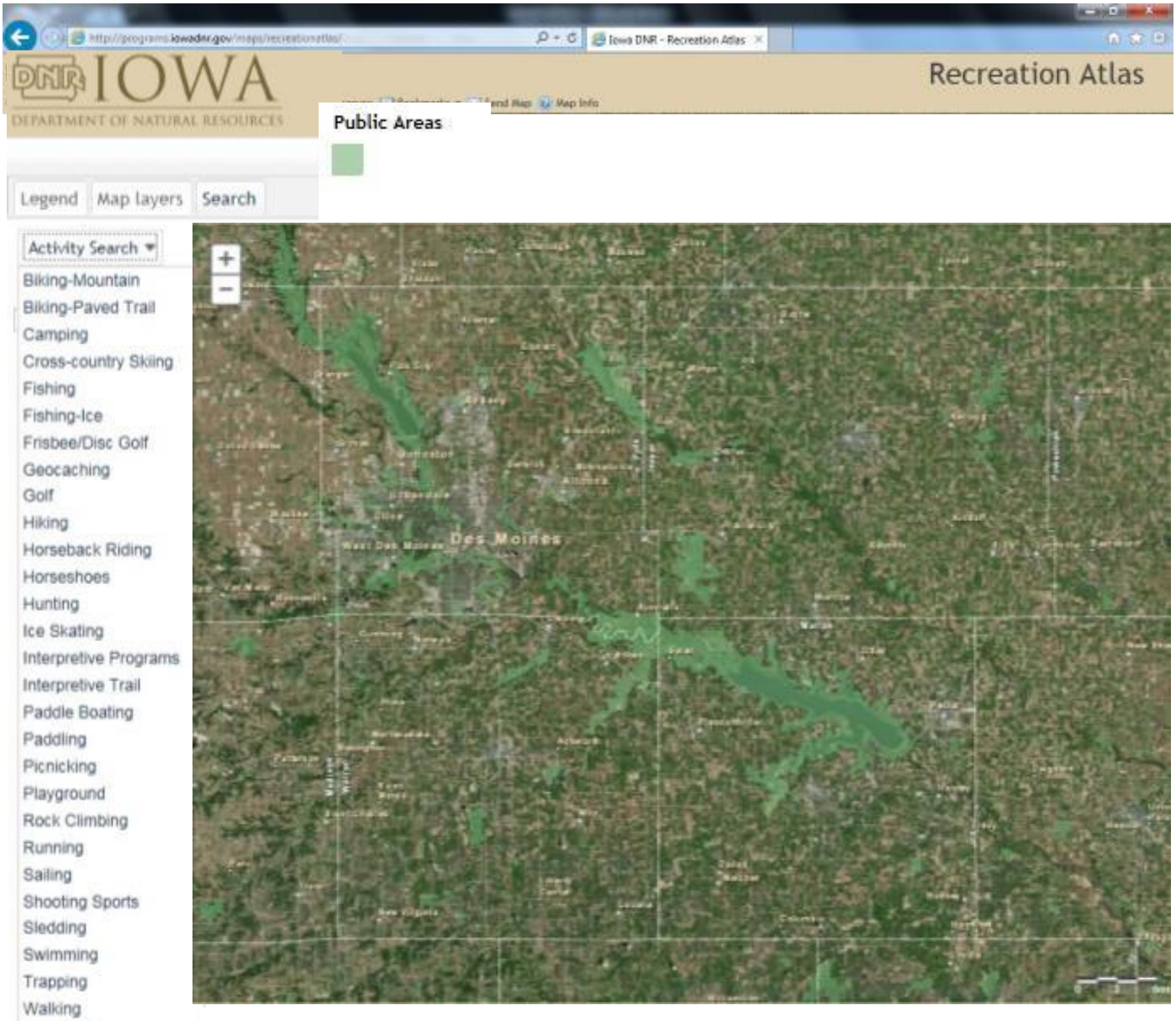


Figure 11- 21. Similar to the hunting atlas, the recreation atlas gives information about public areas in the state. It also allows users to search for which areas provide opportunities for specific recreation activities. The zoom tool also allows the user to search within a certain area of interest. http://www.iowadnr.gov/Conservation/Mapping-GIS

These online resources are important for helping people pursue their outdoor recreation passions. Reaching out to get more people interested in the outdoors and what Iowa has to offer is also an important part of increasing citizen appreciation of wildlife and their habitats. The Springbrook Conservation Education Center is one of many places across the state that hosts camps and field trips for people of all ages who are interested in having fun outside and learning more about Iowa's wildlife. **Figure 11- 22** show a portion of Springbrook's informational brochure and Figure 11- 23 and Figure 11- 24 highlight a few outdoor programs offered at Springbrook.

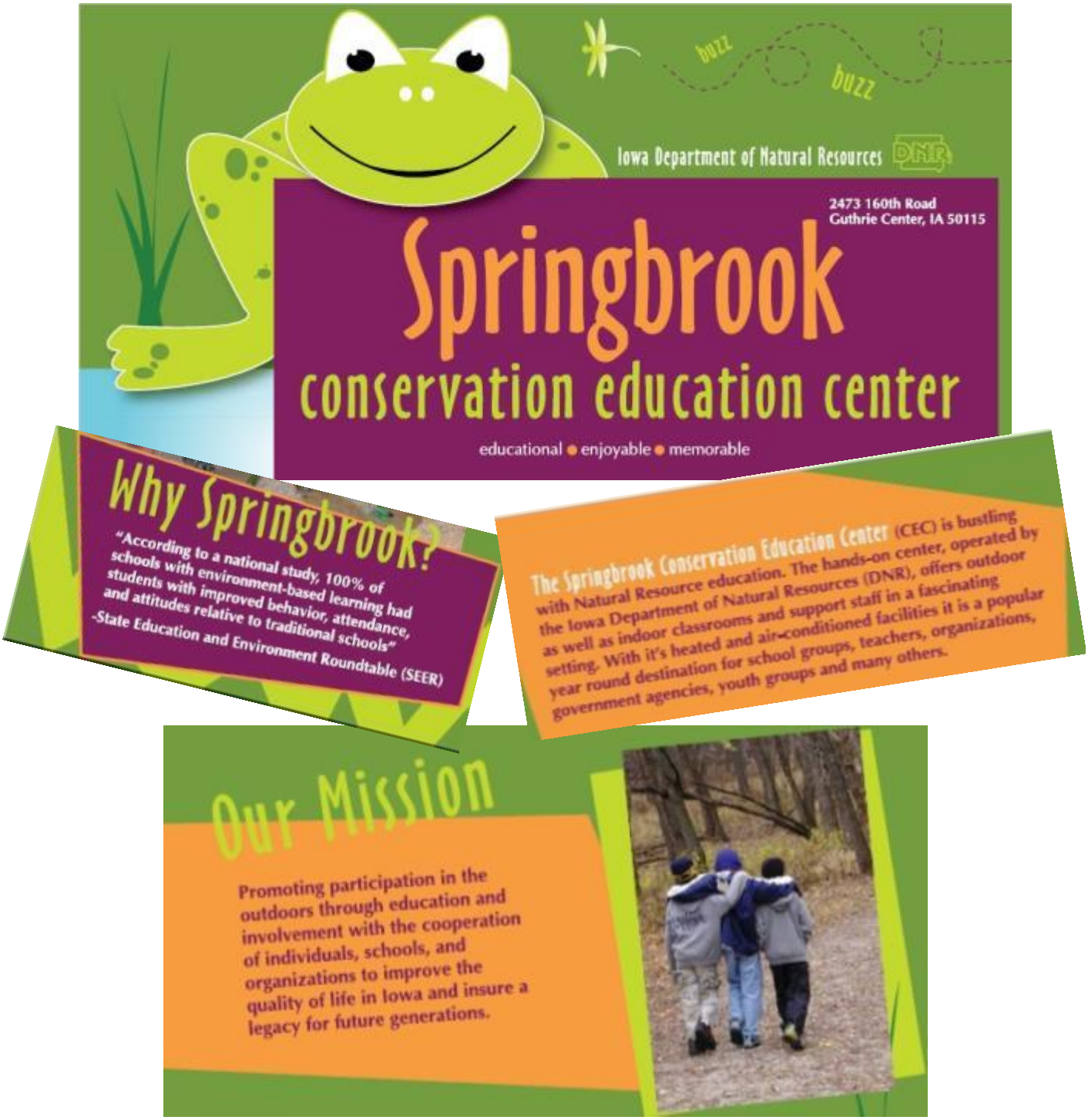


Figure 11- 22. Springbrook Conservation Education Center Informational Brochure

Outdoor Journey for girls

Outdoor Journey for Girls (OJ) is a three-day, two-night program introducing outdoor skills to girls ages 12-to-15 in a supportive, learning environment where they have opportunities to gain hands-on experience.

Three programs are held each summer. June and August programs are located at the Springbrook Conservation Education Center (Guthrie County) and the July program is held at Hickory Hills County Park (Black Hawk County).

Canoeing and Water Safety
Basic Orienteering
Fish and Wildlife Identification
Archery
Firearm Safety and Basic Shooting
Camping and Outdoor Survival
Game Care
Fishing and Preparing the Catch
Hunter Education Certification

Figure 11- 23. Outdoor Journey for Girls is provided through a partnership with Iowa Women in Natural Resources, DNR, and Pheasants Forever. This program allows girls who may not otherwise have a chance to participate in outdoor activities the opportunity to learn about Iowa's wildlife and the outdoor recreational activities that are possible in Iowa.

Promoting participation in outdoor skills through education and involvement with a partnership between Pheasants Forever and the Iowa Department of Natural Resources

HACC

HUNTING AND CONSERVATION CAMP

HISTORY

The HACC program started in 1997 as a partnership between local Iowa Pheasants Forever chapters and the Iowa Department of Natural Resources. Two camps are offered each summer, each accommodating more than 80 12- to 15-year-old boys. All are given the opportunity to experience the outdoors, through the experience and knowledge of professionals from varying fields in an educational and supportive environment.

AGENDA

Hands-on and packed with experiences! During the three-day camp, participants and mentors:

- shoot .22 rifles, shotguns, muzzleloaders, bows
- throw atl-atls
- learn about dog training, bird banding, hunting basics, animal calls, furharvesting, bowhunting, fishing, fish management, game care, turkey hunting, waterfowl hunting and upland bird hunting

Other outdoor skills camps/workshops available through the DNR include:

American Wilderness Leadership School (AWLS) for teachers and outdoor educators

Becoming an Outdoors-Woman (BOW) for women 18 years and older

The Fly Tying and Fishing Experience for people interested in fly tying/fishing

Figure 11- 24. Hunting and Conservation Camp informational brochure and list of other outdoor activities offered by the DNR.

The Education and Recreation working group of the IWAP Implementation Committee was established to help achieve visions four and five. Working group member Jim Pease, retired Iowa State University Extension Wildlife Specialist, participates in a radio show called Wildlife Day hosted on Iowa Public Radio that shares interesting facts about a wide variety of wildlife species in Iowa. While appealing to naturalists and outdoor recreationists alike, this radio show also reaches those who may not be able to participate in outdoor recreation. Working group member Pat Schlarbaum, a staff member in the DNR's Wildlife Diversity Program, has helped get viewing platforms installed at bird conservation areas to help draw people to watch wildlife in the area (Figure 27-28). As of 2015 there were six platforms in existence or being built. The view from the platforms also fosters an appreciation for the landscape within wildlife management areas. These platforms are constructed through cooperation with various conservation partners.

Figure 11- 25. One of the most popular viewing platforms is at the Kellerton BCA, where people gather to hear the prairie chickens booming in the early mornings of the springtime mating season.

Figure 11- 26. Pat Schlarbaum created an eagle design for the viewing platforms at Otter Creek and Sweet Marsh WMAs. The wooden design pictured above was also used adapted by Polk County Conservation for use at Chichauqua Bottoms Greenbelt.

Vision #6: Stable, permanent funding dedicated to wildlife management at a level adequate to achieve plan goals

Chapter 6 states that in order to achieve this goal there will need to be a marketing campaign to convince citizens, conservation professionals, activists, leaders, and law makers of the need to fund the plan. Although funding has never been dedicated to wildlife conservation at the level adequate to achieve plan goals, partnership between agencies has made many projects possible that could not be completed by any entity on their own. One funding

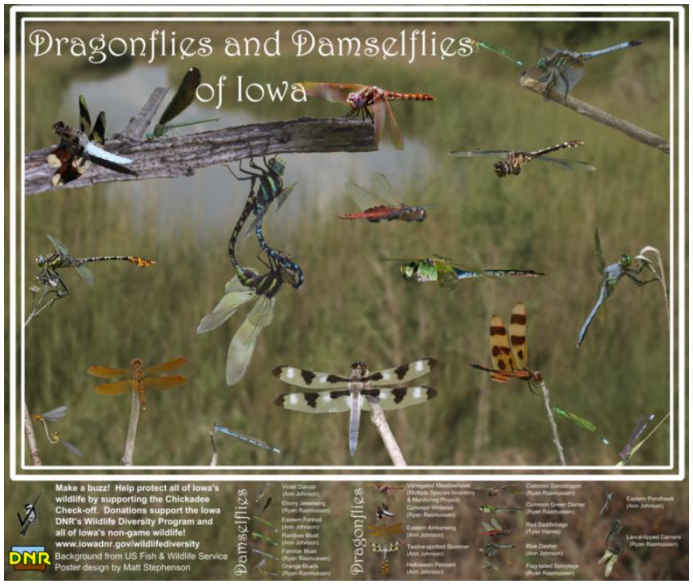
source in Iowa for non-game wildlife is the Chickadee Checkoff. At the national level, the Teaming with Wildlife Coalition (TWW) advocates for a solution to the problem of inadequate wildlife diversity funding.

The Chickadee Checkoff

Check it and Protect it! Donate to Wildlife Conservation this tax season on line 55 of the Iowa state tax form.

The Chickadee Checkoff provides tax-payers with the opportunity to donate money directly to the Wildlife Diversity Program when they fill out their Iowa 1040 tax form. Although the Chickadee Checkoff was enacted in 1981, long before the publication of the Plan, the money that has been raised through this means has been used to benefit non-game wildlife and has contributed to Plan implementation since the Plan was formed. All of the money donated through the Chickadee Checkoff goes to the Wildlife Diversity Program and helps fund projects that help achieve Plan goals such as wildlife research, monitoring and restoration, educational events about wildlife, and public land acquisition and management. Over the years donations to the Chickadee Checkoff have declined. Efforts have been made to spread awareness about the existence of this important funding source for Iowa's non-game wildlife, Including the design and distribution of Chickadee Checkoff posters (Figure 29). As an increasing number of citizens have turned to tax preparation services, the importance of tax preparers' awareness of this option on the tax form has increased. Therefore, members of the Wildlife Diversity Program of the Iowa Department of Natural Resources bring the posters to tax schools where tax preparers are trained, and discuss the importance of the Chickadee Checkoff with those attending the trainings. Postcards are also mailed to those who have donated in previous years, to thank them for their past donations and remind them about the Chickadee Checkoff as the next tax season approaches.

Figure 11- 27. Two Examples of Chickadee Checkoff Posters. Recent designs, like the dragonfly and damselfly poster, have featured a species identification legend where each species can be matched to its common name at the bottom.



Teaming With Wildlife Coalition

Teaming With Wildlife (TWW) is a national coalition dedicated to finding a sustainable, long-term funding source for the conservation of all wildlife. Iowa boasts one of the top ten Teaming With Wildlife Coalitions in the nation, which is a testament to how much Iowans value wildlife. Over 180 organizations and businesses from across Iowa have come together to spread the word about the Iowa Wildlife Action Plan and to secure the funding it needs for success. Member organizations and businesses can help in variety of ways, by engaging organizations in their communities, sharing TWW updates within their networks, and by urging elected officials to support the federal State Wildlife Grants Program and legislation providing long-term, dedicated funding for wildlife conservation and related education and recreation. - See more at: http://www.teaming.com/state/iowa#sthash.R77XJYxg.dpuf

Teaming With Wildlife Fly-In Days

The State and Tribal Wildlife Grants (SWG) Program is the only source of federal funds that is dedicated to implementation of State Wildlife Action Plans. Administered by the US Fish and Wildlife Service, this program provides annual allocations of funding to states, territories, and tribes. These funds are to be used solely for the conservation of wildlife, particularly Species of Greatest Conservation Need. Funding for the SWG program must be appropriated by congress on a yearly basis. In order to help Iowa's lawmakers make informed decisions about the value of the SWG, staff from the wildlife diversity program, as well as occasionally other DNR staff and outside partners have traveled to Washington D.C. at the end of February to participate in Teaming With Wildlife's Fly-in Days. This event provides an opportunity to meet with Iowa's delegates and their staff to educate them about wildlife funding mechanisms in Iowa as well as the work accomplished due to the SWG program (Figure 30). Along with other discretionary programs, SWG funds are often subject to elimination through budget cuts, so the Fly-In Days have been an important communication tool to maintain this funding source. Iowa has received an average of about $720,000 per year through the 15 year life of the program.

Figure 11- 28. Stephanie Shepherd, Wildlife Diversity Program Biologist, with Former Iowa Senator Tom Harkin. Senator Harkin is holding a wren house made by Pat Schlarbaum, Wildlife Diversity Natural Resources Technician II. Senator Harkin was a longtime champion of wildlife and natural resource conservation.

Conclusion

Although Iowa is an agricultural state, it also hosts thousands of vertebrate and invertebrate species. Continuing to develop a diverse base of native habitats and movement corridors for wildlife is essential for the preservation of Iowa's wildlife populations. Maintaining Iowa's rich natural resource legacy also creates a wide variety of enjoyable recreational opportunities for Iowans and visitors alike, thereby improving public health and contributing to the state's economy. This chapter highlights just a few of the many projects that are being conducted across the state to preserve and restore Iowa's natural resources as well as provide opportunities for people to enjoy them. As implementation of the Iowa Wildlife Action Plan continues, more benefits will be seen across the state for wildlife as well as for the people who enjoy outdoor recreation and who value wildlife and wild spaces.

Unless otherwise noted, photos are courtesy of the Iowa Department of Natural Resources

Appendix 1. IWAP Implementation Committee Members in 2015

Table Appendix 1- 1. IWAP Implementation Committee Members in 2015

Name	Title	Affiliation	Plan Responsibilities
Dr. Dale Garner	Wildlife Bureau Chief	DNR Wildlife	Plan Director
Katy Reeder	Wildlife Action Plan Coordinator	DNR Wildlife	Plan Coordinator
Todd Bishop	Special Projects	DNR Wildlife	Statewide land conservation, wetlands
Dr. Steve Dinsmore	Professor of Natural Resource Ecology & Management (NREM)	Iowa State University, Iowa Ornithologist's Union	Chair, Bird Subcommittee
Bruce Ehresman	Wildlife Diversity Biologist	DNR Wildlife	Birds, wildlife diversity program
Marlene Ehresman	Director	Iowa Wildlife Center	Wildlife outreach, landscapes and habitats
Chris Ensminger	Supervisor	DNR GIS Section	GIS, mapping
Scott Gritters	Fisheries Biologist	DNR Fisheries	Aquatics (fish and mussels)
Mark Gulick	NW District Wildlife Supervisor	DNR Wildlife	Land Management, shallow lakes
Doug Harr	President	Iowa Audubon	Birds, wildlife diversity
Doug Helmers	Partners for Fish & Wildlife Director	US Fish & Wildlife Service	Private Lands, Birds
Dr. Karen Kinkead	Wildlife Diversity Program Manager	DNR Wildlife	Chair, Wildlife Working Group, wildlife diversity program manager
Dr. Robert Klaver	Cooperative Fish & Wildlife Research Unit Leader	USGS/ISU	Spatial analysis, wildlife research
Joe Larscheid	Fisheries Bureau Chief	DNR Fisheries	Aquatic species
Gregg Pattison	Private Lands Biologist – Partners for F&W	US Fish & Wildlife Service	Land Management, Private Lands
Scott Peterson	Central District Wildlife Supervisor	DNR Wildlife	Land Management
Dr. Jesse Randall	Extension Forestry Specialist, Associate Professor, NREM Dept	ISU Extension, Natural Resource Ecology & Mgmt	Forestry
Scott Rolfes	Natural Resource Specialist	US Army Corps of Engineers	Land management
Robert Schwartz	Director	Winnebago County Conservation	Land management
Mike Shannon	Regional Biologist	Ducks Unlimited	Waterfowl
Marvin Shirley	Member	Iowa Farmers Union	Agricultural systems, private lands

Name	Title	Affiliation	Plan Responsibilities
Dr. Keith Summerville	Associate Dean, College of Arts and Sciences	Drake University	Lepidoptera, mammals, herpetofauna
Monica Thelen	Federal Aid Coordinator, GIS Specialist	DNR Wildlife	GIS, mapping
Terry Van De Walle	Biologist	Stantec	Herpetofauna, wildlife surveys

Table Appendix 1- 2. IWAP Implementation Committee Working Groups and Subcommittees in 2015

Working Group	Chair	Subcommittees (Subcommittee Chair)
Wildlife	Dr. Karen Kinkead	Amphibian & Reptiles (Jeff LeClere) Birds (Dr. Stephen Dinsmore) Butterflies (Stephanie Shepherd) Dragonflies & Damselflies (Steve Hummel) Fish (Dr. Clay Pierce) Mammals (Vacant) Mussels (Dr. Kevin Roe) Terrestrial Snails (Dr. Kevin Roe)
Wildlife Habitat	Katy Reeder	Northeast (Scott Gritters) Northwest (Mark Gulick) Southeast (Vacant) Southwest (Vacant)
Adaptive Ecological Management	Pete Hildreth	
Education & Recreation	Peter Fritzell	
Climate Change	Katy Reeder	

Appendix 2. 2004 Advisory Group Meeting Attendees

Table Appendix 2- 1. Attendees at the IWAP Advisory Group meeting in 2004, and their titles and affiliations at that time

(In order to accurately display the representation at the forum, no updates have been made to this list to reflect name changes, retirements, or changes.)

Name - Last	Name-First	Affiliation	Title	Address
Anderson-Cruz	Jennifer	Natural Resources Conservation Service	Biologist	Des Moines, IA
Andrews	Ron	Iowa DNR Wildlife	Furbearer Specialist & Wildlife Diversity Program	Clear Lake, IA
Bishop	Richard	Iowa DNR Wildlife	ex-Wildlife Bureau Chief	Des Moines, IA
Bogenschutz	Kim	Iowa DNR Fisheries	Aquatic Nuisance Species Coordinator	Boone, IA
Bonneau	Don	Iowa DNR Fisheries	Fisheries Research Supervisor	Moines, IA
Brandrup	Mike	Iowa DNR Con & Rec	Division Administrator	Des Moines, IA
Brown	Larry	Ruffed Grouse Society	Representative	Radcliffe IA
Bruce	Angi	Iowa DNR Wildlife	District Wildlife Supervisor	Lewis, IA
Burk	John	National Wild Turkey Federation	Biologist	Fulton, MO 65251
Cancilla	Jodeane	MacBride Raptor Center		Cedar Rapids, IA
Christiansen	Scott	Prairie Edge Sustainable Forestry Cooperative		Edgewood, IA
Clark	Jane	Sierra Club	Chair	Des Moines, IA
Conover	Marion	Iowa DNR Fisheries	Fisheries Bureau Chief	Des Moines, IA
Deaver	Steve	Linn County Conservation Board	Resource Technician	Marion, IA
DeGeus	Dave	The Nature Conservancy	Director of Conservation Programs	Des Moines, IA
Dinsmore	James	Iowa Audubon	Representative	Ames, IA
Dolan	Robert	Iowa DNR Wildlife	District Wildlife Supervisor	Manchester, IA
Downing	John	Iowa State University	Professor	Ames, IA
Ehresman	Marlene	IA Natural Heritage Foundation	Program Planning Associate	Des Moines, IA
Ehresman	Bruce	Iowa DNR Wildlife	Wildlife Diversity Program Biologist	Boone, IA
Farrar	Eugenia	EEOB Iowa State University	Professor	Ames, IA
Flynn	Chris	Iowa DNR	Conservation Officer	Birmingham, IA
Ford-Shivvers	Diane	Iowa DNR Con & Rec	Asst. Div. Administrator	Des Moines, IA

Name - Last	Name-First	Affiliation	Title	Address
Francisco	Kim	Natural Resources Commission	Chair	Lucas, IA
Fritzell	Peter	Iowa DNR Wildlife	Assistant Biometrician	Boone, IA
Garner	Dale	Iowa DNR Wildlife	Wildlife Bureau Chief	Des Moines, IA
Gengerke	Tom	Iowa DNR Fisheries	District Fisheries Supervisor	Spirit Lake, IA
Gilbertson	Nancy	US Fish & Wildlife Service	Biologist	Prairie City, IA
Gilliam	Jay	Iowa Ornithologist's Union	Conservation Committee Chair	
Gosselink	Todd	Iowa DNR Wildlife	Wild Turkey Biologist	Chariton, IA
Griffin	Mike	Iowa DNR Wildlife	Mississippi River Coordinator	Bellevue, IA
Gritters	Scott	American Fisheries Society	President	Guttenberg, IA
Hall	Jeff	Representative Boswell's Staff	Staff member	Des Moines, IA
Hansen	Steve	Iowa Woodland Owners Association		Des Moines, IA
Harr	Doug	Iowa DNR Wildlife	Wildlife Diversity Coordinator	Boone, IA
Harson	Greg	Iowa DNR Enforcement	Conservation Officer	Little Rock, IA
Heiser	Neil	Iowa DNR Wildlife	District Wildlife Supervisor	Spirit Lake, IA
Hendricks	Ace	Woodland Growers		Ackworth, IA
Hey	Jane	Morningside College		
Hill	Spencer	Iowa Trappers Association	President	Kanawha, IA
Holland	Steve	Iowa DOT		Ames, IA
Howell	Daryl	Iowa DNR Parks	Senior Environmental Specialist	Des Moines, IA
Hummel	Steve	Ida County Conservation Board	Board Member	Lake View, IA
Johnson	Ann	IA Odonata Society	Vice-Chair	Norwalk, IA
Johnson	Chuck	Loess Hills Audubon	Representative	Sioux City, IA
Kane	Kevin	Iowa State University	GIS Facility Director	Ames, IA
Klaas	Erv	Iowa State University (retired)	Professor Emeritus	Ames, IA
Kline	Don	Iowa DNR Fisheries	Natural Resource Biologist	Brighton, IA
Koenig	Darwin	Iowa Audubon		Ankeny IA
Koford	Rolf	Iowa Coop Unit	Professor	Ames, IA
Lamb	Inger	IA Prairie Network, IA Native Lands	President	
Lampe	Richard	Biology Department Buena Vista University	Professor	Storm Lake, IA
Lancaster	Jennifer	Iowa DNR Enforcement	District Law Enforcement Supervisor	Manchester, IA
Larson	Chris	Iowa DNR Fisheries	Natural Resource Technician	Lewis, IA
LeClere	Jeff		Consultant	St Paul, MN

Name - Last	Name-First	Affiliation	Title	Address
Leopold	Rich	Iowa Environmental Council	Chair	Des Moines, IA
Little	Terry	Iowa DNR Wildlife	Wildlife Research Supervisor Wildlife Diversity Supervisor	Des Moines, IA
MacInroy	Mark	Iowa DNR Wildlife	Wildlife Diversity Technician	Boone, IA
Major	Annabelle	Iowa State University	Grad Student	Ames, IA
Moritz	Bob	Loess Hills Alliance	Chair	Sioux City, IA
Neumann	Kay	Iowa Rehabilitator's Association	President	Dedham, IA
O'Brien	Jason	Iowa NatureMapping	Prog. Coord.	Ames, IA
Olsen	Frank	Lepidopterist		
Otis	Dave	Iowa Cooperative Fish & Wildlife Research Unit	Professor	Ames, IA
Parmalee	Jeff	Simpson College	Professor	Indianola, IA
Poole	Kelly	Iowa Department of Transportation	Aquatic Ecologist	Ames, IA
Roberts	Steve	Iowa DNR - Wildlife	Biometrician	Boone, IA
Robinson	Rick	Iowa Farm Bureau Federation	Environmental Coordinator	West Des Moines, IA
Rovang	Rodney	US Park Service	Resource Manager	Harper's Ferry, IA
Sand	Duane	INHF		Norwalk, IA
Schlarbaum	Pat	Iowa DNR Wildlife	Wildlife Diversity Program Technician	Boone, IA
Schlict	Dennis		Biology Teacher	Center Point, IA
Schwager	Marty	Iowa Pork Producer's Association	Executive Director	Clive, IA
Skibbe	Jessica	Iowa State University	Grad student	Ames, IA
Skold	Steve	Safari Club International	Regional Rep.	West Des Moines, IA
Smith	Kelly	Iowa DNR Wildlife	Landowner Incentive Program Coordinator	Des Moines, IA
Sproul	Tim	Harrison County Conservation Board	Director	Woodbine, IA
Steffen	Chuck	The Wildlife Society	President	Ottumwa, IA
Suchy	Willie	Iowa DNR Wildlife	Deer Biologist	Chariton, IA
Sweet	Mike	US Fish & Wildlife Service	Biologist	Ft. Snelling MN
Sweet	Craig	Iowa Trappers Association		IA
Swinton	Rod	Iowa Tree Farm Committee		Waterloo, IA
Szcodronski	Kevin	Iowa DNR Parks	Bureau Chief	Des Moines, IA
VanDeWalle	Terry	EarthTech	Biologist	Waterloo, IA
VanWaus	Dave	Pheasants Forever	Regional Director	Colo, IA
Walkowiak	John	Iowa DNR Forestry	Bureau Chief	Des Moines, IA

Name - Last	Name-First	Affiliation	Title	Address
Weedum	Joe	Hawkeye Flyfishing Association	President	Altoona, IA
Whittlesey	Dave	National Wild Turkey Federation	Supervisor	Woodburn, IA
Wooley	Jim	Pheasants Forever	State Director	Chariton, IA
Zarwell	Rick	Iowa Audubon	Important Bird Area Coordinator	Lansing, IA
Zenner	Guy	Iowa DNR - Wildlife	Waterfowl Biologist	Clear Lake, IA
Ziemer	Kathleen	Butterfliz of Iowa		Des Moines, IA
Zohrer	Jim	E Resources, Inc.	Private Consultant	West Des Moines, IA

Appendix 3. List of Iowa Amphibians Evaluated by the IWAP.

Taxonomic order derived from: the Society for the Study of Amphibians and Reptiles Standard English and Scientific Names Document, which can be accessed at: http://ssarherps.org/

Iowa Status/Listing: **Iowa Status** refers to Species of Greatest Conservation Need (SGCN) status as determined through IWAP species conservation status assessments. **Iowa Listing** refers to Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov
National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
Order: Caudata				
	Family: Ambystomatidae – Mole Salamanders			
1	Blue-spotted Salamander	*Ambystoma laterale*	SGCN Endangered	N5
2	Smallmouth Salamander	*Ambystoma texanum*	SGCN	N5
3	Eastern Tiger Salamander	*Ambystoma tigrinum*	SGCN	N5
	Family: Proteidae – Mudpuppies and Waterdogs			
1	Common Mudpuppy	*Necturus maculosus*	SGCN Threatened	N5
	Family: Salamandridae - Newts			
1	Eastern Newt	*Notophthalmus viridescens*	SGCN Threatened	N5
Order: Anura				
	Family: Bufonidae – True Toads			
1	American Toad	*Anaxyrus americanus*		N5
2	Great Plains Toad	*Anaxyrus cognatus*	SGCN	N5
3	Fowler's Toad	*Anaxyrus fowleri*	SGCN	N5
4	Woodhouse's Toad	*Anaxyrus woodhousii*	SGCN	N5

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
	Family: Hylidae – Cricket Frogs, Treefrogs, and Chorus Frogs			
1	Blanchard's Cricket Frog	*Acris blanchardi*	SGCN	N5
2	Cope's Gray Treefrog	*Hyla chrysoscelis*	SGCN	N5
3	Eastern Gray Treefrog	*Hyla versicolor*	SGCN	N5
4	Spring Peeper	*Pseudacris crucifer*		N5
5	Boreal Chorus Frog	*Pseudacris maculata*		N5
	Family: Ranidae – True Frogs			
1	Crawfish Frog	*Lithobates areolatus*	SGCN Endangered	N4
2	Plains Leopard Frog	*Lithobates blairi*		N5
3	Bullfrog	*Lithobates catesbeianus*		N5
4	Green Frog	*Lithobates clamitans*		N5
5	Pickerel Frog	*Lithobates palustris*	SGCN	N5
6	Northern Leopard Frog	*Lithobates pipiens*	SGCN	N5
7	Southern Leopard Frog	*Lithobates sphenocephalus*	SGCN	N5
	Family: Scaphiophidae - Spadefoots			
1	Plains Spadefoot	*Spea bombifrons*	SGCN	N5

Data Deficient Species – Species evaluated by Reptile and Amphibian subcommittee for which insufficient information was available to conduct a conservation status assessment

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
1	Common Mudpuppy	*Necturus maculosus*	SGCN Threatened	N5
2	Plains Spadefoot	*Spea bombifrons*	SGCN	N5

Removed from Iowa Species List

Common Name	Scientific Name	Explanation
Western Chorus Frog	*Pseudacris triseriata*	There are no records of this species in Iowa

Appendix 4. List of Iowa Reptiles Evaluated by the IWAP.

Taxonomic order derived from: the Society for the Study of Amphibians and Reptiles Standard English and Scientific Names Document, which can be accessed at: http://ssarherps.org/

Iowa Status/Listing: **Iowa Status** refers to Species of Greatest Conservation Need (SGCN) status as determined through IWAP species conservation status assessments. **Iowa Listing** refers to Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
Order: Chelonia				
	Family: Chelydridae – Snapping Turtles			
1	Snapping Turtle	*Chelydra serpentina*	SGCN	N5
	Family: Emydidae – Freshwater Turtles			
1	Painted Turtle	*Chrysemys picta*		N5
2	Blanding's Turtle	*Emydoidea blandingii*	SGCN Threatened	N4
3	Wood Turtle	*Glyptemys insculpta*	SGCN Endangered	N3
4	Northern Map Turtle	*Graptemys geographica*	SGCN	N5
5	Southern Map Turtle	*Graptemys ouachitensis*	SGCN	N5
6	False Map Turtle	*Graptemys pseudogeographica*	SGCN	N5
7	Ornate Box Turtle	*Terrapene ornata*	SGCN Threatened	N5
8	Pond (Red-eared) Slider	*Trachemys scripta elegans*		N5
	Family: Kinosternidae – Mud and Musk Turtles			

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
1	Yellow Mud Turtle	*Kinosternon flavescens*	SGCN Endangered	N5
2	Eastern Musk Turtle	*Sternotherus odoratus*	SGCN Threatened	N5
	Family: Trionychidae - Softshells			
1	Smooth Softshell Turtle	*Apalone mutica*	SGCN	N5
2	Spiny Softshell Turtle	*Apalone spinifera*	SGCN	N5
Order: Squamata – Suborder: Lacertilia				
	Family: Anguidae – Glass Lizards			
1	Slender Glass Lizard	*Ophisaurus attenuatus*	SGCN Threatened	N5
	Family: Scincidae - Skinks			
1	Five-Lined Skink	*Plestiodon faciatus*	SGCN	N5
2	Great Plains Skink	*Plestiodon obsoletus*	SGCN Endangered	N5
3	Prairie Skink	*Plestiodon septentrionalis*	SGCN	N5
	Family: Teiidae – Racerunners and Whiptails			
1	Six-Lined Racerunner	*Aspidoscelis sexlineata*	SGCN	N5
Order: Squamata – Suborder: Serpentes				
	Family: Colubridae – Harmless Snakes			
1	Western Worm Snake	*Carphophis vermis*	SGCN Threatened	N5
2	North American Racer	*Coluber constrictor*		N5
3	Ringneck Snake	*Diadophis punctatus*	SGCN	N5
4	Western (Plains) Hognose Snake	*Heterodon nasicus*	SGCN Endangered	N5
5	Eastern Hognose Snake	*Heterodon platirhinos*	SGCN	N5
6	Prairie Kingsnake	*Lampropeltis calligaster*	SGCN	N5
7	Speckled Kingsnake	*Lampropeltis holbrooki*	SGCN Threatened	N5
8	Eastern Milk Snake	*Lampropeltis triangulum*		N5
9	Plainbelly (Copperbelly) Watersnake	*Nerodia erythrogaster*	SGCN Endangered	N5 Threatened*
10	Diamondback Water Snake	*Nerodia rhombifer*	SGCN Threatened	N5
11	Common Water Snake	*Nerodia sipedon*	SGCN	N5
12	Smooth Green Snake	*Opheodrys vernalis*	SGCN Special Concern	N5
13	Western (Black) Rat Snake	*Pantherophis obsoletus*	SGCN	N5
14	Western Fox Snake	*Pantherophis ramspotti*	SGCN	N5

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
15	Gopher (Bull) Snake	*Pituophis catenifer*	SGCN Special Concern	N5
16	Graham's Crayfish Snake	*Regina grahamii*	SGCN	N5
17	Brown Snake	*Storeria dekayi*		N5
18	Redbelly Snake	*Storeria occipitomaculata*	SGCN	N5
19	Western Ribbon Snake	*Thamnophis proximus*	SGCN	N5
20	Plains Garter Snake	*Thamnophis radix*	SGCN	N5
21	Common Garter Snake	*Thamnophis sirtalis*		N5
22	Lined Snake	*Tropidoclonion lineatum*	SGCN	N5
23	Smooth Earth Snake	*Virginia valeriae*	SGCN	N5
	Family: Viperidae - Vipers			
1	Copperhead	*Agkistrodon contortrix*	SGCN Endangered	N5
2	Timber Rattlesnake	*Crotalus horridus*	SGCN	N4
3	Prairie Rattlesnake	*Crotalus viridis*	SGCN Endangered	N5
4	Eastern Massasauga	*Sistrurus catenatus*	SGCN Endangered	N3 Candidate
5	Western Massasauga	*Sistrurus turgeminus*	SGCN	N3N4 Candidate

*The Copperbelly Water Snake (*Nerodia erythrogaster neglecta*) was renamed Plainbelly Water Snake (*Nerodia erythrogaster*) after the subspecies designation was removed. However, the Copperbelly Water Snake (*Nerodia erythrogaster neglecta*) is still federally listed as threatened (status not yet updated to show recent taxonomic name change).

Data Deficient Species – Species evaluated by Reptile and Amphibian subcommittee for which insufficient information was available to conduct a conservation status assessment

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
1	Speckled Kingsnake	*Lampropeltis holbrooki*	SGCN Threatened	N5

Removed from List of Iowa Species

Common Name	Scientific Name	Explanation
Alligator Snapping Turtle	*Macrochelys temminckii*	Sole record not considered credible
Yellowbelly Watersnake	*Nerodia erythrogaster flavigaster*	Records mistakenly identified as this subspecies
Rough Greensnake	*Opheodrys aestivus*	Records mistakenly attributed to Iowa

Appendix 5. List of Iowa Breeding Birds Evaluated by the IWAP.

Taxonomic order and nomenclature derived from: the American Ornithologists' Union Check-List of North American Birds, which can be accessed at: http://www.aou.org/checklist/north/

Iowa Status/Listing: **Iowa Status** refers to Species of Greatest Conservation Need (SGCN) status as determined through IWAP species conservation status assessments. **Iowa Listing** refers to Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov.

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Regionally Important: Partners In Flight regionally important birds in Bird Conservation Regions 11 (Prairie Pothole), 22 (Eastern Tallgrass Prairie), and 23 (Prairie Hardwood Transition).

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing	Regionally Important
1	Canada Goose	*Branta canadensis*		N5B, N5N	
2	Mute Swan	*Cygnus olor*		NNA	
3	Trumpeter Swan	*Cygnus buccinator*	SGCN	N4B, N4N	
4	American Wigeon	*Anas americana*	SGCN	N5B, N5N	
5	Wood Duck	*Aix sponsa*		N5B, N5N	
6	Gadwall	*Anas strepera*		N5B, N5N	
7	American Black Duck	*Anas rubripes*		N5B, N5N	
8	Mallard	*Anas platyrhynchos*		N5B, N5N	
9	Blue-winged Teal	*Anas discors*	SGCN	N5B, N5N	
10	Northern Shoveler	*Anas clypeata*		N5B, N5N	
11	Northern Pintail	*Anas acuta*	SGCN	N5B, N5N	
12	Green-winged Teal	*Anas crecca*		N5B, N5N	
13	Canvasback	*Aythya valisineria*	SGCN	N5B, N5N	
14	Redhead	*Aythya americana*	SGCN	N5B, N5N	
15	Ring-necked Duck	*Aythya collaris*	SGCN	N5B, N5N	

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing	Regionally Important
16	Lesser Scaup	*Aythya affinis*	SGCN	N5B, N5N	
17	Hooded Merganser	*Lophodytes cucullatus*		N5B, N5N	
18	Ruddy Duck	*Oxyura jamaicensis*		N5B, N5N	
19	Northern Bobwhite	*Colinus virginianus*	SGCN	N5	22, 23
20	Gray Partridge	*Perdix perdix*		NNA	
21	Ring-necked Pheasant	*Phasianus colchicus*		NNA	
22	Ruffed Grouse	*Bonasa umbellus*	SGCN	N5	11, 23
23	Sharp-tailed Grouse	*Tympanuchus phasianellus*	SGCN	N4	11
24	Greater Prairie-Chicken	*Tympanuchus cupido*	SGCN	N4	11, 22, 23
25	Wild Turkey	*Meleagris gallopavo*		N5	
26	Pied-billed Grebe	*Podilymbus podiceps*		N5B, N5N	
27	Red-necked Grebe	*Podiceps grisegena*	SGCN	N5B, N5N	
28	Eared Grebe	*Podiceps nigricollis*	SGCN	N5B, N5N	
29	Western Grebe	*Aechmophorus occidentalis*		N5B, N5N	
30	American White Pelican	*Pelecanus erythrorhynchos*	SGCN	N4	
31	Neotropic Cormorant	*Phalacrocorax brasilianus*		N4	
32	Double-crested Cormorant	*Phalacrocorax auritus*		N5B, N5N	
33	American Bittern	*Botaurus lentiginosus*	SGCN	N4B, N4N	
34	Least Bittern	*Ixobrychus exilis*		N5B, N5N	
35	Great Blue Heron	*Ardea herodias*		N5B, N5N	
36	Great Egret	*Ardea albus*		N5B, N5N	
37	Cattle Egret	*Bubulcus ibis*		N5B, N5N	
38	Green Heron	*Butorides virescens*		N5B, N5N	
39	Black-crowned Night-Heron	*Nycticorax nycticorax*	SGCN	N5B, N5N	
40	Yellow-crowned Night-Heron	*Nyctanassa violacea*		N5B, N5N	
41	White-faced Ibis	*Plegadis chihi*	SGCN	N4B, N4N	
42	Turkey Vulture	*Cathartes aura*		N5B, N5N	
43	Osprey	*Pandion haliaetus*		N5B, N4N	
44	Mississippi Kite	*Ictinia mississippiensis*		N5B	
45	Bald Eagle	*Haliaeetus leucocephalus*	SGCN Special Concern	N5B, N5N	
46	Northern Harrier	*Circus cyaneus*	SGCN Endangered	N5B, N5N	11
47	Sharp-shinned Hawk	*Accipiter striatus*		N5B, N5N	
48	Cooper's Hawk	*Accipiter cooperii*		N5B, N5N	23

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing	Regionally Important
49	Red-shouldered Hawk	*Buteo lineatus*	SGCN Endangered	N5B, N5N	
50	Broad-winged Hawk	*Buteo platypterus*	SGCN	N5B	
51	Swainson's Hawk	*Buteo swainsoni*	SGCN	N5B	11
52	Red-tailed Hawk	*Buteo jamaicensis*		N5B, N5N	
53	King Rail	*Rallus elegans*	SGCN Endangered	N4B, N4N	
54	Virginia Rail	*Rallus limicola*		N5B, N5N	
55	Sora	*Porzana carolina*		N5B, N5N	
56	Common Gallinule (formerly Moorhen)	*Gallinula galeata*	SGCN	N5B, N5N	
57	American Coot	*Fulica americana*		N5B, N5N	
58	Sandhill Crane	*Grus canadensis*		N5B, N5N	
59	Whooping Crane	*Grus americana*		N1N	
60	Piping Plover	*Charadrius melodus*	SGCN Endangered	N3B, N3N Endangered	
61	Killdeer	*Charadrius vociferus*		N5B, N5N	
62	Black-necked Stilt	*Himantopus mexicanus*		N5B, N5N	
63	Spotted Sandpiper	*Actitis macularia*		N5B, N5N	
64	Upland Sandpiper	*Bartramia longicauda*	SGCN	N5B	
65	Wilson's Snipe	*Gallinago delicata*	SGCN	N5B, N5N	
66	American Woodcock	*Scolopax minor*	SGCN	N5B, N5N	
67	Wilson's Phalarope	*Phalaropus tricolor*	SGCN	N5B	
68	Franklin's Gull	*Larus pipixcan*	SGCN	N4B	
69	Ring-billed Gull	*Larus delawarensis*		N5B, N5N	
70	Least Tern	*Sterna antillarum*	SGCN Endangered	N4B Endangered	
71	Black Tern	*Chlidonias niger*	SGCN Special Concern	N4B	
72	Forster's Tern	*Sterna forsteri*	SGCN Special Concern	N5B, N5N	
73	White-winged Dove	*Zenaida asiatica*		N5	
74	Rock Pigeon	*Columba livia*		NNA	
75	Eurasian Collared-Dove	*Streptopelia decaocto*		NNA	
76	Mourning Dove	*Zenaida macroura*		N5	
77	Yellow-billed Cuckoo	*Coccyzus americanus*	SGCN	N5B	22, 23
78	Black-billed Cuckoo	*Coccyzus erythropthalmus*	SGCN	N5B	11, 22, 23,

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing	Regionally Important
79	Barn Owl	*Tyto alba*	SGCN Endangered	N5	
80	Eastern Screech-Owl	*Otus asio*	SGCN	N5	
81	Great Horned Owl	*Bubo virginianus*		N5	
82	Burrowing Owl	*Athene cunicularia*	SGCN	N4B, N4N	11
83	Barred Owl	*Strix varia*		N5	
84	Long-eared Owl	*Asio otus*	Threatened	N5B, N5N	11
85	Short-eared Owl	*Asio flammeus*	SGCN Endangered	N5B, N5N	11
86	Common Nighthawk	*Chordeiles minor*	SGCN	N5B	11, 22
87	Chuck-will's-widow	*Caprimulgus carolinensis*	SGCN	N5B	
88	Eastern Whip-poor-will	*Caprimulgus vociferus*	SGCN	N5B	22, 23
89	Chimney Swift	*Chaetura pelagica*	SGCN	N5B	11, 22, 23
90	Ruby-throated Hummingbird	*Archilochus colubris*		N5B	
91	Belted Kingfisher	*Ceryle alcyon*	SGCN	N5B, N5N	11, 22, 23
92	Red-headed Woodpecker	*Melanerpes erythrocephalus*	SGCN	N5B, N5N	11, 22, 23
93	Red-bellied Woodpecker	*Melanerpes carolinus*		N5B, N5N	
94	Yellow-bellied Sapsucker	*Sphyrapicus varius*		N5B, N5N	
95	Downy Woodpecker	*Picoides pubescens*		N5	
96	Hairy Woodpecker	*Picoides villosus*		N5	
97	Northern Flicker	*Colaptes auratus*	SGCN	N5B, N5N	11, 22, 23
98	Pileated Woodpecker	*Dryocopus pileatus*		N5	
99	American Kestrel	*Falco sparverius*	SGCN	N5B, N5N	23
100	Peregrine Falcon	*Falco peregrinus*	SGCN Special Concern	N4B, N4N	
101	Eastern Wood-Pewee	*Contopus virens*	SGCN	N5B	22
102	Acadian Flycatcher	*Empidonax virescens*	SGCN	N5B	22, 23
103	Alder Flycatcher	*Empidonax alnorum*		N5B	
104	Willow Flycatcher	*Empidonax traillii*		N5B	23
105	Least Flycatcher	*Empidonax minimus*		N5B	
106	Eastern Phoebe	*Sayornis phoebe*		N5B, N5N	
107	Say's Phoebe	*Sayornis saya*	SGCN	N4B, N5N	
108	Great Crested Flycatcher	*Myiarchus crinitus*		N5B	
109	Western Kingbird	*Tyrannus verticalis*		N5B	
110	Eastern Kingbird	*Tyrannus tyrannus*	SGCN	N5B	11, 22, 23
111	Scissor-tailed Flycatcher	*Tyrannus forficatus*		N5B	

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing	Regionally Important
112	Loggerhead Shrike	*Lanius ludovicianus*	SGCN	N4	11, 22
113	White-eyed Vireo	*Vireo griseus*		N5B, N5N	
114	Bell's Vireo	*Vireo bellii*	SGCN	N4B	22
115	Yellow-throated Vireo	*Vireo flavifrons*		N5B, N4N	23
116	Warbling Vireo	*Vireo gilvus*		N5B	
117	Red-eyed Vireo	*Vireo olivaceus*		N5B	
118	Blue Jay	*Cyanocitta cristata*		N5B, N5N	
119	Black-billed Magpie	*Pica pica*		N5	11
120	American Crow	*Corvus brachyrhynchos*		N5B, N5N	
121	Horned Lark	*Eremophila alpestris*	SGCN	N5B, N5N	11, 22, 23
122	Purple Martin	*Progne subis*	SGCN	N5B	22
123	Tree Swallow	*Tachycineta bicolor*		N5B, N5N	23
124	N. Rough-winged Swallow	*Stelgidopteryx serripennis*		N5B, N5N	
125	Bank Swallow	*Riparia riparia*	SGCN	N5B	11, 22, 23
126	Cliff Swallow	*Hirundo pyrrhonota*		N5B	
127	Barn Swallow	*Hirundo rustica*		N5B	
128	Black-capped Chickadee	*Parus atricapillus*		N5	
129	Tufted Titmouse	*Parus bicolor*		N5	
130	Red-breasted Nuthatch	*Sitta canadensis*		N5	
131	White-breasted Nuthatch	*Sitta carolinensis*		N5	23
132	Brown Creeper	*Certhia americana*		N5	
133	Rock Wren	*Salpinctes obsoletus*		N5	
134	House Wren	*Troglodytes aedon*		N5B, N5N	
135	Winter Wren	*Troglodytes troglodytes*		N5	
136	Sedge Wren	*Cistothorus platensis*	SGCN	N4B, N5N	11
137	Marsh wren	*Cistothorus palustris*		N5B, N5N	11, 23
138	Carolina Wren	*Thryothorus ludovicianus*		N5	
139	Bewick's Wren	*Thryomanes bewickii*	SGCN	N5B	
140	Blue-gray Gnatcatcher	*Polioptila caerulea*		N5B, N5N	
141	Eastern Bluebird	*Sialia sialis*		N5B, N5N	
142	Veery	*Catharus fuscescens*	SGCN	N5B	23
143	Wood Thrush	*Hylocichla mustelina*	SGCN	N5B	22, 23
144	American Robin	*Turdus migratorius*		N5	
145	Gray Catbird	*Dumetella carolinensis*		N5B, N5N	23
146	Northern Mockingbird	*Mimus polyglottos*		N5	
147	Brown Thrasher	*Toxostoma rufum*	SGCN	N5	11, 22, 23
148	European Starling	*Sturnus vulgaris*		NNR	

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing	Regionally Important
149	Cedar Waxwing	*Bombycilla cedrorum*		N5	23
150	Ovenbird	*Seiurus aurocapillus*		N5B	
151	Worm-eating Warbler	*Helmitheros vermivorus*	SGCN	N5B	
152	Louisiana Waterthrush	*Seiurus motacilla*		N5B	
153	Golden-winged Warbler	*Vermivora chrysoptera*	SGCN	N4B	11, 23
154	Blue-winged Warbler	*Vermivora pinus*		N5B	23
155	Black-and-white Warbler	*Mniotilta varia*		N5B, N4NN5N	
156	Prothonotary Warbler	*Protonotaria citrea*	SGCN	N5B	22
157	Kentucky Warbler	*Oporornis formosus*	SGCN	N5B	22
158	Common Yellowthroat	*Geothlypis trichas*	SGCN	N5	22, 23
159	Hooded Warbler	*Wilsonia citrina*		N5B	
160	American Redstart	*Setophaga ruticilla*		N5B	
161	Cerulean Warbler	*Setophaga cerulea*	SGCN	N4B	22, 23
162	Northern Parula	*Parula americana*		N5B	
163	Yellow Warbler	*Dendroica petechia*		N5B, N5N	
164	Chestnut-sided Warbler	*Dendroica pensylvanica*		N5B	
165	Pine Warbler	*Dendroica pinus*		N5B, N5N	
166	Yellow-throated Warbler	*Dendroica dominica*		N5B	
167	Prairie Warbler	*Dendroica discolor*		N5B	
168	Yellow-breasted Chat	*Icteria virens*		N5B	22
169	Eastern Towhee	*Pipilo erythrophthalmus*		N5B	23
170	Chipping Sparrow	*Spizella passerina*		N5B, N5N	
171	Clay-colored Sparrow	*Spizella pallid*		N5B, N4N	11
172	Field Sparrow	*Spizella pusilla*	SGCN	N5	11, 22, 23
173	Vesper Sparrow	*Pooecetes gramineus*		N5B, N5N	11, 23
174	Lark Sparrow	*Chondestes grammacus*		N5B	
175	Savannah Sparrow	*Passerculus sandwichensis*		N5B, N5N	11
176	Grasshopper Sparrow	*Ammodramus savannarum*	SGCN	N5B, N5N	11, 22, 23
177	Henslow's Sparrow	*Ammodramus henslowii*	SGCN Threatened	N3B, N4N	22, 23
178	Song Sparrow	*Melospiza melodia*		N5	23
179	Swamp Sparrow	*Melospiza georgiana*		N5B, N5N	
180	Summer Tanager	*Piranga rubra*		N5B	
181	Scarlet Tanager	*Piranga olivacea*		N5B	
182	Northern Cardinal	*Cardinalis cardinalis*		N5	
183	Rose-breasted Grosbeak	*Pheucticus ludovicianus*		N5B	
184	Blue Grosbeak	*Guiraca caerulea*		N5B	
185	Indigo Bunting	*Passerina cyanea*		N5B	

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing	Regionally Important
186	Dickcissel	*Spiza americana*	SGCN	N5B	11, 22, 23
187	Bobolink	*Dolichonyx oryzivorus*	SGCN	N5B	11, 22, 23
188	Red-winged Blackbird	*Agelaius phoeniceus*		N5	22, 23
189	Eastern Meadowlark	*Sturnella magna*	SGCN	N5	22, 23
190	Western Meadowlark	*Sturnella neglecta*	SGCN	N5	11
191	Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*		N5B, N5N	11, 23
192	Common Grackle	*Quiscalus quiscula*		N5	
193	Great-tailed Grackle	*Quiscalus mexicanus*		N5	
194	Brown-headed Cowbird	*Molothrus ater*		N5	
195	Orchard Oriole	*Icterus spurius*		N5B	
196	Baltimore Oriole	*Icterus galbula*	SGCN	N5B	22, 23
197	American Goldfinch	*Spinus tristis*		N5	
198	House Finch	*Carpodacus mexicanus*		N5	
199	Red Crossbill	*Loxia curvirostra*		N5	
200	Pine Siskin	*Spinus pinus*		N5	11
201	House Sparrow	*Passer domesticus*		NNR	
202	Eurasian Tree Sparrow	*Passer montanus*		NNA	

Appendix 6. List of Non-breeding Birds Evaluated by the IWAP.

Taxonomic order and nomenclature derived from: the American Ornithologists' Union Check-List of North American Birds, which can be accessed at: http://www.aou.org/checklist/north/

Iowa Status/Listing: **Iowa Status** refers to Species of Greatest Conservation Need (SGCN) status as determined through IWAP species conservation status assessments. **Iowa Listing** refers to Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov.

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Regionally Important: Partners in Flight regionally important birds in Bird Conservation Regions 11 (Prairie Pothole), 22 (Eastern Tallgrass Prairie), and 23 (Prairie Hardwood Transition).

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing	Regionally Important
1	Greater White-fronted Goose	*Anser albifrons*		N5B, N5N	
2	Snow Goose	*Anser caerulescens*		N5B, N5N	
3	Ross's Goose	*Anser rossii*		N4N	
4	Cackling Goose	*Branta hutchinsii*		NNR	
5	Tundra Swan	*Cygnus columbianus*		N5B, N5N	
6	Greater Scaup	*Aythya marila*	SGCN	N5B, N5N	
7	Common Goldeneye	*Bucephala clangula*		N5B, N5N	
8	Bufflehead	*Bucephala albeola*		N5B, N5N	
9	Common merganser	*Mergus merganser*		N5B, N5N	
10	Red-breasted Merganser	*Mergus serrator*		N5B, N5N	
11	Common Loon	*Gavia immer*	SGCN	N4B, N5N	
12	Horned Grebe	*Podiceps auritus*		N5B, N5N	
13	Snowy Egret	*Egretta thula*		N5B, N5N	
14	Little Blue Heron	*Egretta caerulea*	SGCN	N5B, N5N	

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing	Regionally Important
15	Glossy Ibis	*Plegadis falcinellus*		N4B, N4N	
16	Northern Goshawk	*Accipiter gentilis*		N4B, N4N	
17	Rough-legged Hawk	*Buteo lagopus*		N5B, N5N	
18	Golden Eagle	*Aquila chrysaetos*		N5B, N5N	11
19	Yellow Rail	*Coturnicops noveboracensis*	SGCN	N3B, N4N	
20	Black Rail	*Laterallus jamaicensis*	SGCN	N3B, N3N	
21	Whooping Crane	*Grus americana*	SGCN	N1N Endangered	
22	Black-bellied Plover	*Pluvialis squatarola*	SGCN	N5B, N5N	
23	American Golden-Plover	*Pluvialis dominica*	SGCN	N5B	
24	Semipalmated Plover	*Charadrius semipalmatus*		N5B, N5N	
25	American Avocet	*Recurvirostra americana*		N5B, N5N	
26	Solitary Sandpiper	*Tringa solitaria*		N4B, N5N	
27	Greater Yellowlegs	*Tringa melanoleuca*		N5B, N5N	
28	Willet	*Catoptrophorus semipalmatus*		N5B, N5N	
29	Lesser Yellowlegs	*Tringa flavipes*	SGCN	N5B, N5N	
30	Whimbrel	*Numenius phaeopus*	SGCN	N5B, N5N	
31	Long-billed Curlew	*Numenius americanus*	SGCN	N5B, N5N	
32	Hudsonian Godwit	*Limosa haemastica*	SGCN	N3?B	
33	Marbled Godwit	*Limosa fedoa*	SGCN	N5B, N5N	
34	Ruddy Turnstone	*Arenaria interpres*	SGCN	N5B, N5N	
35	Red Knot	*Calidris canutus*	SGCN	N5B Threatened	
36	Sanderling	*Calidris alba*	SGCN	N4B, N5N	
37	Semipalmated Sandpiper	*Calidris pusilla*	SGCN	N5B	
38	Western Sandpiper	*Calidris mauri*		N5B, N5N	
39	Least Sandpiper	*Calidris minutilla*		N5B, N5N	
40	White-rumped Sandpiper	*Calidris fuscicollis*	SGCN	N3B	
41	Baird's Sandpiper	*Calidris bairdii*		N4B	
42	Pectoral Sandpiper	*Calidris melanotos*	SGCN	N5B	
43	Sharp-tailed Sandpiper	*Calidris acuminata*		NNR	
44	Dunlin	*Calidris alpina*		N5B, N5N	
45	Stilt Sandpiper	*Caladris himantopus*	SGCN	N3B, N4N	
46	Buff-breasted Sandpiper	*Tryngites subruficollis*	SGCN	N4B	
47	Short-billed Dowitcher	*Limnodromus griseus*	SGCN	N5B, N5N	
48	Long-billed Dowitcher	*Limnodromus scolopaceus*	SGCN	N5B, N5N	

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing	Regionally Important
49	Red-necked Phalarope	*Phalaropus lobatus*		N4NN5B	
50	Bonaparte's Gull	*Larus philadelphia*		N5B, N5N	
51	Herring Gull	*Larus argentatus*		N5B, N5N	
52	Glaucous Gull	*Larus hyperboreus*		N5B, N5N	
53	Caspian Tern	*Sterna caspia*	SGCN	N4N5B, N4N	
54	Common Tern	*Sterna hirundo*		N5B	
55	Northern Saw-whet Owl	*Aegolius acadicus*		N5B, N5N	
56	Snowy Owl	*Nyctea scandiaca*		N4B, N4N	
57	Merlin	*Falco columbarius*		N4B, N4N	
58	Prairie Falcon	*Falco mexicanus*		N5B, N5N	11
59	Olive-sided Flycatcher	*Contopus cooperi*	SGCN	N4B	
60	Yellow-bellied Flycatcher	*Empidonax flaviventris*		N5B	
61	Northern Shrike	*Lanius excubitor*		N4B, N5N	
62	Blue-headed Vireo	*Vireo solitarius*		N5B, N5N	
63	Philadelphia Vireo	*Vireo philadelphicus*		N4B	
64	Golden-crowned Kinglet	*Regulus satrapa*		N5	
65	Ruby-crowned Kinglet	*Regulus calendula*		N5B, N5N	
66	Townsend's Solitaire	*Myadestes townsendi*		N5	
67	Gray-cheeked Thrush	*Catharus minimus*		N5B	
68	Swainson's Thrush	*Catharus ustulatus*		N5B	
69	Hermit Thrush	*Catharus guttatus*		N5	
70	Varied Thrush	*Zoothera naevia*		N5	
71	American Pipit	*Anthus rubescens*		N5B, N5N	
72	Sprague's Pipit	*Anthus spragueii*	SGCN	N4B, N4N Candidate	11
73	Bohemian Waxwing	*Bombycilla garrulus*	SGCN	N5B, N5N	
74	Lapland Longspur	*Calcarius lapponicus*		N5B, N5N	
75	Smith's Longspur	*Calcarius pictus*	SGCN	N4B, N5N	
76	Snow Bunting	*Plectrophenax nivalis*		N5B, N5N	
77	Northern Waterthrush	*Seiurus noveboracensis*		N5B	
78	Tennessee Warbler	*Vermivora peregrina*		N5B	
79	Orange-crowned Warbler	*Vermivora celata*		N5B, N5N	
80	Nashville Warbler	*Vermivora ruficapilla*		N5B	
81	Connecticut Warbler	*Oporornis agilis*		N3B	11
82	Mourning Warbler	*Oporornis philadelphia*		N5B	
83	Cape May Warbler	*Dendroica tigrina*		N5B	
84	Magnolia Warbler	*Dendroica magnolia*		N5B	
85	Bay-breasted Warbler	*Dendroica castanea*	SGCN	N5B	

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing	Regionally Important
86	Blackburnian Warbler	*Dendroica fusca*		N5B	
87	Blackpoll Warbler	*Dendroica striata*		N5B	
88	Black-throated Blue Warbler	*Dendroica caerulescens*		N5B	
89	Palm Warbler	*Dendroica palmarum*		N4B, N5N	
90	Yellow-rumped Warbler	*Dendroica coronata*		N5B, N5N	
91	Black-throated Green Warbler	*Dendroica virens*		N5B	
92	Canada Warbler	*Wilsonia canadensis*	SGCN	N5B	23
93	Wilson's Warbler	*Wilsonia pusilla*		N5B	
94	Spotted Towhee	*Piplio maculatus*		N5	
95	American Tree Sparrow	*Spizella arborea*	SGCN	N5B, N5N	
96	Le Conte's Sparrow	*Ammodramus leconteii*	SGCN	N3B, N4N	11
97	Nelson's Sparrow	*Ammodramus nelsoni*		N3B, N5N	11
98	Fox Sparrow	*Passerella iliaca*		N5B, N5N	
99	Lincoln's Sparrow	*Melospiza lincolnii*		N5B, N5N	
100	White-throated Sparrow	*Zonotrichia albicollis*		N5B, N5N	
101	Harris's Sparrow	*Zonotrichia querula*	SGCN	N5N	
102	White-crowned Sparrow	*Zonotrichia leucophrys*		N5B, N5N	
103	Dark-eyed Junco	*Junco hyemalis*		N5	
104	Rusty Blackbird	*Euphagus carolinus*		N4B, N4N	
105	Brewer's Blackbird	*Euphagus cyanocephalus*		N5B, N5N	
106	Purple Finch	*Carpodacus purpureus*		N5B, N5N	
107	White-winged Crossbill	*Loxia leucoptera*	SGCN	N5	
108	Common Redpoll	*Acanthis flammea*		N5B, N5N	

Vagrant Species - These species are considered stray or vagrant in Iowa. They have confirmed documentation of occurrence in the state but do not have established populations within Iowa. In some years, populations of these species expand into portions of the state.

	Common Name	Scientific Name	National Rank/Listing
1	Taiga Bean-Goose	*Anser fabalis*	NNR
2	Black-bellied Whistling-Duck	*Dendrocygna autumnalis*	N5
3	Brant	*Branta bernicla*	N5B, N5N
4	Eurasian Wigeon	*Anas penelope*	N3N
5	Cinnamon Teal	*Anas cyanoptera*	N5B, N5N
6	Garganey	*Anas querquedula*	NNR
7	King Eider	*Somateria spectabilis*	N4B, N4N

	Common Name	Scientific Name	National Rank/Listing
8	Common Eider	*Somateria mollissima*	N5B, N5N
9	Harlequin Duck	*Histrionicus histrionicus*	N4B, N4N
10	Surf Scoter	*Melanitta perspicillata*	N5B, N5N
11	White-winged Scoter	*Melanitta fusca*	N5B, N5N
12	Black Scoter	*Melanitta nigra*	N5B, N5N
13	Long-tailed Duck	*Clangula hyemalis*	N5B, N5N
14	Barrow's Goldeneye	*Bucephala islandica*	N5B, N5N
15	Red-throated Loon	*Gavia stellata*	N5B, N5N
16	Pacific Loon	*Gavia pacifica*	N5B, N4N5N
17	Yellow-billed Loon	*Gavia adamsii*	N3B
18	Clark's Grebe	*Aechmophorus clarkii*	N5B, N5N
19	Magnificent Frigatebird	*Fregata magnificens*	NNRB, N4N
20	Anhinga	*Anhinga anhinga*	N5B, N5N
21	Brown Pelican	*Pelecanus occidentalis*	N4B, N4N
22	Tricolored Heron	*Egretta tricolor*	N5B, N5N
23	Reddish Egret	*Egretta rufescens*	N4B, N4N
24	White Ibis	*Eudocimus albus*	N5B, N5N
25	Roseate Spoonbill	*Platalea ajaja*	N4
26	Wood Stork	*Mycteria americana*	N3
27	Swallow-tailed Kite	*Elanoides forficatus*	N3B
28	Black Vulture	*Coragyps atratus*	N5B, N5N
29	Ferruginous Hawk	*Buteo regalis*	N4B, N4N
30	Purple Gallinule	*Porphyrio martinica*	N4N, N5B
31	Snowy Plover	*Charadrius alexandrinus*	N3B, N3N
32	Eskimo Curlew	*Numenius borealis*	NHB
33	Ruff	*Philomachus pugnax*	N1B
34	Curlew Sandpiper	*Calidris ferruginea*	N3B
35	Red Phalarope	*Phalaropus fulicaria*	N5B
36	Pomarine Jaeger	*Stercorarius pomarinus*	N5B
37	Parasitic Jaeger	*Stercorarius parasiticus*	N5B
38	Long-tailed Jaeger	*Stercorarius longicaudus*	N5B
39	Thick-billed Murre	*Uria lomvia*	N5B, N5N
40	Long-billed Murrelet	*Brachyramphus perdix*	NNR
41	Ancient Murrelet	*Synthliboramphus antiquus*	N4B, N4N
42	Sabine's Gull	*Xema sabini*	N5B
43	Black-headed Gull	*Larus ridibundus*	N3N
44	Little Gull	*Larus minutus*	N1N2B, N2N3N

	Common Name	Scientific Name	National Rank/Listing
45	Ross's Gull	*Rhodostethia rosea*	NNR
46	Laughing Gull	*Larus atricilla*	N5B, N5N
47	Mew Gull	*Larus canus*	N5B, N5N
48	California Gull	*Larus californicus*	N5B, N5N
49	Thayer's Gull	*Larus thayeri*	N5N
50	Iceland Gull	*Larus glaucoides*	N3N4N
51	Lesser Black-backed Gull	*Larus fuscus*	N2N3N
52	Slaty-backed Gull	*Larus schistisagus*	NNR
53	Great Black-backed Gull	*Larus marinus*	N5B, N5N
54	Arctic Tern	*Sterna pardisaea*	N5B
55	Common Ground-Dove	*Columbina passerina*	N5
56	Groove-billed Ani	*Crotophaga sulcirostris*	N4
57	Northern Hawk Owl	*Surnia ulula*	N5
58	Great Gray Owl	*Strix nebulosa*	N4
59	Rufous Hummingbird	*Selasphorus rufus*	N5B
60	Lewis's Woodpecker	*Melanerpes lewis*	N4B, N4N
61	Black-backed Woodpecker	*Picoides arcticus*	N4
62	Gyrfalcon	*Falco rusticolus*	N3B, N3N4N
63	Western Wood-Pewee	*Contopus sordidulus*	N5B
64	Cordilleran Flycatcher (formerly Western)	*Empidonax occidentalis (formerly difficilis)*	N5B
65	Vermilion Flycatcher	*Pyrocephalus rubinus*	N5B, N5N
66	Gray Jay	*Perisoreus canadensis*	N5
67	Pinyon Jay	*Gymnorhinus cyanocephalus*	N5
68	Fish Crow	*Corvus ossifragus*	N5
69	Common Raven	*Corvus corax*	N5
70	Clark's Nutcracker	*Nucifraga columbiana*	N5
71	Boreal Chickadee	*Poecile hudsonica*	N5
72	Pygmy Nuthatch	*Sitta pygmaea*	N5
73	Boreal Chickadee	*Poecile hudsonica*	N5
74	Pygmy Nuthatch	*Sitta pygmaea*	N5
75	Mountain Bluebird	*Sialia currucoides*	N5
76	Sage Thrasher	*Oreoscoptes montanus*	N5B, N5N
77	Curve-billed Thrasher	*Toxostoma curvirostre*	N5
78	Chestnut-collared Longspur	*Calcarius ornatus*	N5B, N5N
79	MacGillivray's Warbler	*Oporornis tolmiei*	N5B

	Common Name	Scientific Name	National Rank/Listing
80	Black-throated Gray Warbler	*Dendroica nigrescens*	N5B
81	Townsend's Warbler	*Dendroica townsendi*	N5B, NNRN
82	Green-tailed Towhee	*Pipilo chlorurus*	N5B, N5N
83	Lark Bunting	*Calamospiza melanocorys*	N5B, N5N
84	Black-throated Sparrow	*Amphispiza bilineata*	N5
85	Golden-crowned Sparrow	*Zonotrichia atricapilla*	N5B, N5N
86	Western Tanager	*Piranga ludoviciana*	N5B
87	Black-headed Grosbeak	*Pheucticus melanocephalus*	N5B
88	Lazuli Bunting	*Passerina amoena*	N5B
89	Painted Bunting	*Passerina cirus*	N5B
90	Bullock's Oriole	*Icterus bullockii*	N5B
91	Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*	N5
92	Pine Grosbeak	*Pinicola enucleator*	N5
93	Hoary Redpoll	*Acanthis hornemanni*	N5B, N5N
94	Lesser Goldfinch	*Spinus psaltria*	N5
95	Evening Grosbeak	*Coccothraustes vespertinus*	N5

Data Deficient Breeding Bird Species – Species evaluated by Bird subcommittee for which insufficient information was available to conduct a conservation status assessment

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing
1	Eastern Screech-owl	*Otus asio*	SGCN	N5
2	Long-eared Owl	*Asio otus*	SGCN Threatened	N5B, N5N

Data Deficient Non-Breeding Bird Species – Species evaluated by Bird subcommittee for which insufficient information was available to conduct a conservation status assessment

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing
1	Black Rail	*Laterallus jamaicensis*	SGCN	N3B, N3N
2	American Tree Sparrow	*Spizella arborea*	SGCN	N5B, N5N

Presumed Extirpated

	Common Name	Scientific Name	Iowa Status/ Listing	National Rank/Listing	Regionally Important
1	Sharp-tailed Grouse	Tympanuchus phasianellus	SGCN	N4	11

Appendix 7. List of Iowa Butterflies Evaluated by the IWAP.

Taxonomic order and scientific names derived from: Opler, PA, and AD Warren. 2002. Butterflies of North America. 2. Scientific Names List for Butterfly Species of North America, north of Mexico. CP Gillette Museum of Arthropod Diversity, Department of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, Colorado. 79 pp. This can be accessed at: http://www.biology.ualberta.ca/old_site/uasm/Opler&Warren.pdf

Iowa Status/Listing: **Iowa Status** refers to Species of Greatest Conservation Need (SGCN) status as determined through IWAP species conservation status assessments. **Iowa Listing** refers to Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	*Scientific Name*	Iowa Status/Listing	National Rank/Listing
Family: Papilionidae- Swallowtails				
	Subfamily: Papilioninae- Swallowtails			
1	Pipevine Swallowtail	*Battus philenor*	SGCN Special Concern	N5
2	Zebra Swallowtail	*Eurytides marcellus*	SGCN Special Concern	N5
3	Black Swallowtail	*Papilio polyxenes*		N5
4	Giant Swallowtail	*Papilio cresphontes*		N5
5	Eastern Tiger Swallowtail	*Papilio glaucus*		N5
6	Spicebush Swallowtail	*Papilio troilus*	SGCN	N4?
Family: Pieridae- Whites and Sulphurs				
	Subfamily: Pierinae- Whites			
7	Checkered White	*Pontia protodice*		N4
8	Olympia Marble	*Euchloe olympia*	SGCN Special Concern	N4N5

	Common Name	*Scientific Name*	Iowa Status/Listing	National Rank/Listing
	Subfamily: Coliadinae- Sulphurs			
9	Clouded Sulphur	*Colias philodice*		N5
10	Orange Sulphur	*Colias eurytheme*		N5
11	Southern Dogface	*Zerene cesonia*		N5
12	Cloudless Sulphur	*Phoebis sennae*		N5
13	Little Yellow	*Eurema lisa*		N5
14	Dainty Sulphur	*Nathalis iole*		N5
Family: Lycaenidae- Gossamer-wings				
	Subfamily: Miletinae- Harvesters			
15	Harvester	*Feniseca tarquinius*	SGCN	N4
	Subfamily: Lycaeninae- Coppers			
16	American Copper	*Lycaena phlaeas*		N5
17	Gray Copper	*Lycaena dione*		N5
18	Bronze Copper	*Lycaena hyllus*		N4N5
19	Purplish Copper	*Lycaena helloides*	SGCN Special Concern	N5
	Subfamily: Theclinae- Hairstreaks			
20	Coral Hairstreak	*Satyrium titus*		N4N5
21	Acadian Hairstreak	*Satyrium acadica*	SGCN Special Concern	N5
22	Edward's Hairstreak	*Satyrium edwardsii*	SGCN Special Concern	N4
23	Banded Hairstreak	*Satyrium calanus*		N5
24	Hickory Hairstreak	*Satyrium caryaevorum*	SGCN Special Concern	N4
25	Striped Hairstreak	*Satyrium liparops*	SGCN Special Concern	N5
26	Henry's Elfin	*Callophrys henrici*		N5
27	Juniper Hairstreak	*Callophrys gryneus*		N5
28	White M Hairstreak	*Parrhasius m-album*	SGCN	N5
29	Gray Hairstreak	*Strymon melinus*		N5
30	Henry’s Elfin	*Callophrys henrici*	SGCN	N5
	Subfamily: Polyommatinae- Blues			
31	Reakirt's Blue	*Echinargus isola*	SGCN	N5
32	Eastern-tailed Blue	*Everes comyntas*		N5
33	Spring Azure	*Celastrina ladon*		N4
34	Summer Azure	*Celastrina neglecta*		N5
35	Silvery Blue	*Glaucopsyche lygdamus*	SGCN Threatened	N5

	Common Name	*Scientific Name*	Iowa Status/Listing	National Rank/Listing
36	Melissa Blue	*Plebejus melissa*	SGCN	N5
Family: Nymphalidae- Brushfoots				
	Subfamily: Libytheinae- Snouts			
37	American Snout	*Libytheana carinenta*		N5
	Subfamily: Heliconiinae- Heliconians and Fritillaries			
38	Variegated Fritillary	*Euptoieta claudia*		N5
39	Great Spangled Fritillary	*Speyeria cybele*		N5
40	Aphrodite Fritillary	*Speyeria aphrodite*	SGCN	N5
41	Regal Fritillary	*Speyeria idalia*	SGCN Special Concern	N3
42	Silver-bordered Fritillary	*Boloria selene*	SGCN	N5
43	Meadow Fritillary	*Boloria bellona*		N5
	Subfamily: Nymphalinae- True Brushfoots			
44	Gorgone Checkerspot	*Chlosyne gorgone*	SGCN	N5
45	Silvery Checkerspot	*Chlosyne nycteis*		N5
46	Pearl Crescent	*Phyciodes tharos*		N5
47	Tawny Crescent	*Phyciodes batesii*	Potentially Extirpated	N3N4
48	Baltimore Checkerspot	*Euphydryas phaeton*	SGCN Threatened	N4
49	'Ozark' Baltimore Checkerspot	*Euphydryas phaeton ozarkae*	SGCN Threatened	N3
50	Question Mark	*Polygonia interrogationis*		N5
51	Eastern Comma	*Polygonia comma*		N5
52	Gray Comma	*Polygonia progne*		N4N5
53	Compton Tortoiseshell	*Nymphalis vaualbum*	SGCN	N5
54	Mourning Cloak	*Nymphalis antiopa*		N5
55	Milbert's Tortoiseshell	*Nymphalis milberti*		N5
56	American Lady	*Vanessa virginiensis*		N5
57	Painted Lady	*Vanessa cardui*		N5
58	Red Admiral	*Vanessa atalanta*		N5
59	Common Buckeye	*Junonia coenia*		N5
	Subfamily: Limenitidinae- Admirals and Relatives			
60	Red-spotted Purple	*Limenitis arthemis*		N5
61	Viceroy	*Limenitis archippus*		N5
	Subfamily: Apaturinae- Emperors			
62	Hackberry Emperor	*Asterocampa celtis*		N5
63	Tawny Emperor	*Asterocampa clyton*		N5

	Common Name	*Scientific Name*	Iowa Status/Listing	National Rank/Listing
	Subfamily: Satyrinae- Satyrs			
64	Northern Pearly Eye	*Enodia anthedon*		N4
65	Eyed Brown	*Satyrodes eurydice*	SGCN	N4
66	Little Wood Satyr	*Megisto cymela*		N5
67	Common Ringlet	*Coenonympha tullia*	SGCN Endangered	N5
68	Common Wood Nymph	*Cercyonis pegala*		N5
	Subfamily: Danainae- Monarchs			
69	Monarch	*Danaus plexippus*	SGCN	N2N3
Family: Hesperiidae- Skippers				
	Subfamily: Pyrginae- Spread-wing Skippers			
70	Silver-spotted Skipper	*Epargyreus clarus*		N5
71	Southern Cloudywing	*Thorybes bathyllus*	SGCN	N5
72	Northern Cloudywing	*Thorybes pylades*		N5
73	Hayhurst's Scallopwing	*Staphylus hayhurstii*	SGCN	N5
74	Dreamy Duskywing	*Erynnis icelus*	SGCN Special Concern	N5
75	Sleepy Duskywing	*Erynnis brizo*	SGCN Special Concern	N5
76	Juvenal's Duskywing	*Erynnis juvenalis*	SGCN	N5
77	Horace's Duskywing	*Erynnis horatius*		N5
78	Mottled Duskywing	*Erynnis martialis*	SGCN	N3
79	Columbine Duskywing	*Erynnis lucilius*	SGCN Special Concern	N4
80	Wild Indigo Duskywing	*Erynnis baptisiae*	Special Concern	N5
81	Common Checkered-Skipper	*Pyrgus communis*		N5
82	Common Sootywing	*Pholisora catullus*		N5
	Subfamily: Hesperiinae- Grass-skippers			
83	Least Skipper	*Ancyloxypha numitor*		N5
84	Poweshiek Skipper	*Oarisma poweshiek*	SGCN Threatened	N1 Endangered
85	European Skipper	*Thymelicus lineola*		NNA
86	Fiery Skipper	*Hylephila phyleus*		N5
87	Ottoe Skipper	*Hesperia ottoe*	SGCN Special Concern	N3N4
88	Leonard's Skipper	*Hesperia leonardus*	SGCN Special Concern	N4

	Common Name	*Scientific Name*	Iowa Status/Listing	National Rank/Listing
89	Dakota Skipper	*Hesperia dacotae*	SGCN Endangered	N2 Threatened
90	Peck's Skipper	*Polites peckius*		N5
91	Tawny-edged Skipper	*Polites themistocles*		N5
92	Crossline Skipper	*Polites origenes*	SGCN	N4N5
93	Long Dash	*Polites mystic*	SGCN	N5
94	Northern Broken-Dash	*Wallengrenia egeremet*	SGCN	N5
95	Little Glassywing	*Pompeius verna*	SGCN	N5
96	Sachem	*Atalopedes campestris*		N5
97	Arogos Skipper	*Atrytone arogos*	SGCN Special Concern	N3
98	Delaware Skipper	*Anatrytone logan*		N5
99	Byssus Skipper	*Problema byssus*	SGCN Threatened	N3N4
100	Mulberry Wing	*Poanes massasoit*	SGCN Threatened	N4
101	Hobomok Skipper	*Poanes hobomok*		N5
102	Zabulon Skipper	*Poanes zabulon*	SGCN Special Concern	N5
103	Broad-winged Skipper	*Poanes viator*	Special Concern	N5
104	Dion Skipper	*Euphyes dion*	SGCN Special Concern	N4
105	Black Dash	*Euphyes conspicua*	SGCN	N4
106	Two-spotted Skipper	*Euphyes bimacula*	SGCN Special Concern	N4
107	Dun Skipper	*Euphyes vestris*		N5
108	Dusted Skipper	*Atrytonopsis hianna*	SGCN Special Concern	N4N5
109	Pepper and Salt Skipper	*Amblyscirtes hegon*	SGCN Special Concern	N5
110	Common Roadside-Skipper	*Amblyscirtes vialis*	SGCN	N4
111	Swarthy skipper	*Nastra lherminier*	SGCN	N5

Data Deficient Species – Species evaluated by butterfly subcommittee for which insufficient information was available to conduct a conservation status assessment

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
1	White M. Hairstreak	*Parrhasius m-album*	SGCN	N5
2	'Ozark' Baltimore Checkerspot	*Euphydryas phaeton ozarkae*	SGCN Threatened	N3
3	Hayhurst's Scallopwing	*Staphylus hayhurstii*	SGCN	N5

4	Dreamy Duskywing	*Erynnis icelus*	SGCN Special Concern	N5
5	Common Roadside-skipper	*Amblyscirtes vialis*	SGCN	N4
6	Swarthy Skipper	*Nastra lherminier*	SGCN	N5

Vagrant Species - These species are considered stray or vagrant in Iowa. They have confirmed documentation of occurrence in the state but do not have established populations within Iowa. In some years, populations of these species expand into portions of the state.

	Common Name	Scientific Name
1	White Admiral	*Limenitis arthemis*
2	Sleepy Orange	*Eurema nicippe*
3	Mexican Yellow	*Eurema mexicana*
4	Marine Blue	*Leptotes marina*
5	Red-banded Hairstreak	*Calycopis cecrops*
6	Queen	*Danaus gilippus*
7	Gulf Fritillary	*Agraulis vanillae*
8	Hoary Edge	*Achalarus lyciades*
9	Persius Duskywing	*Erynnis persius*
10	Funereal Duskywing	*Erynnis funeralis*
11	Eufala Skipper	*Lerodea eufala*
12	Goatweed Leafwing	*Anaea andria*

Introduced Species - These species have established breeding populations within the state of Iowa but were excluded from consideration as SGCN due to the fact that they were introduced to Iowa by humans.

	Common Name	Scientific Name
1	Cabbage White	*Pieris rapae*
2	European Skipper	*Thymelicus lineola*

Removed from List of Iowa Species

Common Name	Scientific Name	Explanation
Swamp Metalmark	*Calephelis muticum*	The single record for Iowa has since been determined to be in error.
Greenish Blue	*Plebejus saepiolus*	Unclear why this was included in initial plan
Uncas Skipper	*Hesperia uncas*	Unclear why this was included in initial plan

Appendix 8. List of Iowa Crayfish Evaluated by the IWAP

Taxonomic order and scientific names derived from: NatureServe Explorer.

Iowa Status/Listing: **Iowa Status** refers to Species of Greatest Conservation Need (SGCN) status as determined through IWAP species conservation status assessments. **Iowa Listing** refers to Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
8	Devil Crayfish	*Cambarus diogenes*	SGCN	N5
9	Calico Crayfish	*Orconectes immunis*	SGCN	N5
10	Golden Crayfish	*Orconectes luteus*	SGCN	N5
11	Northern Clearwater Crayfish	*Orconectes propinquus*	SGCN	N5
12	Virile Crayfish	*Orconectes virilis*	SGCN	N5
13	Prairie Crayfish	*Procambarus gracilis*	SGCN	N5
14	White River Crayfish	*Procambrus acutus*	SGCN	NNR

Exotic Species - Species evaluated by Plan authors for which a conservation status assessment was not conducted due to non-native status in Iowa

	Common Name	Scientific Name
1	Rusty Crayfish	*Orconectes rusticus*

Appendix 9. List of Iowa Dragonflies & Damselflies Evaluated by the IWAP.

Taxonomic order and scientific names derived from: Paulson, DR, and SW Dunkle, eds. 2009. *A Checklist of North American Odonata.* Accessed at: http://www.odonatacentral.org/docs/NA_Odonata_Checklist_2009.pdf

Iowa Status: refers to Species of Greatest Conservation Need (SGCN) status as determined through IWAP species conservation status assessments. As of 2015, no Dragonfly or Damselfly species have been included in Iowa's list of species having Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77). For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Status	National Rank/Listing
Broad-winged damsels: Calopterygidae				
1	River Jewelwing	*Calopteryx aequabilis*		N5
2	Ebony Jewelwing	*Calopteryx maculata*		N5
3	American Rubyspot	*Hetaerina americana*		N5
4	Smoky Rubyspot	*Hetaerina titia*		N5
Spreadwings: Lestidae				
5	Great Spreadwing	*Archilestes grandis*		N5
6	Southern Spreadwing	*Lestes australis*		N5
7	Spotted Spreadwing	*Lestes congener*	SGCN	N5
8	Emerald Spreadwing	*Lestes dryas*		N5
9	Amber-winged Spreadwing	*Lestes eurinus*	SGCN	N4
10	Sweetflag Spreadwing	*Lestes forcipatus*	SGCN	N5
11	Elegant Spreadwing	*Lestes inaequalis*		N5
12	Slender Spreadwing	*Lestes rectangularis*		N5
13	Lyre-tipped Spreadwing	*Lestes unguiculatus*		N5
Pond Damsels: Coenagrionidae				
14	Eastern Red Damsel	*Amphiagrion saucium*		N5

	Common Name	Scientific Name	Iowa Status	National Rank/Listing
15	Paiute Dancer	*Argia alberta*	SGCN	N4
16	Blue-fronted Dancer	*Argia apicalis*		N5
17	Variable (Violet) Dancer	*Argia fumipennis*		N5
18	Powdered Dancer	*Argia moesta*		N5
19	Springwater Dancer	*Argia plana*	SGCN	N5
20	Blue-tipped Dancer	*Argia tibialis*		N5
21	Prairie Bluet	*Coenagrion angulatum*	SGCN	N3?
22	Taiga Bluet	*Coenagrion resolutum*	SGCN	N5
23	River Bluet	*Enallagma anna*		N5
24	Northern Bluet	*Enallagma annexum*		N5
25	Rainbow Bluet	*Enallagma antennatum*		N5
26	Azure Bluet	*Enallagma aspersum*		N5
27	Double-striped Bluet	*Enallagma basidens*		N5
28	Boreal Bluet	*Enallagma boreale*	SGCN	N5
29	Tule Bluet	*Enallagma carunculatum*		N5
30	Familiar Bluet	*Enallagma civile*		N5
31	Alkali Bluet	*Enallagma clausum*	SGCN	N5
32	Marsh Bluet	*Enallagma ebrium*		N5
33	Stream Bluet	*Enallagma exsulans*		N5
34	Skimming Bluet	*Enallagma geminatum*		N5
35	Hagen's Bluet	*Enallagma hageni*		N5
36	Orange Bluet	*Enallagma signatum*		N5
37	Slender Bluet	*Enallagma traviatum*		N5
38	Vesper Bluet	*Enallagma vesperum*		N5
39	Citrine Forktail	*Ischnura hastata*		N5
40	Western Forktail	*Ischnura perparva*	SGCN	N5
41	Fragile Forktail	*Ischnura posita*		N5
42	Eastern Forktail	*Ischnura verticalis*		N5
43	Sedge Sprite	*Nehalennia irene*	SGCN	N5
Darners: Aeshnidae				
44	Canada Darner	*Aeshna canadensis*	SGCN	N5
45	Lance-tipped Darner	*Aeshna constricta*		N5
46	Variable Darner	*Aeshna interrupta*	SGCN	N5
47	Shadow Darner	*Aeshna umbrosa*		N5
48	Common Green Darner	*Anax junius*		N5
49	Fawn Darner	*Boyeria vinosa*		N5
50	Swamp Darner	*Epiaeschna heros*		N5
51	Cyrano Darner	*Nasiaeschna pentacantha*		N5

	Common Name	Scientific Name	Iowa Status	National Rank/Listing
52	Blue-eyed Darner	*Rhionaeshna multicolor*		N5
Clubtails: Gomphidae				
53	Horned Clubtail	*Arigomphus cornutus*		N4
54	Jade Clubtail	*Arigomphus submedianus*		N5
55	Flag-tailed Spinyleg	*Dromogomphus spoliatus*		N4N5
56	Plains Clubtail	*Gomphus externus*		N5
57	Midland Clubtail	*Gomphus fraternus*	SGCN	N5
58	Pronghorn Clubtail	*Gomphus graslinellus*		N5
59	Sulphur-tipped Clubtail	*Gomphus militaris*	SGCN	N5
60	Rapids Clubtail	*Gomphus quadricolor*	SGCN	N3N4
61	Cobra Clubtail	*Gomphus vastus*		N5
62	Rusty Snaketail	*Ophiogomphus rupinsulensis*	SGCN	N5
63	Pale Snaketail	*Ophiogomphus severus*	SGCN	N5
64	Sioux Snaketail	*Ophiogomphus smithi*	SGCN	N2
65	Westfall's Snaketail	*Ophiogomphus westfalli*	SGCN	N3
66	Common Sanddragon	*Progomphus obscurus*		N5
67	Riverine Clubtail	*Stylurus amnicola*		N4
68	Brimstone Clubtail	*Stylurus intricatus*	SGCN	N4
69	Elusive Clubtail	*Stylurus notatus*	SGCN	N3
70	Russet-tipped Clubtail	*Stylurus plagiatus*		N5
71	Arrow Clubtail	*Stylurus spiniceps*	SGCN	N4
Cruisers: Macromidae				
72	Stream Cruiser	*Didymops transversa*	SGCN	N5
73	Swift (Illinois) River Cruiser	*Macromia illinoiensis*		N5
74	Royal River Cruiser	*Macromia taeniolata*	SGCN	N5
Emeralds: Corduliidae				
75	Slender Baskettail	*Epitheca costalis*	SGCN	N5
76	Common Baskettail	*Epitheca cynosura*		N5
77	Prince Baskettail	*Epitheca princeps*		N5
78	Smoky Shadowdragon	*Neurocordulia molesta*	SGCN	N4
79	Stygian Shadowdragon	*Neurocordulia yamaskanensis*	SGCN	N5
80	Plains Emerald	*Somatochlora ensigera*	SGCN	N4
81	Mocha Emerald	*Somatochlora linearis*		N5
Skimmers: Libellulidae				
82	Calico Pennant	*Celithemis elisa*		N5
83	Halloween Pennant	*Celithemis eponina*		N5
84	Eastern Pondhawk	*Erythemis simplicicollis*		N5

	Common Name	Scientific Name	Iowa Status	National Rank/Listing
85	Dot-tailed Whiteface	*Leucorrhinia intacta*		N5
86	Spangled Skimmer	*Libellula cyanea*		N5
87	Slaty Skimmer	*Libellula incesta*		N5
88	Widow Skimmer	*Libellula luctuosa*		N5
89	Twelve-spotted Skimmer	*Libellula pulchella*		N5
90	Four-spotted Skimmer	*Libellula quadrimaculata*		N5
91	Blue Dasher	*Pachydiplax longipennis*		N5
92	Wandering Glider	*Pantala flavescens*		N5
93	Spot-winged Glider	*Pantela hymenaea*		N5
94	Eastern Amberwing	*Perithemis tenera*		N5
95	Common Whitetail	*Plathemis lydia*		N5
96	Blue-faced Meadowhawk	*Sympetrum ambiguum*		N5
97	Variegated Meadowhawk	*Sympetrum corruptum*		N5
98	Saffron-winged Meadowhawk	*Sympetrum costiferum*		N5
99	Black Meadowhawk	*Sympetrum danae*		N5
100	Cherry-faced Meadowhawk	*Sympetrum internum*		N5
101	White-faced Meadowhawk	*Sympetrum obtrusum*		N5
102	Ruby Meadowhawk	*Sympetrum rubicundulum*		N5
103	Band-winged (Western) Meadowhawk	*Sympetrum semicinctum (sub species = occidentale)*		N5
104	Autumn Meadowhawk	*Sympetrum vicinum*		N5
105	Carolina Saddlebags	*Tramea carolina*	SGCN	N5
106	Black Saddlebags	*Tramea lacerata*		N5
107	Red Saddlebags	*Tramea onusta*		N5

Data Deficient Species - Species evaluated by Dragonfly & Damselfly subcommittee for which insufficient information was available to conduct a conservation status assessment.

	Common Name	Scientific Name	Iowa Status	National Rank/Listing	Explanation
1	Prairie Bluet	Coenagrion angulatum	SGCN	N3?	Minimal records and poorly documented range
2	Taiga Bluet	Coenagrion resolutum	SGCN	N5	Iowa at southern portion of range
3	Boreal Bluet	Enallagma boreale	SGCN	N5	Minimal records
4	Alkali Bluet	Enallagma clausum	SGCN	N5	
5	Western Forktail	Ischnura perparva	SGCN	N5	Only found in one county – IA is extreme eastern edge of range
6	Canada Darner	Aeshna canadensis	SGCN	N5	Minimal records and poorly

	Common Name	Scientific Name	Iowa Status	National Rank/Listing	Explanation
					documented historical range – IA is southern edge of range
7	Variable Darner	Aeshna interrupta	SGCN	N5	IA is on southeast edge of range
8	Rapids Clubtail	Gomphus quadricolor	SGCN	N3N4	Limited distribution – nymphs found in NE IA
9	Pale Snaketail	Ophiogomphus severus	SGCN	N5	Reliably found in only one location in IA
10	Westfall's Snaketail	Ophiogomphus westfalli	SGCN	N3	Only documented in small numbers in Boone River – Normal species range in Ozarks
11	Brimstone Clubtail	Stylurus intricatus	SGCN	N4	Minimal historical record
12	Arrow Clubtail	Stylurus spiniceps	SGCN	N4	Only one adult record and few nymphs
13	Slender Baskettail	Epitheca costalis	SGCN	N5	No historical record
14	Stygian Shadowdragon	Neurocordulia yamaskanensis	SGCN	S5	No adults documented in IA - Difficult to survey: flies after dusk
15	Carolina Saddlebags	Tramea carolina	SGCN	N5	Only reliably documented in one location

Vagrant Species - These species are considered stray or vagrant in Iowa. They have confirmed documentation of occurrence in the state but do not have established populations within Iowa. In some years, populations of these species expand into portions of the state.

	Common Name	Scientific Name	Iowa Status	National Rank/Listing	Explanation
1	Emma's Dancer	Argia emma		N5	Only seen once in a single location
2	Black-tipped Darner	Aeshna tuberculifera		N4	
3	Green-striped Darner	Aeshna verticalis		N5	
4	Spatterdock Darner	Rhionaeshna mutata		N4	Only recorded once
5	Golden-winged Skimmer	Libellula auripennis		N5	Few specimens
6	Painted Skimmer	Libellula semifasciata		N5	Only documented in two locations – no established population
7	Great Blue Skimmer	Libellula vibrans		N5	Only documented in one location – no established population
8	Striped Saddlebags	Tramea calverti		NNR	Southern stray – no

	Common Name	Scientific Name	Iowa Status	National Rank/Listing	Explanation
					established population

Appendix 10. List of Iowa Fish Evaluated by the IWAP.

Taxonomy from: Page, LM, H Espinosa-Perez, LT Findley, CR Gilbert, RN Lea, NE Mandrak, RL Mayden, and JS Nelson. 2013. **Common and scientific names of fishes from:** the United States, Canada, and Mexico, 7th Edition. American Fisheries Society, Special Publication 34, Bethesda, MD.

Iowa Status/Listing: **Iowa Status** refers to Species of Greatest Conservation Need (SGCN) status as determined through IWAP species conservation status assessments. **Iowa Listing** refers to Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
Lampreys: Petromyzontidae				
1	Chestnut lamprey	*Ichthyomyzon castaneus*	SGCN Threatened	N4
2	Northern brook lamprey	*Ichthyomyzon fossor*	SGCN	N4
3	Silver lamprey	*Ichthyomyzon unicuspis*	SGCN	N5
4	American brook lamprey	*Lethenteron appendix*	SGCN Threatened	N4
Sturgeons: Acipenseridae				
5	Lake sturgeon	*Acipenser fulvescens*	SGCN Endangered	N3N4
6	Pallid sturgeon	*Scaphirhynchus albus*	SGCN Endangered	N2 Endangered
7	Shovelnose sturgeon	*Scaphirhynchus platorynchus*	SGCN	N4 Threatened*
Paddlefishes: Polyodontidae				
8	Paddlefish	*Polyodon spathula*	SGCN	N4
Gars: Lepisosteidae				
9	Spotted gar	*Lepisosteus oculatus*		N5

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
10	Longnose gar	*Lepisosteus osseus*		N5
11	Shortnose gar	*Lepisosteus platostomus*		N5
Bowfins: Amiidae				
12	Bowfin	*Amia calva*		N5
Mooneyes: Hiodontidae				
13	Goldeye	*Hiodon alosoides*		N5
14	Mooneye	*Hiodon tergisus*		N5
Freshwater eels: Anguillidae				
15	American eel	*Anguilla rostrata*	SGCN	N4
Herrings: Clupeidae				
16	Skipjack herring	*Alosa chrysochloris*	SGCN	N5
17	Gizzard shad	*Dorosoma cepedianum*		N5
18	Alabama shad	*Alosa alabamae*		N3
Carps and minnows: Cyprinidae				
19	Central stoneroller	*Campostoma anomalum*		N5
20	Largescale stoneroller	*Campostoma oligolepis*	SGCN	N5
21	Southern redbelly dace	*Chrosomus erythrogaster*		N5
22	Redside dace	*Clinostomus elongatus*		N3N4
23	Lake chub	*Couesius plumbeus*		N5
24	Red shiner	*Cyprinella lutrensis*		N5
25	Spotfin shiner	*Cyprinella spiloptera*		N5
26	Gravel chub	*Erimystax x-punctatus*	SGCN	N4
27	Western silvery minnow	*Hybognathus argyritis*	SGCN	N4
28	Brassy minnow	*Hybognathus hankinsoni*		N5
29	Mississippi silvery minnow	*Hybognathus nuchalis*	SGCN	N5
30	Plains minnow	*Hybognathus placitus*	SGCN	N4
31	Pallid shiner	*Hybopsis amnis*	SGCN	N4
32	Common shiner	*Luxilus cornutus*		N5
33	Redfin shiner	*Lythrurus umbratilis*	SGCN	N5
34	Shoal chub	*Macrhybopsis hyostoma*	SGCN	N5
35	Sturgeon chub	*Macrhybopsis gelida*	SGCN	N3
36	Sicklefin chub	*Macrhybopsis meeki*	SGCN	N3
37	Silver chub	*Macrhybopsis storeriana*		N5
38	Pearl dace	*Margariscus margarita*	SGCN Endangered	N5
39	Hornyhead chub	*Nocomis biguttatus*		N5
40	Golden shiner	*Notemigonus crysoleucas*	SGCN	N5
41	Pugnose shiner	*Notropis anogenus*	SGCN Endangered	N3

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
42	Emerald shiner	*Notropis atherinoides*		N5
43	River shiner	*Notropis blennius*	SGCN	N5
44	Silverband shiner	*Notropis shumardi*	SGCN	N5
45	Ghost shiner	*Notropis buchanani*	SGCN	N5
46	Ironcolor shiner	*Notropis chalybaeus*		N4
47	Bigmouth shiner	*Notropis dorsalis*		N5
48	Blackchin shiner	*Notropis heterodon*		N5
49	Blacknose shiner	*Notropis heterolepis*	SGCN Threatened	N4
50	Spottail shiner	*Notropis hudsonius*		N5
51	Ozark minnow	*Notropis nubilus*	SGCN	N5
52	Carmine shiner	*Notropis percobromus*	SGCN	N5
53	Sand shiner	*Notropis stramineus*		N5
54	Weed shiner	*Notropis texanus*	SGCN Endangered	N5
55	Topeka shiner	*Notropis topeka*	SGCN Threatened	N3 Endangered
56	Mimic shiner	*Notropis volucellus*	SGCN	N5
57	Channel shiner	*Notropis wickliffi*	SGCN	N5
58	Pugnose minnow	*Opsopoeodus emiliae*	SGCN	N5
59	Suckermouth minnow	*Phenacobius mirabilis*	SGCN	N5
60	Southern redbelly dace	*Chrosomus erythrogaster*	SGCN	N5
61	Bluntnose minnow	*Pimephales notatus*		N5
62	Fathead minnow	*Pimephales promelas*		N5
63	Bullhead minnow	*Pimephales vigilax*		N5
64	Flathead chub	*Platygobio gracilis*	SGCN	N5
65	Blacknose dace	*Rhinichthys atratulus*		N5
66	Longnose dace	*Rhinichthys cataractae*	SGCN	N5
67	Creek chub	*Semotilus atromaculatus*		N5
Suckers: Catostomidae				
68	River carpsucker	*Carpiodes carpio*		N5
69	Quillback	*Carpiodes cyprinus*		N5
70	Highfin carpsucker	*Carpiodes velifer*		N4N5
71	White sucker	*Catostomus commersonii*		N5
72	Blue sucker	*Cycleptus elongatus*	SGCN	N3
73	Lake chubsucker	*Erimyzon sucetta*	SGCN	N5
74	Northern hog sucker	*Hypentelium nigricans*		N5
75	Smallmouth buffalo	*Ictiobus bubalus*		N5
76	Bigmouth buffalo	*Ictiobus cyprinellus*		N5

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
77	Black buffalo	*Ictiobus niger*	SGCN	N5
78	Spotted sucker	*Minytrema melanops*	SGCN	N5
79	Silver redhorse	*Moxostoma anisurum*		N5
80	River redhorse	*Moxostoma carinatum*	SGCN	N4
81	Black redhorse	*Moxostoma duquesnei*	SGCN Threatened	N5
82	Golden redhorse	*Moxostoma erythrurum*		N5
83	Shorthead redhorse	*Moxostoma macrolepidotum*		N5
North American catfishes: Ictaluridae				
84	Black bullhead	*Ameiurus melas*		N5
85	Yellow bullhead	*Ameiurus natalis*		N5
86	Brown bullhead	*Ameiurus nebulosus*	SGCN	N5
87	Blue catfish	*Ictalurus furcatus*	SGCN	N5
88	Channel catfish	*Ictalurus punctatus*		N5
89	Slender madtom	*Noturus exilis*	SGCN	N5
90	Stonecat	*Noturus flavus*		N5
91	Tadpole madtom	*Noturus gyrinus*	SGCN	N5
92	Freckled madtom	*Noturus nocturnus*	SGCN Endangered	N5
93	Flathead catfish	*Pylodictis olivaris*		N5
Pikes: Esocidae				
94	Redfin pickerel	*Esox americanus*	SGCN Threatened	N5
95	Northern pike	*Esox lucius*	SGCN	N5
96	Muskellunge	*Esox masquinongy*		N5
Mudminnows: Umbridae				
97	Central mudminnow	*Umbra limi*	SGCN	N5
Smelts: Osmeridae				
98	Rainbow smelt	*Osmerus mordax*		N5
Trouts and salmons: Salmonidae				
99	Brook trout	*Salvelinus fontinalis*	SGCN	N5
Trout-perches: Percopsidae				
100	Trout-perch	*Percopsis omiscomaycus*	SGCN	N5
Pirate perches: Aphredoderidae				
101	Pirate perch	*Aphredoderus sayanus*	SGCN	N5
Cods: Gadidae				
102	Burbot	*Lota lota*	SGCN Threatened	N5

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
New World silversides: Atherinopsidae				
103	Brook silverside	*Labidesthes sicculus*	SGCN	N5
Topminnows: Fundulidae				
104	Banded killifish	*Fundulus diaphanus*	SGCN	N5
105	Starhead topminnow	*Fundulus dispar*	SGCN	N4
106	Blackstripe topminnow	*Fundulus notatus*	SGCN	N5
107	Plains topminnow	*Fundulus sciadicus*	SGCN	N4
Livebearers: Poeciliidae				
108	Western mosquitofish	*Gambusia affinis*		N5
Sticklebacks: Gasterosteidae				
109	Brook stickleback	*Culaea inconstans*		N5
Sculpins: Cottidae				
110	Mottled sculpin	*Cottus bairdii*	SGCN	N5
111	Slimy sculpin	*Cottus cognatus*	SGCN	N5
Temperate basses: Moronidae				
112	White perch	*Morone americana*		N5
113	White bass	*Morone chrysops*		N5
114	Yellow bass	*Morone mississippiensis*		N5
Sunfishes: Centrarchidae				
115	Rock Bass	*Ambloplites rupestris*	SGCN	N5
116	Green sunfish	*Lepomis cyanellus*		N5
117	Pumpkinseed	*Lepomis gibbosus*		N5
118	Warmouth	*Lepomis gulosus*		N5
119	Orangespotted sunfish	*Lepomis humilis*		N5
120	Bluegill	*Lepomis macrochirus*		N5
121	Longear sunfish	*Lepomis megalotis*	SGCN	N5
122	Redear sunfish	*Lepomis microlophus*		N5
123	Smallmouth bass	*Micropterus dolomieu*		N5
124	Spotted bass	*Micropterus punctulatus*		N5
125	Largemouth bass	*Micropterus salmoides*		N5
126	White crappie	*Pomoxis annularis*		N5
127	Black crappie	*Pomoxis nigromaculatus*		N5
Perches: Percidae				
128	Western sand darter	*Ammocrypta clara*	SGCN Threatened	N3
129	Crystal darter	*Crystallaria asprella*	SGCN	N3
130	Mud darter	*Etheostoma asprigene*	SGCN	N4
131	Rainbow darter	*Etheostoma caeruleum*	SGCN	N5

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
132	Bluntnose darter	*Etheostoma chlorosoma*	SGCN Endangered	N5
133	Iowa darter	*Etheostoma exile*	SGCN	N5
134	Fantail darter	*Etheostoma flabellare*		N5
135	Least darter	*Etheostoma microperca*	SGCN Endangered	N5
136	Johnny darter	*Etheostoma nigrum*		N5
137	Orangethroat darter	*Etheostoma spectabile*	SGCN Threatened	N5
138	Banded darter	*Etheostoma zonale*	SGCN	N5
139	Yellow perch	*Perca flavescens*		N5
140	Logperch	*Percina caprodes*	SGCN	N5
141	Gilt darter	*Percina evides*		N4
142	Blackside darter	*Percina maculata*	SGCN	N5
143	Slenderhead darter	*Percina phoxocephala*	SGCN	N5
144	River darter	*Percina shumardi*	SGCN	N5
145	Sauger	*Sander canadensis*		N5
146	Walleye	*Sander vitreus*		N5
Drums and croakers: Sciaenidae				
147	Freshwater drum	*Aplodinotus grunniens*		N5

*In 2010 the Shovelnose Sturgeon was listed as Threatened under the Similarity of Appearance Provisions of the Endangered Species Act. The purpose of this is to protect pallid sturgeon by treating shovelnose sturgeon as a threatened species where their ranges overlap.

Data Deficient Species – Species evaluated by fish subcommittee for which insufficient information was available to conduct a conservation status assessment

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
1	Mimic shiner	*Notropis volucellus*		N5
2	Channel shiner	*Notropis wickliffi*		N5
3	Lake chubsucker	*Erimyzon succetta*		N5
4	Bluntnose darter	*Etheostoma chlorosomum*	SGCN Endangered	N5
5	Orangethroat darter	*Etheostoma spectabile*	SGCN Threatened	N5

Exotic Species – Species evaluated by fish subcommittee for which a conservation status assessment was not conducted due to non-native status in Iowa

	Common Name	Scientific Name
1	Goldfish	*Carassius auratus*
2	Grass carp	*Ctenopharyngodon idella*
3	Common carp	*Cyprinus carpio*

	Common Name	Scientific Name
4	Silver carp	*Hypophthalmichthys molitrix*
5	Bighead carp	*Hypophthalmichthys nobilis*
6	Rainbow trout	*Oncorhynchus mykiss*
7	Brown trout	*Salmo trutta*
8	Spotted bass	*Micropterus punctulatus*
9	Striped bass	*Morone saxatilis*

Presumed Extirpated

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
1	Alabama shad	*Alosa alabamae*		N3
2	Redside dace	*Clinostomus elongatus*		N3N4
3	Lake chub	*Couesius plumbeus*		N5
4	Ironcolor shiner	*Notropis chalybaeus*		N4
5	Blackchin shiner	*Notropis heterodon*		N5
6	Blacknose shiner	*Notropis heterolepis*	Threatened	N4
7	Gilt darter	*Percina evides*		N4

Removed From List of Iowa Species

	Common Name	Scientific Name	Explanation
1	Greater redhorse	Moxostoma valenciennesi	There is no current or historical evidence that this species ever occurred in Iowa or along the Iowa portion of the Upper Mississippi River

Appendix 11. List of Mammals Evaluated by the IWAP.

Taxonomic order derived from: Mammal Species of the World, used by the Smithsonian Institution's National Museum of Natural History, which can be accessed at: http://www.mnh.si.edu/ Reference: Wilson, DE and DM Reeder (editors). 2005. Mammal Species of the World: A Taxonomic and Geographic Reference (3rd Ed.) Johns Hopkins University Press. 2,142 pp.

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Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

Native, Extant Species

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
1	Virginia opossum	*Didelphis virginiana*		N5
2	Hayden's Shrew	*Sorex haydeni*	SGCN	N4
3	Northern short-tailed shrew	*Blarina brevicauda*		N5
4	Southern Short-tailed Shrew	*Blarina carolinensis*	SGCN	N5
5	Elliot's Short-tailed Shrew	*Blarina hylophaga*	SGCN	N5
6	Least shrew	*Cryptotis parva*	SGCN Threatened	N5
7	Cinereus (Masked) shrew	*Sorex cinereus*		N5
8	Eastern mole	*Scalopus aquaticus*		N5
9	Northern long-eared bat	*Myotis septentrionalis*	SGCN	N1N2 Threatened
10	Little brown bat	*Myotis lucifugus*	SGCN	N3
11	Indiana bat	*Myotis sodalis*	SGCN Endangered	N2 Endangered
12	Silver-haired bat	*Lasionycteris noctivagans*	SGCN	N5

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
13	Tri-colored bat (formerly Eastern pipistrelle)	*Perimyotis subflavus*	SGCN	N5
14	Big brown bat	*Eptesicus fuscus*		N5
15	Red bat	*Lasiurus borealis*		N5
16	Hoary bat	*Lasiurus cinereus*		N5
17	Evening Bat	*Nycticeius humeralis*	SGCN	N5
18	Eastern cottontail	*Sylvilagus floridanus*		N5
19	White-tailed jackrabbit	*Lepus townsendii*	SGCN	N5
20	Coyote	*Canis latrans*		N5
21	Gray fox	*Urocyon cinereoargenteus*	SGCN	N5
22	Red fox	*Vulpes vulpes*		N5
23	Bobcat	*Lynx rufus*		N5
24	River otter	*Lontra canadensis*		N5
25	Striped skunk	*Mephitis mephitis*		N5
26	Eastern spotted skunk	*Spilogale putorius*	SGCN Endangered	N4
27	Ermine	*Mustela erminea*	SGCN	N5
28	Long-tailed weasel	*Mustela frenata*	SGCN	N5
29	Least weasel	*Mustela nivalis*	SGCN	N5
30	Mink	*Neovison vison*		N5
31	Badger	*Taxidea taxus*		N5
32	Raccoon	*Procyon lotor*		N5
33	Moose	*Alces americanus*		N5
34	White-tailed deer	*Odocoileus virginianus*		N5
35	Woodchuck	*Marmota monax*		N5
36	Eastern gray squirrel	*Sciurus carolinenesis*		N5
37	Eastern fox squirrel	*Sciurus niger*		N5
38	Franklin's ground squirrel	*Spermophilus (Poliocitellus) franklinii*	SGCN	N5
39	Richardson's Ground Squirrel	*Spermophilus (Spermophilus) richardsonii*		N5
40	Thirteen-lined ground squirrel	*Spermophilus (Ictidomys) tridecemlineatus*		N5
41	Eastern chipmunk	*Tamias striatus*		N5
42	Red squirrel	*Tamiasciurus hudsonicus*		N5
43	Southern Flying Squirrel	*Glaucomys volans*	SGCN	N5
44	Beaver	*Castor canadensis*		N5
45	Plains pocket gopher	*Geomys bursarius*	SGCN	N5
46	Plains pocket mouse	*Perognathus flavescens*	SGCN	N5

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
47	Meadow jumping mouse	*Zapus hudsonius*		N5
48	Southern Bog Lemming	*Synaptomys cooperi*	SGCN	N5
49	Prairie vole	*Microtus ochrogaster*		N5
50	Meadow vole	*Microtus pennsylvanicus*	SGCN	N5
51	Woodland vole	*Microtus pinetorum*		N5
52	Common Muskrat	*Ondatra zibethicus*		N5
53	Northern grasshopper mouse	*Onychomys leucogaster*		N5
54	White-footed mouse	*Peromyscus leucopus*		N5
55	Deermouse	*Peromyscus maniculatus*		N5
56	Western harvest mouse	*Reithrodontomys megalotis*		N5

Data Deficient Species - Species evaluated by mammal subcommittee for which insufficient information was available to conduct a conservation status assessment

	Common Name	Scientific Name	Iowa Status	National Rank	Explanation
1	Elliot's Short-tailed Shrew	*Blarina hylophaga*	SGCN	N5	IA is on northern edge of range
2	Southern Short-tailed Shrew	*Blarina carolinensis*	SGCN	N5	According to NatureServe only reaches north into southern IL - possibly in SE corner of Iowa
3	Hayden's Shrew	*Sorex haydeni*	SGCN	N4	
4	Evening Bat	*Nycticeius humeralis*	SGCN	N5	
5	Southern Bog Lemming	*Synaptomys cooperi*	SGCN Threatened	N5	

Vagrant Species - These species are considered stray or vagrant in Iowa. They have confirmed documentation of occurrence in the state but do not have established populations within Iowa. In some years, individuals of these species may expand into portions of the state.

	Common Name	Scientific Name	National Rank	Explanation
1	Nine-banded armadillo	*Dasypus novemcinctus*	N5	Occasional individuals have wandered north from MO
2	Big free-tailed bat	*Nyctinomops macrotis*	N3N4	
3	Brazilian (Mexican) free-tailed bat	*Tadarida brasiliensis*	N5	
4	Hispid cotton rat	*Sigmodon hispidus*	N5	Only found in owl pellets
5	Gray wolf	*Canis lupus*	N4	Formerly considered extirpated
6	Swift fox	*Vulpes velox*	N3	Formerly considered extirpated until recent road kill record from Lyon County
7	Black bear	*Ursus americanus*	N5	Occasional individuals have been

	Common Name	Scientific Name	National Rank	Explanation
				documented in Iowa
8	Fisher	*Martes pennanti*	N5	Historical record unclear on presence in Iowa
9	Wolverine	*Gulo gulo*	N4	Historical record unclear on presence in Iowa
10	Mountain lion	*Puma concolor*	N5	Occasional individuals have wandered into or through Iowa
11	Mule deer	*Odocoileus hemionus*	N5	
12	Moose	*Alces alces*	N5	Occasional individuals have wandered south from MN

Introduced and Domesticated Species - These species have been documented or have established breeding populations within the state of Iowa but were excluded from consideration as SGCN due to the fact that they were introduced to Iowa by humans.

	Common Name	Scientific Name	Classification
1	House mouse	*Mus musculus*	Introduced
2	Norway rat	*Rattus norvegicus*	Introduced
3	Nutria (Coypu)	*Myocaster coypus*	Introduced
4	Feral dog	*Canis familiaris*	Domesticated
5	Feral cat	*Felis catus*	Domesticated
6	Feral hog	*Sus scrofa*	Domesticated

Extirpated Species

	Common Name	Scientific Name	National Rank	Explanation
1	Pygmy shrew	*Microsorex hoyi*	N5	
2	American marten	*Martes americana*	N5	
3	Red-backed vole	*Clethrionomys gapperi*	N5	
4	Porcupine	*Erethizon dorsatum*	N5	
5	Canada lynx	*Lynx canadensis*	N4?	
6	Elk (Wapiti)	*Cervus elaphus*	N5	
7	Pronghorn	*Antilocapra americana*	N5	
8	Bison	*Bison bison*	N4	
9	Eastern woodrat	*Neotoma norvegicus*		Based on fossil evidence
10	Marsh rice rat	*Oryzomys palustris*		Based on fossil evidence

Appendix 12. List of Iowa Mussels Evaluated by the IWAP.

Taxonomic order derived from: DD Turgeon, JF Quinn Jr, AE Bogan, EV Coan, FG Hochberg, Jr, WG Lyons, PM Mikkelsen, RJ Neves, CFE Roper, G Rosenberg, B Roth, A Scheltema, FG Thompson, M Vecchione & JD Williams. 1998. *Common and scientific names of aquatic invertebrates from the United States and Canada: Mollusks. 2nd Edition*. American Fisheries Society, Special Publication 26, Bethesda, Maryland. ix + 526 pp

Iowa Status/Listing: **Iowa Status** refers to Species of Greatest Conservation Need (SGCN) status as determined through IWAP species conservation status assessments. **Iowa Listing** refers to Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: **National Rank** refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
Order: Unionoida				
	Family: Unionidae			
1	Mucket	*Actinonaias ligamentina*	SGCN	N5
2	Elktoe	*Alasmidonta marginata*	SGCN	N4
3	Slippershell	*Alasmidonta viridis*	SGCN	N4
4	Threeridge	*Amblema plicata*	SGCN	N5
5	Flat floater	*Anodonta suborbiculata*	SGCN	N5
6	Cylinder (Cylindrical papershell)	*Anodontoides ferussacianus*	SGCN Threatened	N5
7	Rock pocketbook	*Arcidens confragosus*	SGCN	N4
8	Spectacle case	*Cumberlandia monodonta*	SGCN Endangered	N3 Endangered
9	Purple wartyback	*Cyclonaias tuberculata*	SGCN Threatened	N5
10	Butterfly	*Ellipsaria lineolata*	SGCN Threatened	N4
11	Elephantear	*Elliptio crassidens*	SGCN	N5

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
12	Spike	*Elliptio dilatata*	SGCN	N5
13	Snuffbox	*Epioblasma triquetra*	SGCN	N3
14	Ebonyshell	*Fusconaia ebena*	SGCN	N4N5
15	Wabash pigtoe	*Fusconaia flava*	SGCN	N5
16	Plain pocketbook	*Lampsilis cardium*		N5
17	Higgins eye pearlymussel	*Lampsilis higginsi*	SGCN Endangered	N1N2 Endangered
18	Fatmucket	*Lampsilis siliquoidea*	SGCN	N5
19	Yellow sandshell	*Lampsilis teres*	SGCN Endangered	N5
20	White heelsplitter	*Lasmigona camplanata*	SGCN	N5
21	Creek heelsplitter	*Lasmigona compressa*	SGCN Threatened	N5
22	Flutedshell	*Lasmigona costata*	SGCN	N5
23	Fragile papershell	*Leptodea fragilis*		N5
24	Black sandshell	*Ligumia recta*		N4N5
25	Pondmussel	*Ligumia subrostrata*	SGCN	N5
26	Washboard	*Megalonaias nervosa*	SGCN	N5
27	Threehorn wartyback	*Obliquaria reflexa*	SGCN	N5
28	Hickorynut	*Obovaria olivaria*	SGCN	N4
29	Bullhead (Sheepnose)	*Plethobasus cyphyus*	SGCN Endangered	N3 Endangered
30	Pyramid pigtoe	*Pleurobema rubrum*	SGCN	N2N3
31	Round pigtoe	*Pleurobema sintoxia*	SGCN Endangered	N4N5
32	Pink heelsplitter	*Potamilus alatus*	SGCN	N5
33	Pink papershell	*Potamilus ohiensis*	SGCN	N5
34	Giant floater	*Pyganodon grandis*		N5
35	Monkeyface	*Quadrula metanevra*	SGCN	N4
36	Wartyback	*Quadrula nodulata*	SGCN	N4
37	Pimpleback	*Quadrula pustulosa*	SGCN	N5
38	Mapleleaf	*Quadrula quadrula*	SGCN	N5
39	Salamander mussel	*Simpsonaias ambigua*	SGCN	N1
40	Strange floater (Creeper, formerly Squawfoot)	*Strophitus undulatus*	SGCN Threatened	N5
41	Lilliput	*Toxolasma parvum*		N5
42	Pistolgrip	*Tritogonia verrucosa*	SGCN Endangered	N4
43	Fawnsfoot	*Truncilla donaciformis*	SGCN	N5
44	Deertoe	*Truncilla truncata*	SGCN	N5

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
45	Paper pondshell	*Utterbackia imbecillis*	SGCN	N5
46	Ellipse	*Venustaconcha ellipsiformis*	SGCN Threatened	N4

Data Deficient Species - Species evaluated by mussel subcommittee for which insufficient information was available to conduct a conservation status assessment

	Common Name	Scientific Name	Iowa Status	National Rank	Explanation
1	Pondmussel	*Ligumia subrostrata*	SGCN	N5	Historical record lacking, need to know more about current range, only a few records of this species in IA – in decline
2	Pyramid pigtoe	*Pleurobema rubrum*	SGCN	N2N3	Only shells found – possibly extirpated
3	Round pigtoe	*Pleurobema sintoxia*	SGCN Endangered	N4N5	Only rarely documented
4	Wartyback	*Quadrula nodulata*	SGCN	N4	Need more info on hosts
5	Salamander mussel	*Simpsonaias ambigua*	SGCN	N1	Previously thought extirpated – two occurrences in 2008
6	Pondhorn	*Uniomerus tetralasmus*	SGCN	N5	Southern Iowa range is not well surveyed

Presumed Extirpated Species

	Common Name	Scientific Name	National Rank
1	Slippershell	*Alasmidonta viridis*	N4
2	Scaleshell	*Leptodea leptodon*	N1N2
3	Fat pocketbook	*Potamilus capax*	N2
4	Winged mapleleaf	*Quadrula fragosa*	N1

Other species or groups of clams/mussels not evaluated

	Common Name	Scientific Name	Iowa Listing	National Rank	Explanation
1	Ozark pigtoe	*Fusconaia ozarkensis*	E	N3N4	Single known specimen misidentified
2	Slough sandshell	*Lampsilis teres teres*	E	N5	Formerly separate from Yellow Sandshell – now considered to be same species
3	Fingernail clams	-	-	-	Includes multiple species of

					clams

Exotic Species - Species evaluated by mussel subcommittee for which a conservation status assessment was not conducted due to non-native status in Iowa

	Common Name	Scientific Name	National Rank
1	Asiatic clam	*Corbicula fluminea*	NNA
2	Zebra mussel	*Dreissena polymorpha*	NNA

Appendix 13. List of Iowa Terrestrial Snails Evaluated by the IWAP.

Taxonomic order and nomenclature derived from: DD Turgeon, JF Quinn Jr, AE Bogan, EV Coan, FG Hochberg, Jr, WG Lyons, PM Mikkelsen, RJ Neves, CFE Roper, G Rosenberg, B Roth, A Scheltema, FG Thompson, M Vecchione & JD Williams. 1998. *Common and scientific names of aquatic invertebrates from the United States and Canada: Mollusks. 2nd Edition.* American Fisheries Society, Special Publication 26, Bethesda, Maryland. ix + 526 pp

Iowa Status/Listing: **Iowa Status** refers to Species of Greatest Conservation Need (SGCN) status as determined through IWAP species conservation status assessments. **Iowa Listing** refers to Iowa Endangered, Threatened, or Special Concern Status (from Iowa Code Chapter 77) as of 2015. For up-to-date state listing information, please see the Threatened and Endangered Species Program page on the DNR website at www.iowadnr.gov

National Rank/Listing: National Rank refers to NatureServe Conservation Status Ranks. N1 = Critically Imperiled in Nation; N2 = Imperiled in Nation; N3 = Vulnerable in Nation; N4 = Apparently Secure in Nation; N5 = Secure in Nation. For additional definitions and explanation see Appendix 14. **National Listing** refers to federally Endangered or Threatened species.

Assessments of species conservation status undertaken as part of the IWAP are used to determine SGCN status only. Other information is provided as a reference. Updates to State Wildlife Action Plans, NatureServe National Ranks, Federal T&E Status, and State T&E Status are each independent processes, undertaken by different entities with differing timeframes. As such, the various listings or status ranks for a given species at a given point in time may not always appear to be in accord.

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
Helicinidae				
1	Cherrystone Drop	*Hendersonia occulta*		N4
Pomatiopsidae				
2	Slender Walker	*Pomatiopsis lapidaria*		N5
3	Brown Walker	*Pomatiopsis cincinnatiensis*		N4
Carychiidae				
4	Obese Thorn	*Carychium exiguum*		N5
5	Ice Thorn	*Carychium exile exile*		N5
Cochlicopidae				
6	Thin Pillar	*Cochlicopa lubricella*		N5
7	Glossy Pillar	*Cocjlicopa lubrica*		N5
Valloniidae				
8	Lovely Vallonia	*Vallonia pulchella*		N5
9	Costale Vallonia	*Vallonia costata*		N5
10	Trumpet Vallonia	*Vallonia parvula*		N4
11	Multirib Vallonia	*Vallonia gracilicosta*		N5

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
12	Thin-lip Vallonia	*Vallonia perspectiva*		N4N5
Pupillidae				
13	Widespread Column	*Pupilla muscorum muscorum*		N5
14	White-lip Dagger	*Pupoides albilabris*		N5
Vertiginidae				
15	Plains Snaggletooth	*Gastrocopta abbreviata*		N4
16	Armed Snaggletooth	*Gastrocopta armifera*		N5
17	Bottleneck Snaggletooth	*Gastrocopta contracta*		N5
18	Bark Snaggletooth	*Gastrocopta corticaria*		N5
19	Lamda Snaggletooth	*Gastrocopta holzingeri*		N5
20	Comb Snaggletooth	*Gastrocopta pentodon*		N5
21	Wing Snaggletooth	*Gastrocopta procera*		N5
22	Rio Grande Snaggletooth	*Gastrocopta riograndensis*		N1
23		*Gastrocopta rogersensis*		N3N4
24	Great Lakes Snaggletooth	*Gastrocopta similis*		N5
25	White Snaggletooth	*Gastrocopta tappaniana*		N5
26	Delicate Vertigo	*Vertigo bollesiana*		N4
27	Hubricht's Vertigo	*Vertigo hubrichti*	SGCN Threatened	N3
28	Blade Vertigo	*Vertigo milium*		N5
29	Six-whorl Vertigo	*Vertigo morsei*		N3
30	Ovate Vertigo	*Vertigo ovata*		N5
31	Crested Vertigo	*Vertigo pygmaea*		N5
32	Tapered Vertigo	*Vertigo elatior*		N5
33	Honey Vertigo	*Vertigo tridentata*		N5
34	Variable Vertigo	*Vertigo gouldi*		N5
35	Cross Vertigo	*Vertigo modesta modesta*		N5
36	Bluff Vertigo	*Vertigo meramecensis*	SGCN Endangered	N2N3
37	Mellow Column	*Columnella columnella alticola*		N5
38	High-spire Column	*Columnella simplex*		N5
39	Toothless Column	*Columnella edentula*		N5
Strobilopsidae				
40	Bronze Pinecone	*Strobilops aeneus*		N5
41	Maze Pinecone	*Strobilops labyrinthicus*		N5
Succineidae				
42	Niobrara Ambersnail	*Oxyloma haydeni*		N2N3

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
43	Blunt Ambersnail	*Oxyloma retusa*		N5
44	Humboldt Ambersnail	*Oxyloma sillimani*		N2
45	Oval Ambersnail	*Novisuccinean ovalis*		N5
46	Minnesota Pleistocene Succinea	*Novasuccinea n. Sp. Minnesota a*	SGCN Endangered	N2
47	Iowa Pleistocene Succinea	*Novasuccinea n. Sp. Minnesota b*	SGCN Endangered	N2
48	Chittenango Ambersnail	*Succinea chittenangoensis*		N1
49	Spotted Ambersnail	*Succinea forsheyi*		N4
50	Suboval Ambersnail	*Catinella avara*		N5
51	Slope Ambersnail	*Catinella wandae*		N2
Discidae				
52	Flamed Tigersnail	*Anguispira alternata*		N5
53	Angular Disc	*Discus catskillensis*		N5
54	Iowa Pleistocene Snail	*Discus macclintocki*	SGCN Endangered	N1 Endangered
55	Domed Disc	*Discus patulus*		N5
56	Striate Disc	*Discus shimeki*		N5
57	Forest Disc	*Discus whitneyi (=cronkhitei)*		N5
Heliodiscidae				
58	Compound Coil	*Helicodiscus parallelus*		N5
59	Temperate Coil	*Helicodiscus shimeki*		N4N5
Punctidae				
60	Small Spot	*Punctum minutissimum*		N5
61	Glass Spot	*Punctum vitreum*		N5
Limacidae				
62	Meadow Slug	*Deroceras laeve*		N5
63	Gray Fieldslug (Non-native)	*Deroceras reticulatum*		NNA
Philomycidae				
64	Changeable Mantleslug	*Megapallifera mutabilis*		N5
65	Pale Mantleslug	*Pallifera dorsalis*		N5
66	Redfoot Mantleslug	*Pallifera ohioensis*		N5
67	Carolina Mantleslug	*Philomycus carolinianus*		N5
Cionellidae				
68	Glossy Pillar	*Cochlicopa lubrica*		N5
69	Thin Pillar	*Cochlicopa lubricella*		N5
70	Appalachian Pillar	*Cochlicopa morseana*		N5
Helicarionidae				
71	Brown Hive	*Euconulus fulvus*		N5

	Common Name	Scientific Name	Iowa Status/Listing	National Rank/Listing
72	(classification uncertain)	*Guppya sterkii*		N5
Zonitidae				
73	Carved Glyph	*Glyphyalinia indentata*		N5
74	Minute Gem	*Hawaiia miniscula*		N5
75	Amber Glass	*Nesovitrea electrina*		N5
76	Fine-ribbed Striate	*Striatura milium*		N5
77	Quick Gloss	*Zonitoides arboreus*		N5
78	Dull Gloss	*Zonitoides limatulus*		N4N5
79	Black Gloss	*Zonitoides nitidus*		N5
Haplotrematidae				
80	Gray-foot Lancetooth	*Haplotrema concavum*		N5
Polygyridae				
81	Broad-banded Forestsnail	*Allogona profunda*		N5
82	Upland Pillsnail	*Euchemotrema fraternum*		N5
83		*Euchemotrema fraternum fraternum*		N5
84	Lowland Pillsnail	*Euchemotrema leai*		N5
85		*Euchemotrema leai aliciae*		N5
86		*Euchemotrema leai leai*		N5
87	Yellow Globelet	*Mesodon clausus*		N5
88		*Mesodon clausus clausus*		N5
89	White-lip Globe	*Mesodon thyroidus*		N5
90	Whitelip	*Neohelix allolabris {albolabris}*		N5
91	Western Whitelip	*Neohelix alleni*		N5
92	Smooth Bladetooth	*Patera laevior*		N4
93	Proud Globelet	*Patera pennsylvanica*		N4
94	Bristled Slitmouth	*Stenotrema barbatum*		N5
95	Hairy Slitmouth	*Stenotrema hirsutum*		N5
96	Striped Whitelip	*Webbhelix multilineata*		N5
97	Bladetooth Wedge	*Xolotrema fosteri*		N5

Appendix 14. NatureServe National Heritage Status Rank Definitions.

Status	Definition
NX	**Presumed Extirpated**—Species or ecosystem is believed to be extirpated from the jurisdiction (i.e., nation, or state/province). Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered. [Equivalent to "Regionally Extinct" in IUCN Red List terminology]
NH	**Possibly Extirpated** – Known only from historical records but still some hope of rediscovery. There is evidence that the species or ecosystem may no longer be present in the jurisdiction, but not enough to state this with certainty. Examples of such evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully, but not thoroughly enough to presume that it is no longer present in the jurisdiction.
N1	**Critically Imperiled**—At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
N2	**Imperiled**—At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
N3	**Vulnerable**—At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
N4	**Apparently Secure**—At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences but with possible cause for some concern as a result of local recent declines, threats, or other factors.
N5	**Secure**—At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.

Variant National Conservation Ranks

Rank	Definition
N#N#	**Range Rank** —A numeric range rank (e.g., S2S3 or S1S3) is used to indicate any range of uncertainty about the status of the species or ecosystem. Ranges cannot skip more than two ranks (e.g., SU is used rather than S1S4).
NU	**Unrankable**—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
NNR	**Unranked**—Nation or subnational (state/province) conservation status not yet assessed.
NNA	**Not Applicable** —A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
Not Provided	Species is known to occur in this nation or state/province. Contact the relevant natural heritage program for assigned conservation status.

References for Appendix 14

Master, LL, D Faber-Langendoen, R Bittman, GA Hammerson, B Heidel, L Ramsay, K Snow, A Teucher, and A Tomaino. 2012. *NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk.* NatureServe, Arlington, VA.

Appendix 15. Iowa Animals Endangered, Threatened, and Species of Special Concern

(from Iowa Code Chapter 77 – Updated in 2011)

Due to independent timeframes for updates to Federal T&E Status, State T&E Status, and SGCN Status, the statuses for a given species at a given point in time may not always appear to be in accord.

Table Appendix 15- 1. Federally-listed Animals which are not State-listed as of 2015

Common Name	Scientific Name	T	E	C
Mammals				
Northern Long-eared Bat	*Myotis septenrionalis*	♦		

Table Appendix 15- 2. State Endangered Animals

Federally Endangered, Threatened, and Candidate Species are indicated with a ♦ in the appropriate column for Threatened (T), Endangered (E), or Candidate (C) status. Species common and scientific names as well as species concept is presented here as presented within Iowa code. Additions to the 'Common Name' column (in parentheses) are added by the Plan authors for clarification.

Common Name	Scientific Name	T	E	C
Mammals				
Indiana Bat	*Myotis sodalis*		♦	
Plains Pocket Mouse	*Perognathus flavescens*			
Red-backed Vole	*Clethrionomys gapperi*			
Spotted Skunk	*Spilogale putorius*			
Birds				
Red-shouldered Hawk	*Buteo lineatus*			
Northern Harrier	*Circus cyaneus*			
Piping Plover	*Charadrius melodus*		♦	
Common Barn Owl	*Tyto alba*			
Least Tern	*Sterna antillarum*		♦	
King Rail	*Rallus elegans*			
Short-eared Owl	*Asio flammeus*			
Fish				
Lake Sturgeon	*Acipenser fulvescens*			
Pallid Sturgeon	*Scaphirhynchus albus*		♦	
Pugnose Shiner	*Notropis anogenus*			
Weed Shiner	*Notropis texanus*			
Pearl Dace	*Semotilus margarita*			
Freckled Madtom	*Noturus nocturnus*			

Common Name	Scientific Name	T	E	C
Bluntnose Darter	*Etheostoma chlorosomum*			
Least Darter	*Etheostoma microperca*			
Reptiles				
Yellow Mud Turtle	*Kinosternon flavescens*			
Wood Turtle	*Clemmys insculpta*			
Great Plains Skink	*Eumeces obsoletus*			
Copperbelly Water Snake	*Nerodia erythrogaster neglecta*	♦		
Western Hognose Snake	*Heterodon nasicus*			
Copperhead	*Agkistrodon contortrix*			
Prairie Rattlesnake	*Crotalus viridis*			
(Eastern) Massasauga Rattlesnake	*Sistrurus catenatus*			♦
Amphibians				
Blue-spotted Salamander	*Ambystoma laterale*			
Crawfish Frog	*Lithobates (Rana) areolata*			
Butterflies				
Dakota Skipper	*Hesperia dacotae*	♦		
Ringlet	*Coenonympha tullia*			
Terrestrial Snails				
Iowa Pleistocene Snail	*Discus macclintocki*		♦	
Minnesota Pleistocene Ambersnail	*Novisuccinea new species A*			
Iowa Pleistocene Ambersnail	*Novisuccinea new species B*			
Frigid Ambersnail	*Catinella gelida*			
Briarton Pleistocene Vertigo	*Vertigo briarensis*			
Bluff Vertigo	*Vertigo meramecensis*			
Iowa Pleistocene Vertigo	*Vertigo new species*			
Fresh Water Mussels				
Spectacle Case	*Cumberlandia monodonta*		♦	
Slippershell	*Alasmidonta viridis*			
Buckhorn (Pistolgrip)	*Tritogonia verrucosa*			
Ozark Pigtoe	*Fusconaia ozarkensis*			
Bullhead (Sheepnose)	*Plethobasus cyphyus*		♦	
Ohio River Pigtoe (Round Pigtoe)	*Pleurobema sintoxia*			
Slough Sandshell	*Lampsilis teres teres*			
Yellow Sandshell	*Lampsilis teres anodontoides*			
Higgin's-eye Pearly Mussel	*Lampsilis higginsi*		♦	

Table Appendix 15- 3. State Threatened Animals

Federally Endangered, Threatened, and Candidate Species are indicated with a ♦ in the appropriate column for Threatened (T), Endangered (E), or Candidate (C) status. Species common and scientific names as well as species concept is presented here as presented within Iowa code. Additions to the 'Common Name' column (in parentheses) are added by the Plan authors for clarification.

Common Name	Scientific Name	T	E	C
Mammals				
Least Shrew	*Cryptotis parva*			
Southern Bog Lemming	*Synaptomys cooperi*			
Birds				
Long-eared Owl	*Asio otus*			
Henslow's Sparrow	*Ammodramus henslowii*			
Fish				
Chestnut Lamprey	*Ichthyomyzon castaneus*			
American Brook Lamprey	*Lampetra appendix*			
Grass Pickerel	*Esox americanus*			
Blacknose Shiner	*Notropis heterolepis*			
Topeka Shiner	*Notropis topeka*		♦	
Western Sand Darter	*Ammocrypta clara*			
Black Redhorse	*Moxostoma duquesnei*			
Burbot	*Lota lota*			
Orangethroat Darter	*Etheostoma spectabile*			
Reptiles				
Slender Glass Lizard	*Ophisaurus attenuatus*			
Common Musk Turtle	*Sternotherus odoratus*			
Blanding's Turtle	*Emydoidea blandingii*			
Ornate Box Turtle	*Terrapene ornata*			
Diamondback Water Snake	*Nerodia rhombifer*			
Western Worm Snake	*Carphophis amoenus vermis*			
Speckled Kingsnake	*Lampropeltis getulus*			
Amphibians				
Mudpuppy	*Necturus maculosus*			
Central Newt	*Notophthalmus viridescens*			
Butterflies				
Poweshiek Skipperling	*Oarisma poweshiek*		♦	
Byssus Skipper	*Problema byssus*			
Mulberry Wing	*Poanes massasoit*			
Silvery Blue	*Glaucopsyche lygdamus*			
Baltimore (Checkerspot)	*Euphydryas phaeton*			
Terrestrial Snails				

Common Name	Scientific Name	T	E	C
Midwest Pleistocene (Hubricht's Vertigo)	*Vertigo hubrichti*			
Occult Vertigo	*Vertigo occulta*			
Fresh Water Mussels				
Cylinder	*Anodontoides ferussacianus*			
Strange Floater	*Strophitus undulatus*			
Creek Heelsplitter	*Lasmigona compressa*			
Purple Pimpleback	*Cyclonaias tuberculata*			
Butterfly	*Ellipsaria lineolata*			
Ellipse	*Venustaconcha ellipsiformis*			

Table Appendix 15- 4. State Special Concern Animals

Species common and scientific names as well as species concept is presented here as presented within Iowa code. Additions to the 'Common Name' column (in parentheses) are added by the Plan authors for clarification.

Common Name	Scientific Name
Mammals	
Southern Flying Squirrel	*Glaucomys volans*
Birds	
Forster's Tern	*Sterna forsteri*
Black Tern	*Chlidonias niger*
Peregrine Falcon	*Falco peregrinus*
Bald Eagle	*Haliaeetus leucocephalus*
Fish	
Pugnose Minnow	*Notropis emiliae*
Pirate Perch	*Aphredoderus sayanus*
Reptiles	
Smooth Green Snake	*Opheodrys vernalis*
Bullsnake	*Pituophis catenifer sayi*
Butterflies	
Dreamy Duskywing	*Erynnis icelus*
Sleepy Duskywing	*Erynnis brizo*
Columbine Duskywing	*Erynnis lucilius*
Wild Indigo Duskywing	*Erynnis baptisiae*
Ottoe Skipper	*Hesperia ottoe*
Leonardus Skipper	*Hesperia l. leonardus*
Pawnee Skipper	*Hesperia leonardus pawnee*
Beardgrass (Arogos) Skipper	*Atrytone arogos*
Zabulon Skipper	*Poanes zabulon*
Broad-winged Skipper	*Poanes viator*

Common Name	Scientific Name
Sedge (Dion) Skipper	*Euphyes dion*
Two-spotted Skipper	*Euphyes bimacula*
Dusted Skipper	*Atrytonopsis hianna*
Salt-and-pepper Skipper	*Amblyscirtes hegon*
Pipevine Swallowtail	*Battus philenor*
Zebra Swallowtail	*Eurytides marcellus*
Olympia White (Olympia Marble)	*Euchloe olympia*
Purplish Copper	*Lycaena helloides*
Acadian Hairstreak	*Satyrium acadicum*
Edward's Hairstreak	*Satyrium edwardsii*
Hickory Hairstreak	*Satyrium caryaevorum*
Striped Hairstreak	*Satyrium liparops*
Swamp Metalmark	*Calephelis mutica*
Regal Fritillary	*Speyeria idalia*
(Ozark) Baltimore (Checkerspot)	*Euphydryas phaeton ozarkae*

Appendix 16. Species Status Assessment Criteria and Summarized Assessment Values

To assess the conservation status of all native, extant Iowa wildlife species, we utilized 8 criteria. The Wildlife Working Group developed a scoring process in which each criterion was weighted according to our understanding of the relative contribution of each factor to a species' overall conservation status. The theoretical potential score for an individual species ranges from 0 - 3.75. Individual species scores ranged from 0.57 (for the Slippershell Mussel, which has not been observed in Iowa since 1984) to 3.75 (for several species of low conservation concern that have been expanding their range within Iowa). The cutoff value was set at $\leq$3.0, meaning that if a species score was a 3.0 or lower, it was categorized as Species of Greatest Conservation Need.

Status Assessment Criteria

Species with 2 or more fields that are unknown went into a separate "Data Deficient" category of species for which information requirements are high. Data Deficient Species will be categorized as SGCN. If a species has been extirpated from the state, it was also put into a separate category for further discussion; some extirpated species may be included as SGCN and others may not, depending on whether the species is a candidate for restoration activities within the state.

Range-wide Factor

Criteria 1: Range Extent – Area encompassing all known and projected occurrences, excluding vagrancy. This includes the entire range, not just the range extent within Iowa. (Breeding range only for migratory species)

Rank Value	Range in km^2	Range in square miles	Examples of Comparable Size
0	no occurrences believed to be extant; species presumed extinct	NA	NA
1	<1000 km^2	< about 400 square miles	Rocky Mountain Natl Park
2	1,000 -5000 km^2	400 - 2,000 square miles	Prince Edward Island
3	5,000 - 100,000 km^2	2,000 - 40,000 square miles	Kentucky
4	100,000 - 2,50,000 km^2	40,000 - 1,000,000 square miles	Alaska + Texas
5	>2,500,000 km^2	> 1,000,000 square miles	> Alaska + Texas

(Note - This is not intended to be an estimate of the amount of occupied or potential habitat. The use of this parameter is to determine the degree to which risks from threatening factors are spread spatially across the geographic distribution of the species.)

Iowa-Only Factors

Criteria 2: Area of Occupancy

- Extent of historical range within Iowa which currently supports the species. (Breeding and Migratory Range)
    - 0 = Species known from < 10% historic range
    - 1 = Species known from 11-25% historic range
    - 2 = Species known from 26-50% historic range
    - 3 = Species known from 51-75% historic range
    - 4 = Species known from 76-100% historic range
    - 5 = Species known from >100% historic range

Criteria 3: Long-term Trend

- Can be population numbers, density, or area occupied since time of European settlement in Iowa (Breeding and migratory range)
    - 0 = Species has declined by > 90%
    - 1 = Species has declined by 68 - 89%
    - 2 = Species has declined by 41 - 67%
    - 3 = Species has declined by 11- 40%
    - 4 = Species has declined by 0 - 10%
    - 5 = Species has increased

Criteria 4: Short-term Trend

- Can be population numbers, density or area occupied for past ten years in Iowa.
    - 0 = Species has declined by > 90%
    - 1 = Species has declined by 68 - 89%
    - 2 = Species has declined by 41 - 67%
    - 3 = Species has declined by 11- 40%
    - 4 = Species has declined by 0 - 10%
    - 5 = Species has increased

Criteria 5: Ecological Specialization (Population Concentration)

- Degree to which individuals within populations congregate or aggregate seasonally or daily in Iowa (e.g. hibernacula, breeding sites, migration focal points).
    - 0 = Majority of individuals congregate at a single location
    - 1 = Individuals concentrate at 1-25 locations
    - 2 = Individuals congregate at over 25 sites or do not concentrate

Criteria 6: Ecological Specialization (Dietary)

- Relates to the primary way in which local populations respond to decreases in availability of preferred food type.
    - 0 = Number of individuals declines, no shift in diet
    - 1 = Some shift in diet, population suffers but stabilizes
    - 2 = Species shifts to different diet, no impact to population

Criteria 7: Ecological Specialization (General)

- Species has some unique life history requirement not addressed above (e.g. hibernacula requirements; narrow ambient temperature limits; specific roosting structure)
    - 0 = Highly specialized
    - 1 = Moderately specialized
    - 2 = Not specialized

Criteria 8: Threat Not Addressed Above

- List and rank any threat not addressed above (e.g. mussels lack of recruitment; butterflies uni- or multi-voltine) If no threat, score as 4, if 0-3, articulate what threat is.
    - 0 = Severe threat to species endurance
    - 1 = High threat to species endurance
    - 2 = Medium threat to species endurance
    - 3 = Low threat to species endurance
    - 4 = no threat to species endurance

Summarized Status Assessment Values

Table 1. Mean and standard deviation for each of the 8 scoring criteria for the species that were assessed (and not categorized as data deficient).

Criteria	Mean Score	Range of Values	Standard Deviation
#1 Range Extent	4.6	0-5	0.6
#2 Area of Occupancy	3.8	0-5	1.1
#3 Long-term Trend	3.3	0-5	1.4
#4 Short-term Trend	3.8	0-5	0.9
#5 Ecological Specialization (Population concentration)	1.85	0-2	0.41
#6 Ecological Specialization (Diet)	1.75	0-2	0.46
#7 Ecological Specialization (General)	1.45	0-2	0.64
#8 Threat Not Addressed Above	3.2	0-4	1
Overall Species Status Score	2.96	0-3.75	0.55

Appendix 17. Informational Form for Nomination of New Taxonomic Groups to the Iowa Wildlife Action Plan

The Iowa Wildlife Action Plan (IWAP) currently includes all animals known to occur (or have occurred) in Iowa in the following Classes: Mammals, Birds, Amphibians, Fish, Reptiles, Odonates, Butterflies, Crayfish, and Mussels. In addition, the IWAP includes 5 species of terrestrial snails which are State threatened or endangered.

In order to include any additional taxonomic group in the Iowa Wildlife Action Plan, this set of questions needs to be returned to Karen Kinkead at Karen.Kinkead@dnr.iowa.gov. In addition, to be included, all Iowa species within the taxonomic group will need to have the Species Status Assessment Scoring Criteria completed (see Appendix 16).

Definition of taxonomic group – preferably an entire order or sub-order of species known to occur within Iowa, but we will consider groups as small as complete genera occurring within Iowa.

Please provide the following information:

1. Species list in taxonomic order to include:
    a. Order, Family, Genus, species, Common Name
    b. This can be placed into an excel spreadsheet.
2. Justification for why you are limiting this group to any list less than the complete Order of species occurring in Iowa.
3. How long the taxon has been studied in Iowa (i.e. are there historic data?)
    a. Are there publications from this work? What are they?
4. What portions of the state have been surveyed for this taxon? (statewide, concentrated within one region, or concentrated within one habitat type or land use?)
5. Who are the primary people working on that taxon within Iowa?
    a. Would they be willing to donate their time and expertise (serving on informational committees, assisting with species knowledge, etc.)?
6. What percentage of the taxonomic group is believed to be declining and why?
7. What are the threats to those species and are the treats something that can be controlled or changed?
8. How many of those species can be ranked using our ranking criteria and how many would be data deficient? (See attached criteria). This can be an estimate for the October 15 deadline.
9. Can you identify any potential grants/sources of funding (non-DNR) to study these species?
10. What exact data sources exist or are available for Iowa for these species? Do you have access to these data sources?
11. What are the accepted, standardized protocols for monitoring or documenting the species? How widespread are these protocols implemented?
12. Contact information for person sponsoring the taxon?

Appendix 18. Habitat Preferences for SGCN

Table Appendix 18- 1. Habitat preferences of SGCN – Amphibians

	Common Name	Scientific Name	Habitat Preference	Distribution
1	Blue-spotted Salamander	*Ambystoma laterale*	Forested-wooded wetlands	Cedar River Basin – Linn & Blackhawk Counties
2	Smallmouth Salamander	*Ambystoma texanum*	Woodlands, wetlands	Southern 1/3
3	Tiger Salamander	*Ambystoma tigrinum*	All aquatic habitat types, esp. lentic wetlands	Statewide
4	Common Mudpuppy	*Necturus maculosus*	Rivers, streams	Mississippi, Cedar, Wapsipinicon, Des Moines, Skunk, Raccoon, Boone, Shell Rock, Upper Iowa Rivers
5	Eastern Newt	*Notophthalmus viridescens*	Woodland wetlands	Cedar and Wapsipinicon Basins
6	Great Plains Toad	*Anaxyrus cognatus*	Grasslands & Savanna	Western border Loess Hills
7	Fowler's Toad	*Anaxyrus fowleri*	Grasslands, Woodlands	Seven southeastern-most counties
8	Woodhouse's Toad	*Anaxyrus woodhousii*	Woodlands & Savanna	Western border
9	Blanchard's Cricket Frog	*Acris crepitans*	Rivers, streams, lakes, wetlands	Statewide (more common in South)
10	Cope's Gray Treefrog	*Hyla chrysoscelis*	Wetlands, savanna grasslands, woodland edges	Scattered statewide
11	Eastern Gray Treefrog	*Hyla versicolor*	Forests, woodlands, riparian	Statewide (more common in east)
12	Crawfish Frog	*Lithobates areolatus*	Ponds, streams, grasslands	Five southeastern counties
13	Pickerel Frog	*Lithobates palustris*	Cold water streams, rivers, ponds, impoundments	Mississippi. Wapsipinicon, Maquoketa river basins
14	Northern Leopard Frog	*Lithobates pipiens*	All aquatic habitat types, wetlands	Statewide
15	Southern Leopard Frog	*Lithobates sphenocephalus*	Wetlands, ponds, backwaters, impoundments	Seven counties along south-east border
16	Plains Spadefoot	*Spea bombifrons*	Grassland	Western border

Table Appendix 18- 2. Habitat preferences of SGCN - Reptiles

	Common Name	Scientific Name	Habitat Preference	Distribution
1	Snapping Turtle	*Chelydra serpentina*	All aquatic habitat types, wetlands	Statewide
2	Blanding's Turtle	*Emydoidea blandingii*	Shallow, well-vegetated permanent wetlands & marshes	Statewide
3	Wood Turtle	*Glyptemys insculpta*	Floodplain forest, rivers, riparian savanna	North-central (only found in Eastern IA Drift Plains ecoregion)
4	Northern Map Turtle	*Graptemys geographica*	Rivers and streams	Eastern border
5	Southern Map Turtle	*Graptemys ouachitensis*	Mississippi River and associated oxbows	Mississippi River
6	False Map Turtle	*Graptemys pseudogeographica*	Slow portions of large rivers	Mississippi and Missouri Rivers (occasionally move west from Mississippi)
7	Ornate Box Turtle	*Terrapene ornata*	Sand/loess prairie, savanna	Confirmed in 28 counties in East and southwest
8	Yellow Mud Turtle	*Kinosternon flavescens*	Shallow, ephemeral pools/herbaceous wetlands near sand soils	Southeast
9	Eastern Musk Turtle	*Sternotherus odoratus*	Herbaceous wetlands, backwaters, and spring fed ponds adjacent to sandy uplands	East
10	Smooth Softshell	*Apalone mutica*	Boundary rivers, large rivers in south	South
11	Spiny Softshell	*Apalone spinifera*	Rivers, streams, large lakes	Scattered statewide
12	Slender Glass Lizard	*Ophisaurus attenuatus*	Prairie, pastures, woodland edge, savanna	South (confirmed in 10 counties)
13	Common Five-lined Skink	*Plestiodon fasciatus*	Deciduous forests along blufflands of Mississippi & large eastern Iowa rivers	East
14	Great Plains Skink	*Plestiodon obsoletus*	Loess Hills/prairie	Three counties along southwest border

	Common Name	Scientific Name	Habitat Preference	Distribution
15	Prairie Skink	*Plestiodon septentrionalis*	Grasslands with loose soil and rocky areas adjacent to marshes or lakes	West and Central
16	Six-lined Racerunner	*Aspidocelis sexlineatus*	Sand/loess prairie, savanna	East and Southwest
17	Western Worm Snake	*Carphophis vermis*	Savanna & woodlands near rivers, creeks, or streams	Southern 1/3 (Confirmed in 8 counties)
18	(Prairie) Ringneck Snake	*Diadophis punctatus*	Woodlands, savanna, and adjacent grasslands	Scattered throughout state except in north-central
19	Western (Plains) Hog-nosed Snake	*Heterodon nasicus*	Shortgrass prairie with sandy/gravely soils	Clinton, Muscatine, and Louisa Counties
20	Eastern Hognose Snake	*Heterodon platirhinos*	Woodland, savanna, grassland	Eastern and western borders, and south
21	Prairie Kingsnake	*Lampropeltis calligaster*	Sand prairie, grasslands, savanna & woodland edge	Southern 1/3
22	Speckled Kingsnake	*Lampropeltis holbrooki*	Grasslands near lakes or large ponds, savanna	South-eastern 1/3 (Confirmed in 12 counties)
23	*Plainbelly (Copperbelly) Water Snake	*Nerodia erythrogaster*	Mississippi River and associated backwaters and wet woodland	South-east near Mississippi River (Scott, Muscatine, Louisa counties)
24	Diamondback Water Snake	*Nerodia rhombifer*	Rivers, ponds, backwaters, oxbows	Southeast (confirmed in 4 counties)
25	Common Water Snake	*Nerodia sipedon*	Lakes, ponds, marshes, streams, backwaters	Statewide except northwest 1/4
26	Smooth Green Snake	*Opheodrys vernalis*	Wet prairie and grasslands adjacent to lakes and impoundments, savanna	Scattered throughout the state
27	Western Rat Snake	*Elaphe obsoleta*	Heavily wooded blufflands along rivers	Mississippi River and south
28	Western Fox Snake	*Pantherophis ramspotti*	Wooded rivers/streams, savanna & grasslands near lakes and marshes	Statewide
29	Gopher (Bull) Snake	*Pituophis catenifer*	Sand and bluff prairies, savanna, pasture	Statewide

	Common Name	Scientific Name	Habitat Preference	Distribution
30	Graham's Crayfish Snake	*Regina grahamii*	Ponds, sloughs, marshes, floodplains, creeks	South and central
31	(Northern) Redbelly Snake	*Storeria occipitomaculata*	Savanna, woodland and adjacent grasslands near water	North and southwest
32	Western Ribbon Snake	*Thamnophis proximus*	Herbaceous wetland, ponds, streams, rivers	Southern half
33	Plains Garter Snake	*Thamnophis radix*	Generalist	Statewide
34	Lined Snake	*Tropidoclonion lineatum*	Grassland, pasture, woodland edge	Northwest and south
35	Smooth Earth Snake	*Virginia valeriae*	Wet woodland in river valleys	Along Des Moines and Chariton Rivers in southeast and central
36	Copperhead	*Agkistrodon contortrix*	Forested, rocky hillsides	Des Moines, Lee, Van Buren and Davis counties
37	Timber Rattlesnake	*Crotalus horridus*	Forested areas with rock outcrops, esp. woodland, bluff prairie	Northeast, southeast, and Madison County
38	Prairie Rattlesnake	*Crotalus viridis*	Prairie	Plymouth County
39	Eastern Massasauga	*Sistrurus catenatus*	Prairie wetland close to rivers and adjacent upland prairie	Wapsipinicon and Iowa Rivers in east
40	Western Massasauga	*Sistrurus turgeminus*	Prairie wetland close to rivers and adjacent upland prairie	Mills County

Table Appendix 18- 3. Habitat preferences of SGCN - Breeding Birds

	Common Name	Scientific Name	Habitat Preference	Distribution
1	Trumpeter Swan	*Cygnus buccinator*	Wetland	Statewide
2	American Wigeon	*Anas americana*	Wetland	Statewide
3	Blue-winged Teal	*Anas discors*	Wetland	Statewide
4	Northern Pintail	*Anas acuta*	Wetland, grassland	Northern half
5	Canvasback	*Aythya valisineria*	Wetland	Northwest and north-central
6	Redhead	*Aythya americana*	Wetland	Northwest and north-central
7	Ring-necked Duck	*Aythya collaris*	Wetland	Statewide
8	Lesser Scaup	*Aythya affinis*	Wetland	Statewide

	Common Name	Scientific Name	Habitat Preference	Distribution
9	Northern Bobwhite	*Colinus virginianus*	Grassland, shrubland	Southern 3/4
10	Ruffed Grouse	*Bonasa umbellus*	Open woodland, dense forest	Northeast, southeast, and south-central
11	Sharp-tailed Grouse	*Tympanuchus phasianellus*	Grassland, shrubland	West
12	Greater Prairie-Chicken	*Tympanuchus cupido*	Large, landscape-scale grassland	Southwest, south-central
13	Red-necked Grebe	*Podiceps grisegena*	Wetland, hemi-marsh	Scattered statewide except southwest
14	Eared Grebe	*Podiceps nigricollis*	Wetland, hemi-marsh	Scattered statewide
15	American White Pelican	*Pelecanus erythrorhynchos*	Wetland	Statewide
16	American Bittern	*Botaurus lentiginosus*	Wetland, grassland	Northern 2/3
17	Black-crowned Night-Heron	*Nycticorax nycticorax*	Wetland, wet shrubland	Statewide, esp. in Prairie Pothole Region
18	White-faced Ibis	*Plegadis chihi*	Marsh	Prairie Pothole Region and Fremont County
19	Bald Eagle	*Haliaeetus leucocephalus*	Forest, Rivers	Statewide
20	Northern Harrier	*Circus cyaneus*	Large grassland, marsh, prairie	Statewide
21	Red-shouldered Hawk	*Buteo lineatus*	Large riparian forest	Eastern 3/4
22	Broad-winged Hawk	*Buteo platypterus*	Deciduous forest, open woodland-large savanna	Statewide
23	Swainson's Hawk	*Buteo swainsoni*	Grassland, savanna, ag	Statewide except southeast
24	King Rail	*Rallus elegans*	Sedge meadow, wetland	East and Prairie Pothole Region
25	Common Gallinule (formerly Moorhen)	*Gallinula chloropus*	Large, wetland, hemi-marsh	Scattered statewide
26	Piping Plover	*Charadrius melodus*	Wetland, Rivers	Missouri River
27	Upland Sandpiper	*Bartramia longicauda*	Grassland, no-till soybeans	Scattered statewide
28	Wilson’s Snipe	*Gallinago delicata*	Hemi-marsh	Statewide
29	American Woodcock	*Scolopax minor*	Open woodland, dense forest, riparian forest	Statewide
30	Wilson's Phalarope	*Phalaropus tricolor*	Wetland, grassland	Northern half
31	Franklin’s Gull	*Larus pipixcan*	Wetland	Prairie Pothole Region
32	Least Tern	*Sterna antillarum*	Wetland, rivers with sandbars	Missouri River
33	Black Tern	*Chlidonias niger*	Wetland	Statewide

	Common Name	Scientific Name	Habitat Preference	Distribution
34	Forster's Tern	*Sterna forsteri*	Permanent wetland, hemi-marsh	Prairie Pothole Region & Missouri River floodplain
35	Yellow-billed Cuckoo	*Coccyzus americanus*	Forest, shrubland, open woodland	Statewide
36	Black-billed Cuckoo	*Coccyzus erythropthalmus*	Forest, shrubland, open riparian woodland	Statewide
37	Barn Owl	*Tyto alba*	Savanna, prairie-grassland with trees	Statewide, primarily southern Iowa
38	Eastern Screech-owl	*Otus asio*	Riparian forest/woodland, savanna	Statewide
39	Burrowing Owl	*Speotyto cunicularia*	Grassland	Mostly western Iowa
40	Long-eared Owl	*Asio otus*	Open woodland, savanna, coniferous & deciduous forest	Statewide
41	Short-eared Owl	*Asio flammeus*	Very large grassland	Scattered Statewide
42	Common Nighthawk	*Chordeiles minor*	Grassland, savanna, bluffland with flat rock outcrops, nests primarily on flat pea-gravel roof-tops in larger towns and cities with rivers	Statewide
43	Chuck-will's-widow	*Caprimulgus carolinensis*	Open woodland, savanna	Mostly southern Iowa
44	Eastern Whip-poor-will	*Caprimulgus vociferus*	Deciduous forest, open woodland with grass component	Statewide
45	Chimney Swift	*Chaetura pelagica*	Older growth forests, woodlands, savanna, towns	Statewide
46	Belted Kingfisher	*Ceryle alcyon*	Wetland, riparian with cutbanks	Statewide
47	Red-headed Woodpecker	*Melanerpes erythrocephalus*	Savanna, open woodland, decid forest	Statewide
48	Northern Flicker	*Colaptes auratus*	Savanna, open woodland	Statewide
49	American Kestrel	*Falco sparverius*	Savanna, open woodland	Statewide
50	Peregrine Falcon	*Falco peregrinus*	Bluffland riparian forest, deciduous forest	Scattered statewide

	Common Name	Scientific Name	Habitat Preference	Distribution
51	Eastern Wood-pewee	*Contopus virens*	Forest/woodland, savanna	Statewide
52	Acadian Flycatcher	*Empidonax virescens*	Deciduous, riparian forest	Scattered statewide except northwest corner
53	Say's Phoebe	*Sayornis saya*	Grassland	Nested in Sioux and Plymouth counties
54	Eastern Kingbird	*Tyrannus tyrannus*	Grassland-shrub, edges	Statewide
55	Loggerhead Shrike	*Lanius ludovicianus*	Grassland-shrub, savannas	Scattered statewide
56	Bell's Vireo	*Vireo bellii*	Grassland-shrub, savanna	Scattered statewide
57	Horned Lark	*Eremophila alpestris*	Sparse grassland, agricultural land	Statewide
58	Purple Martin	*Progne subis*	Riparian forest, towns and wetlands	Statewide
59	Bank Swallow	*Riparia riparia*	Rivers and streams with cutbanks	Statewide
60	Sedge Wren	*Cistothorus platensis*	Marsh, dense grasslands	Statewide
61	Bewick's Wren	*Thryomanes bewickii*	Savanna, open woodland, shrubland	Southern Iowa, esp. Southeast
62	Veery	*Catharus fuscescens*	Shrubby riparian forest	Scattered statewide (less common in southwest)
63	Wood Thrush	*Hylocichla mustelina*	Shrubby forest and woodland	Scattered statewide
64	Brown Thrasher	*Toxostoma rufum*	Shrubby grassland	Statewide
65	Worm-eating Warbler	*Helmitheros vermivorus*	Shrubby deciduous forest	Mostly southeast and northeast
66	Golden-winged Warbler	*Vermivora chrysoptera*	Shrubby open woodland	Less common in western half during migration. Lee County – only nest
67	Prothonotary Warbler	*Protonotaria citrea*	Riparian forest, wooded sloughs	Scattered statewide (Eastern primarily)
68	Kentucky Warbler	*Geothlypis formosus*	Deciduous and riparian shrubby forest	Nests especially in south & northeast (rare in extreme northwest)
69	Common Yellowthroat	*Geothlypis trichas*	Shrubland and grassland	Statewide
70	Cerulean Warbler	*Setophaga cerulea*	Large older-growth deciduous forest	Primarily in eastern IA and along Des Moines River in central IA

	Common Name	Scientific Name	Habitat Preference	Distribution
71	Field Sparrow	*Spizella pusilla*	Shrubland-grassland, grass-shrub-woodland edge	Statewide
72	Grasshopper Sparrow	*Ammodramus savannarum*	Short grassland	Statewide
73	Henslow's Sparrow	*Ammodramus henslowii*	Large, older grasslands	Eastern 3/4 (most abundant in south)
74	Dickcissel	*Spiza americana*	Shrubby grassland	Statewide
75	Bobolink	*Dolichonyx oryzivorus*	Medium height grassland	Statewide
76	Eastern Meadowlark	*Sturnella magna*	Grassland, savanna	Statewide (most abundant in east)
77	Western Meadowlark	*Sturnella neglecta*	Grassland	Statewide (most abundant in west)
78	Baltimore Oriole	*Icterus galbula*	Open woodland, savanna	Statewide

Table Appendix 18- 4. Habitat preferences of SGCN – Non-Breeding Birds

	Common Name	Scientific Name	Habitat Preference	Distribution
1	Greater Scaup	*Aythya marila*	Lakes, rivers, wetlands	Scattered statewide
2	Common Loon	*Gavia immer*	Clear, large, open water, lakes	Scattered statewide
3	Little Blue Heron	*Egretta caerulea*	Marsh	Scattered statewide
4	Yellow Rail	*Coturnicops noveboracensis*	Wetland, grassland	Scattered statewide
5	Black Rail	*Laterallus jamaicensis*	Marsh	East-central, central, and northwest
6	Whooping Crane	*Grus americana*	Wetland, grassland	Northeast/north-central, southwest, and Polk County
7	Black-bellied plover	*Pluvialis squatarola*	Wetland	Scattered statewide
8	American Golden-Plover	*Pluvialis dominica*	Wetland	Scattered statewide
9	Lesser Yellowlegs	*Tringa flavipes*	Wetland	Statewide
10	Whimbrel	*Numenius phaeopus*	Wetland	West, central, and three counties in east
11	Long-billed Curlew	*Numenius americanus*	Grassland-wetland	Western half and Jefferson County
12	Hudsonian Godwit	*Limosa haemastica*	Wetland	Scattered statewide (less common in eastern ¼)
13	Marbled Godwit	*Limosa fedoa*	Wetland	Scattered statewide

	Common Name	Scientific Name	Habitat Preference	Distribution
14	Ruddy Turnstone	*Arenaria interpres*	Grassland - wetland	Scattered statewide (more common in north-central)
15	Red Knot	*Calidris canutus*	Wetland	Southern half and Kossuth and Dickinson Counties
16	Sanderling	*Calidris alba*	Wetland	Scattered statewide
17	Semipalmated Sandpiper	*Calidris pusilla*	Wetland	Statewide
18	White-rumped Sandpiper	*Calidris fuscicollis*	Wetland	Scattered statewide
19	Pectoral Sandpiper	*Calidris melanotos*	Wetland and grassland	Statewide
20	Stilt Sandpiper	*Micropalama himantopus*	Wetland	Scattered statewide
21	Buff-breasted Sandpiper	*Tryngites subruficollis*	Wetland and short grassland	Scattered statewide
22	Short-billed Dowitcher	*Limnodromus griseus*	Marsh	Scattered statewide
23	Long-billed Dowitcher	*Limnodromus scolopaceus*	Marsh	Scattered statewide
24	Caspian Tern	*Sterna caspia*	Wetland	Scattered statewide
25	Olive-sided Flycatcher	*Contopus cooperi*	Coniferous forests, openings and edges	Statewide
26	Sprague's pipit	*Anthus spragueii*	Grassland	Northwest, southwest, central
27	Bohemian Waxwing	*Bombycilla garrulus*	Coniferous or mixed forest	Scattered statewide
28	Smith's Longspur	*Calcarius pictus*	Grassland	Scattered statewide except northeast
29	Bay-breasted Warbler	*Dendroica castanea*	Forest/woodland	Scattered statewide
30	Canada Warbler	*Cardellina canadensis*	Deciduous shrubby woodland	Scattered statewide
31	American Tree Sparrow	*Spizella arborea*	Open woodland	Statewide
32	Le Conte's Sparrow	*Ammodramus leconteii*	Grassland, wetland edges	Scattered statewide except portions of the southwest
33	Harris's Sparrow	*Zonotrichia querula*	Pastures, hedgerows	Statewide
34	White-winged Crossbill	*Loxia leucoptera*	Coniferous forest	Scattered statewide (less common in southwest corner)

Table Appendix 18- 5. Habitat preferences of SGCN – Butterflies

	Common Name	Scientific Name	Habitat Preference	Distribution
1	Pipevine Swallowtail	*Battus philenor*	Forest, open fields, and roadsides	Southeast ¼
2	Zebra Swallowtail	*Eurytides marcellus*	Riparian woodland	Southern half

	Common Name	Scientific Name	Habitat Preference	Distribution
3	Spicebush Swallowtail	*Papilio troilus*	Woodlands	Southeast ¼, west-central, and northeast
4	Olympia Marble	*Euchloe olympia*	Open woodland, river bluffs, areas of poor soil, and grasslands	Western 1/3 and northeast
5	Harvester	*Feniseca tarquinius*	Woodland and streams	East and southwest/west-central
6	Purplish Copper	*Lycaena helloides*	Moist or disturbed areas	Scattered statewide except southwest
7	Acadian Hairstreak	*Satyrium acadica*	Riparian areas, woodlands, prairies	Scattered
8	Edward's Hairstreak	*Satyrium edwardsii*	Woodlands, clearings, and areas of poor soil	Scattered statewide except north-central
9	Hickory Hairstreak	*Satyrium caryaevorum*	Forest	Northeast ¼ and west
10	Striped Hairstreak	*Satyrium liparops*	Forest openings/edges, prairie along streams	Scattered
11	White M. Hairstreak	*Parrhasius m-album*	Woodland, savanna	Southeast ¼
12	Henry's Elfin	*Callophrys henrici*	Woodland	Southern 1/3
13	Reakirt's Blue	*Echinargus (Hemiargus) isola*	Native prairie	Scattered (more common in northwest)
14	Silvery Blue	*Glaucopsyche lygdamus*	Prairie, open fields, and woodland openings	Northern half and Lee County
15	Melissa Blue	*Plebejus (Lycaeides) melissa*	Prairies and grasslands	Northwest ¼ and Lucas County
16	Aphrodite Fritillary	*Speyeria aphrodite*	High quality prairie, wetlands, and fens	Scattered (more common in northern half)
17	Regal Fritillary	*Speyeria idalia*	Prairie and open grassland	Statewide
18	Silver-bordered Fritillary	*Boloria selene*	Fens, wet prairie, and meadows	Northeast ¼ and northwest corner
19	Gorgone Checkerspot	*Chlosyne gorgone*	Oldfield, roadsides, pastures, vacant lots, and native prairie	Scattered statewide except north-central
20	Baltimore Checkerspot	*Euphydryas phaeton*	Wetlands, fens, and bogs	Eastern half
21	'Ozark' Baltimore Checkerspot	*Euphydryas phaeton ozarkae*	Wetlands, fens, bogs, and woodlands	Lee and Henry Counties
22	Compton Tortoiseshell	*Nymphalis vaualbum (l-album)*	Large tracts of forest	Eastern half and Pocahontas County

	Common Name	Scientific Name	Habitat Preference	Distribution
23	Common Ringlet	*Coenonympha tullia*	Prairie and marsh edge, road ditches	Lyon, Osceola, Dickinson, and Palo Alto Counties
24	Eyed Brown	*Satyrodes eurydice*	Fens, wet prairies, and marshes	Northern 2/3
25	Monarch	*Danaus plexippus*	Open habitat and disturbed areas	Statewide
26	Southern Cloudywing	*Thorybes bathyllus*	Xeric prairie	Scattered statewide except far north and north-central
27	Hayhurst's Scallopwing	*Staphylus hayhurstii*	Floodplain and Loess Hills forests	Scattered within southern half
28	Dreamy Duskywing	*Erynnis icelus*	Woodland or edge	Allamakee County
29	Sleepy Duskywing	*Erynnis brizo*	Oak barrens, sand or shale soils	South half and east
30	Juvenal's Duskywing	*Erynnis juvenalis*	Oak forests	Scattered (more common in east ¼)
31	Mottled Duskywing	*Erynnis martialis*	Xeric prairie	Scattered (more common in west)
32	Columbine Duskywing	*Erynnis lucilius*	Rocky, wooded ravines	Eastern ¼
33	Poweshiek Skipperling	*Oarisma poweshiek*	High quality tallgrass prairie	Northern ¼
34	Ottoe Skipper	*Hesperia ottoe*	High quality mid- and tallgrass prairie	Loess Hills and northeast
35	Leonard's Skipper	*Hesperia leonardus*	Open grasslands	Southern Loess Hills and Jackson County
36	Dakota Skipper	*Hesperia dacotae*	Prairie	Dickinson County
37	Crossline Skipper	*Polites origines*	Xeric prairie	Scattered
38	Long Dash	*Polites mystic*	Xeric prairie in northwest, fens and wet prairies in northeast	Northern 2/3
39	Northern Broken-dash	*Wallengrenia egeremet*	Fens, xeric prairie, forest/woodland	Scattered except in north-central
40	Little Glassywing	*Pompeius verna*	Woodland edge	Scattered
41	Arogos Skipper	*Atrytone arogos*	Prairies and grasslands	Western half
42	Byssus Skipper	*Problema byssus*	Tallgrass prairie	Southern half
43	Mulberry Wing	*Poanes massasoit*	Wetlands, fens	Northwest ¼
44	Broad-winged Skipper	*Poanes viator*	Wetlands, fens	North-central
45	Dion Skipper	*Euphyes dion*	Sedge wetlands	Northern 2/3
46	Black Dash	*Euphyes conspicua*	Fens, wet prairies, marshes	Scattered statewide except in southwest

	Common Name	Scientific Name	Habitat Preference	Distribution
47	Two-spotted Skipper	*Euphyes bimacula*	Sedge meadows and marshes	Scattered
48	Dusted Skipper	*Atrytonopsis hianna*	Bluestem grasslands and oldfields	Loess Hills, Dickinson, Palo Alto, Allamakee, and Jackson
49	Pepper and Salt Skipper	*Amblyscirtes hegon*	Woodland edge and grass waterways	Allamakee County
50	Common Roadside-Skipper	*Amblyscirtes vialis*	High quality, xeric prairie	Loess Hills and southeast and northwest corner
51	Swarthy Skipper	*Nastra lherminier*		

Table Appendix 18- 6. Habitat preferences of SGCN – Crayfish

	Common Name	Scientific Name	Habitat Preference	Distribution
1	Devil Crayfish	*Cambarus diogenes*	Streams, creeks	
2	Calico Crayfish	*Orconectes immunis*	Sloughs, floodplains	
3	Golden Crayfish	*Orconectes luteus*	Rivers, streams, creeks	
4	Northern Clearwater Crayfish	*Orconectes propinquus*	Cool water streams	
5	Virile Crayfish	*Orconectes virilis*	Rivers, streams, ponds lacking predatory fish	
6	Prairie Crayfish	*Procambarus gracilis*	Grasslands	
7	White River Crayfish	*Procambrus acutus*		

Table Appendix 18- 7. Habitat preferences of SGCN – Dragonflies & Damselflies

	Common Name	Scientific Name	Habitat Preference	Distribution
1	Spotted Spreadwing	*Lestes congener*	Ponds and lakes of all sizes with emergent vegetation	Scattered localities across northern, eastern, and southern, Iowa
2	Amber-winged Spreadwing	*Lestes eurinus*	Fishless shallow ponds and wetlands	Eastern half, south-central, and Dickinson County
3	Sweetflag Spreadwing	*Lestes forcipatus*	Ponds and lakes with emergent vegetation	North-, south-, and east-central
4	Paiute Dancer	*Argia alberta*	Small streams, marshy springs	Western 1/3 and Polk County
5	Springwater Dancer	*Argia plana*	Small, shallow springs with canopy cover and clay substrate	Scattered statewide

	Common Name	Scientific Name	Habitat Preference	Distribution
6	Prairie Bluet	*Coenagrion angulatum*	Prairie lakes, ponds, sloughs, and slow streams with much vegetation	Northwest 1/4 into central
7	Taiga Bluet	*Coenagrion resolutum*	Ponds and wetlands	Northern 2/3
8	Boreal Bluet	*Enallagma boreale*	Fishless ponds, lakes, and slow flow streams	Northeast of line from Dickinson to Muscatine Counties
9	Alkali Bluet	*Enallagma clausum*	Ponds and lakes	Western side of northern border and Dallas County
10	Western Forktail	*Ischnura perparva*	Heavily vegetated ponds, lakes, and slow flow streams with mud substrate	Sac County
11	Sedge Sprite	*Nehalennia irene*	Ponds and sedge wetlands and meadows	Scattered statewide except extreme southeast corner
12	Canada Darner	*Aeshna canadensis*	Marshes, pond edges	Scattered localities across east and central
13	Variable Darner	*Aeshna interrupta*	Lakes, ponds, streams	Northwest ¼ to Butler and Polk Counties
14	Midland Clubtail	*Gomphus fraternus*	Creeks and rivers with rock and mud	Northeast 2/3 and Woodbury County
15	Sulphur-tipped Clubtail	*Gomphus militaris*	Ponds, lakes, streams, and creeks with mud substrate	Western and southern border and Muscatine County
16	Rapids Clubtail	*Gomphus quadricolor*	Rocky creeks and rivers with mud for nymphs	Fayette and Winneshiek Counties
17	Rusty Snaketail	*Ophiogomphus rupinsulensis*	Sandy, rocky creeks to rivers	Northeast ¼
18	Pale Snaketail	*Ophiogomphus severus*	Rivers and streams with fast flow and cobble substrate	Plymouth County
19	Sioux Snaketail	*Ophiogomphus smithi*	Sand bottomed streams with gravel beds	Northeast ¼
20	Westfall's Snaketail	*Ophiogomphus westfalli*	Clear forest streams with strong riffles and cobble substrate	Hamilton County

	Common Name	Scientific Name	Habitat Preference	Distribution
21	Brimstone Clubtail	*Stylurus intricatus*	Strong-flowing, open streams and rivers	Audubon, Page, and Woodbury County
22	Elusive Clubtail	*Stylurus notatus*	Creeks and rivers with sandy substrate	Scattered statewide except southwest and south-central
23	Arrow Clubtail	*Stylurus spiniceps*	Rivers with sandy substrate	Bremer and Clayton Counties
24	Stream Cruiser	*Didymops transversa*	Medium to large streams and rivers	Van Buren County
25	Royal River Cruiser	*Macromia taeniolata*	Lakes, rivers	Eastern border
26	Slender Baskettail	*Epitheca costalis*	Lakes, ponds, and backwaters	Lucas, Wayne, and Warren Counties
27	Smoky Shadowdragon	*Neurocordulia molesta*	Fast-flowing rivers and medium sized streams	Northeast, east-central, central, and Cherokee County
28	Stygian Shadowdragon	*Neurocordulia yamaskanensis*	Mississippi River	Allamakee and Clayton Counties
29	Plains Emerald	*Somatochlora ensigera*	Prairie Streams	Northwest ¼ and Winneshiek and Delaware Counties
30	Carolina Saddlebags	*Tramea carolina*	Marsh	Mahaska county

Table Appendix 18- 8. Habitat preferences of SGCN – Fish

	Common Name	Scientific Name	Distribution	Habitat Preference	Substrate	Flow
1	Chestnut lamprey	*Ichthyomyzon castaneus*	Miss., Chariton	Rivers		
2	Northern brook lamprey	*Ichthyomyzon fossor*	Northeast ¼	Stream	Muck	Moderate to fast
3	Silver lamprey	*Ichthyomyzon unicuspis*	Miss.	Rivers, impoundments, lakes		
4	American brook lamprey	*Lampetra appendix*	Northeast ¼	Small to medium rivers and streams		
5	Lake sturgeon	*Acipenser fulvescens*	Miss.	Large rivers and lakes	Sand, gravel, rock	
6	Pallid sturgeon	*Scaphirhynchus albus*	Mo.	Large, turbid rivers	Gravel, sand	Fast
7	Shovelnose sturgeon	*Scaphirhynchus platorynchus*	Miss., Mo.	Large, turbid rivers		

	Common Name	Scientific Name	Distribution	Habitat Preference	Substrate	Flow
8	Paddlefish	*Polyodon spathula*	Miss., Mo., DM, Cedar, Iowa,Skunk	Medium to large rivers, backwater, and impoundments		Slow
9	American eel	*Anguilla rostrata*	Miss., Mo., and larger tributaries	Rivers, large streams and lakes		
10	Skipjack herring	*Alosa chrysochloris*	Miss., Mo.	Medium to large rivers and large impoundments	Sand and gravel	
11	Largescale stoneroller	*Campostoma oligolepis*	Northeast 1/3	Medium to large clear streams	Gravel	
12	Gravel chub	*Erimystax x-punctatus*	Northern ½	Large streams and rivers	Gravel	
13	Western silvery minnow	*Hybognathus argyritis*	Mo. Drainage	Backwater	Sand, muck	
14	Mississippi silvery minnow	*Hybognathus nuchalis*	Eastern Miss. drainage	Backwater		Slow
15	Plains minnow	*Hybognathus placitus*	Mo. drainage	Stream, river	Silt	Slow
16	Pallid shiner	*Hybopsis amnis*	Upper. Miss.	Medium to large rivers	Sand, muck	
17	Redfin shiner	*Lythrurus umbratilis*	Northeast ¼	Rivers, streams, and creeks		
18	Shoal chub	*Macrhybopsis hyostomus*	Large interior rivers statewide	Rivers	Sand, cobble	Moderate to fast
19	Sturgeon chub	*Macrhybopsis gelida*	Eastern half and Mo.	Warm, turbid rivers		
20	Sicklefin chub	*Macrhybopsis meeki*	Mo.	Large, turbid rivers	Gravel, sand	
21	Pearl dace	*Margariscus margarita*	Worth County	Ponds and small lakes	Sand, gravel	
22	Golden shiner	*Notemigonus crysoleucas*				
23	Pugnose shiner	*Notropis anogenus*	West Okoboji Lake	Clear, vegetated lakes	Silt, sand, gravel	
24	River shiner	*Notropis blennius*				

	Common Name	Scientific Name	Distribution	Habitat Preference	Substrate	Flow
25	Ghost shiner	*Notropis buchanani*	Miss.	Large creeks and small to medium rivers		Slow
26	Blacknose shiner	*Notropis heterolepis*	Northwest	Creeks, small rivers, and lakes with cool water	Sand	
27	Ozark minnow	*Notropis nubilus*	Northeast ¼	Creeks and small to medium rivers	Gravel, rock	Fast
28	Carmine shiner	*Notropis percobromus*	Northeast ¼			
29	Silverband shiner	*Notropis shumardi*				
30	Weed shiner	*Notropis texanus*	Cedar, Miss.	Creeks and small to medium rivers	Sand	
31	Topeka shiner	*Notropis topeka*	DM, Boone, Raccoon, Rock drainages	Backwaters, creeks, streams, and rivers with clear water		Slow
32	Mimic shiner	*Notropis volucellus*				
33	Channel shiner	*Notropis wickliffi*	Iowa River			
34	Pugnose minnow	*Opsopoeodus emiliae*	Miss.	Vegetated lakes, impoundments and streams		Slow
35	Suckermouth minnow	*Phenacobius mirabilis*	Upper DM basin			
36	Southern redbelly dace	*Phoxinus erythrogaster*	Northeast 1/3 and Northwest ¼			
37	Flathead chub	*Platygobio gracilis*	Mo. drainage	Turbid rivers		
38	Longnose dace	*Rhinichthys cataractae*	Northeast corner	Clear, small to medium rivers	Gravel, rock	Fast
39	Blue sucker	*Cycleptus elongatus*	Miss., Mo., and large tributaries	Large rivers		
40	Lake chubsucker	*Erimyzon succetta*				

	Common Name	Scientific Name	Distribution	Habitat Preference	Substrate	Flow
41	Black buffalo	*Ictiobus niger*	Miss. and large tributaries	Backwaters, rivers, and impoundments		
42	Spotted sucker	*Minytrema melanops*	Miss.	Small to medium rivers	Firm	Slow
43	Silver redhorse	*Moxostoma anisurum*				
44	River redhorse	*Moxostoma carinatum*	Upper pools of Miss.	Large creeks and river with clear water		
45	Black redhorse	*Moxostoma duquesnei*	Turkey, Upper Iowa, Cedar, Wapsi, drainages	Creeks and small to medium rivers	Gravel, rock	
46	Brown bullhead	*Ameiurus nebulosus*	Northern 1/3	Ponds, lakes, backwaters, impoundments, and streams		Slow
47	Blue catfish	*Ictalurus furcatus*	Lower Miss, Mo.	Rivers and backwaters		
48	Slender madtom	*Noturus exilis*	Miss. tributaries	Medium to large streams and small to medium rivers		Moderate to fast
49	Tadpole madtom	*Noturus gyrinus*	Statewide	Vegetated lakes, impoundments, backwaters, creeks, and rivers	Muck	Slow
50	Freckled madtom	*Noturus nocturnus*	Miss. drainage	Creeks and rivers		Slow to moderate
51	Redfin (Grass) pickerel	*Esox americanus*	Miss. and tributaries	Vegetated backwaters, ponds, and small lakes		Slow
52	Northern pike	*Esox lucius*				
53	Central mudminnow	*Umbra limi*	Northern 1/3	Vegetated streams and backwaters		Slow
54	Brook Trout	*Salvelinus fontinalis*	Northeast corner	Cool creeks, streams, and rivers	Sand, gravel, cobble, rock	Moderate to fast

	Common Name	Scientific Name	Distribution	Habitat Preference	Substrate	Flow
55	Trout perch	*Percopsis omiscomaycus*	Northwest ¼, Miss., Grand, Chariton	Streams and rivers	Sand	
56	Pirate perch	*Aphredoderus sayanus*	Miss. and large tributaries	Vegetated lakes, ponds, and backwaters		
57	Burbot	*Lota lota*	Mo., Miss. and Miss. tributaries	Deep, cold lakes and rivers		
58	Brook silverside	*Labidesthes sicculus*	East			
59	Banded killifish	*Fundulus diaphanus*	Natural lakes in northwest Mo.	Lakes, ponds, streams		Slow
60	Starhead topminnow	*Fundulus dispar*	Little Sioux and Iowa	Creeks and backwaters	Muck	None
61	Blackstripe topminnow	*Fundulus notatus*	Eastern 1/3	Turbid backwaters and streams		
62	Plains topminnow	*Fundulus sciadicus*	Rock River basin	Creeks, streams, and backwaters		Moderate
63	Mottled sculpin	*Cottus bairdii*	Lower Bear Creek	Clear, cool, creeks and small rivers	Sand, gravel, rock	
64	Slimy sculpin	*Cottus cognatus*	Northeast corner	Cold streams	Rock	Fast
65	Rock bass	*Ambloplites rupestris*			Rock	
66	Northern (longear) sunfish	*Lepomis peltastes*				
67	Western sand darter	*Ammocrypta clara*	Miss.	Medium to large rivers	Sand	Slow to moderate
68	Crystal darter	*Crystallaria asprella*	Miss., Turkey	Small to medium rivers	Sand, gravel	
69	Mud darter	*Etheostoma asprigene*	Miss. and tributaries	Backwaters and rivers	Sand, muck	Slow
70	Rainbow darter	*Etheostoma caeruleum*	Cedar River basin			
71	Bluntnose darter	*Etheostoma chlorosomum*	Miss.	Small to medium rivers, creeks, and backwaters	Sand, muck	Slow

	Common Name	Scientific Name	Distribution	Habitat Preference	Substrate	Flow
72	Iowa darter	*Etheostoma exile*	Northern ½	Cool creeks, ponds, and lakes	Muck, sand	None or slow
73	Least darter	*Etheostoma microperca*	Maquoketa, tributaries to Otter Creek	Vegetated creeks		Slow
74	Orangethroat darter	*Etheostoma spectabile*	Southeast ¼	Creeks and small rivers	Sand, cobble, gravel, bedrock	Moderate to fast
75	Banded darter	*Etheostoma zonale*	Northeast ¼	Rivers and large creeks	Cobble, gravel	Moderate
76	Logperch	*Percina caprodes*	Miss. drainage, Clear Lake	Creeks, streams, rivers, lakes, and impoundments	Sand, gravel	Moderate to fast
77	Blackside darter	*Percina maculata*	Northern 2/3	Creeks, and small to medium rivers	Sand, gravel	Slow
78	Slenderhead darter	*Percina phoxocephala*	Miss. drainage	Creeks and small to medium rivers	Cobble, gravel, and bedrock	Moderate to fast
79	River darter	*Percina shumardi*	Miss.	Large rivers	Gravel, rock	Fast

Table Appendix 18- 9. Habitat preferences of SGCN – Mammals

	Common Name	Scientific Name	Habitat Preference	Distribution
1	Hayden's Shrew	*Sorex haydeni*	Grasslands, wetlands, riparian	West
2	Elliot's Short-tailed Shrew	*Blarina hylophaga*	Forest, woodland, savanna, grassland	Extreme southwest
3	Southern Short-tailed Shrew	*Blarina carolinensis*	Forests, shrublands, grasslands, wetlands	Southeast corner (?)
4	Least Shrew	*Cryptotis parva*	Woodland, savanna, grassland, riparian	Southern and eastern
5	Northern (Myotis) Long-eared Bat	*Myotis septentrionalis*	Forest, woodlands	Statewide
6	Little Brown Bat	*Myotis lucifigus*	Woodland near waterways; readily rears young in buildings & bat houses	Statewide
7	Indiana Bat	*Myotis sodalis*	Forest, upland and riparian	Southeast two-thirds

	Common Name	Scientific Name	Habitat Preference	Distribution
8	Silver-haired Bat	*Lasionycteris noctivagans*	Woodland edge, riparian	Statewide
9	Eastern Pipistrelle	*Perimyotis subflavus*	Woodland edge, riparian	East
10	Evening Bat	*Nycticeius humeralis*	Forest, riparian	Southern half
11	White-tailed Jackrabbit	*Lepus townsendii*	Short grasslands, hayfields, esp. cultivated areas	Historically nearly statewide, now in Central/north-central
12	Franklin's Ground Squirrel	*Spermophilus franklinii*	Tallgrass prairie, savanna and roadsides	Statewide (all recent documentation in southern IA)
13	Southern Flying Squirrel	*Glaucomys volans*	Oak-hickory forest	Eastern 2/3 of state, especially along Mississippi and Des Moines rivers
14	Plains Pocket Gopher	*Geomys bursarius*	Open grassy areas with well-drained soil	State-wide
15	Plains Pocket Mouse	*Perognathus flavescens*	Prairie, sand and loess	West (Loess Hills), disjunct in east
16	Southern Bog Lemming	*Synaptomys cooperi*	Moist grassland, sedge meadow, bog, woodland, shrubland	Probably statewide, primarily southern Iowa
17	Woodland Vole	*Microtus pinetorum*	Deciduous riparian forests with ground layer of leaf litter	Southern and eastern
18	Gray Fox	*Urocyon cinereoargenteus*	Mixed forests and open woodlands/savanna	Statewide, primarily in southern 1/3
19	Long-tailed Weasel	*Mustela frenata*	Generalist; found in all habitats near water	Statewide – sparse distribution
20	Least Weasel	*Mustela nivalis*	Meadows, fields, shrubby areas, and open woodlands	Statewide – most common in northeast
21	Spotted Skunk	*Spilogale putorius*	Oak savanna, grassland, open woodland, and farmsteads	Statewide historically (most recent documentation in Webster, Ringgold, Pole and Marion counties)
22	Ermine	*Mustela ermine*	Shrubby or woodland areas, usually near water	Northern half of state

Table Appendix 18- 10. Habitat preferences of SGCN – Mussels

	Common Name	Scientific Name	Distribution	Habitat Preference	Substrate	Flow
1	Mucket	*Actinonaias ligamentina*	Cedar River	Medium to large rivers	Firm gravel	
2	Elktoe	*Alasmidonta marginata*	Northeast ¾	Medium streams	Sand, gravel	Moderate
3	Slippershell	*Alasmidonta viridis*	East	Creeks, streams	Sand, muck	
4	Three Ridge	*Amblema plicata*	Miss. and Iowa Rivers	Small to large rivers and lakes	Gravel, sand, mud	
5	Flat Floater	*Anodonta suborbiculata*	Miss. River	Ponds, lakes, rivers	Muck, silt	None or slow
6	Cylinder (Cylindrical Papershell)	*Anodontoides ferussacianus*	North-central	Small creeks	Sand, muck	
7	Rock Pocketbook	*Arcidens confragosus*	Miss. River	Medium to large rivers	Sand, muck	
8	Spectacle Case	*Cumberlandia monodonta*	Miss. River	Large rivers	Sand, muck	Fast
9	Purple Wartyback	*Cyclonaias tuberculata*	Southeast	Medium to large rivers	Gravel	
10	Butterfly	*Ellipsaria lineolata*	Miss. and Cedar Rivers	Large rivers	Sand, gravel	
11	Elephant Ear	*Elliptio crassidens*	Upper Cedar and Miss. Rivers	Large rivers	Mud, sand, gravel	
12	Spike	*Elliptio dilatata*	Northeast ¾	Streams and lakes	Firm, sand, gravel	
13	Snuffbox	*Epioblasma triquetra*		Medium to large rivers	Gravel	
14	Ebonyshell	*Fusconaia ebena*	Miss. River	Large, deep rivers	Sand, gravel	
15	Wabash pigtoe	*Fusconaia flava*	Scattered statewide	Creeks to large rivers	Gravel, sand	
16	Higgins' Eye Pearlymussel	*Lampsilis higginsii*	Miss. River	Large rivers	Gravel, sand	
17	Fatmucket	*Lampsilis siliquoidea*	Miss. and Shell Rock Rivers	Small streams to large rivers, lakes, reservoirs		
18	Yellow Sandshell	*Lampsilis teres anodontoides*	Northeast 2/3	Medium to large rivers	Sand, gravel	
19	White Heelsplitter	*Lasmigona camplanata*		Medium to large rivers	Mud, mud-gravel	
20	Creek Heelsplitter	*Lasmigona compressa*	Northeast 2/3	Creeks, streams	Sand, gravel	

	Common Name	Scientific Name	Distribution	Habitat Preference	Substrate	Flow
21	Fluted Shell	*Lasmigona costata*	Northeast ¾	Medium to large rivers	Sand, gravel, muck	
22	Pondmussel	*Ligumia subrostrata*	DM and Iowa Rivers	Small creeks and ponds	Sand, muck	
23	Black Sandshell	*Ligumia recta*		Medium to large rivers	Gravel, firm sand	
24	Washboard	*Megalonaias nervosa*	Miss. River	Large rivers	Gravel, gravel-mud	Fast
25	Threehorn Wartyback	*Obliquaria reflexa*	Skunk, Iowa, DM River	Medium to large rivers	Gravel	
26	Hickorynut	*Obovaria olivaria*	Miss. River	Large rivers	Sand, gravel	
27	Bullhead (Sheepnose)	*Plethobasus cyphyus*	Miss. and DM Rivers	Medium to large rivers	Sand, gravel	
28	Pyramid pigtoe	*Pleurobema rubrum*	Miss. River	Large rivers	Gravel-sand	
29	Round pigtoe	*Pleurobema sintoxia*	Northeast ¾	Streams and rivers	Firm, sand, gravel	
30	Pink Heelsplitter	*Potamilus alatus*		Medium to large rivers		
31	Pink Papershell	*Potamilus ohiensis*		Medium to large rivers		
32	Monkeyface	*Quadrula metanevra*	Eastern 2/3	Medium to large rivers	Gravel	
33	Wartyback	*Quadrula nodulata*	Miss. River	Large rivers	Sand, gravel	
34	Pimpleback	*Quadrula pustulosa*		Small streams to large rivers		
35	Mapleleaf	*Quadrula quadrula*		Medium to large rivers	Gravel, sand	
36	Salamander mussel	*Simpsonaias ambigua*	Miss. River	Rivers	Mud	
37	Strange Floater (Creeper, Formerly Squawfoot)	*Strophitus undulatus*	Northeast ¾	Small to medium streams	Sand, gravel, muck	
38	Pistolgrip	*Tritogonia verrucosa*	Miss., Iowa, and DM Rivers	Medium to large rivers	Sand, gravel, muck	
39	Fawnsfoot	*Truncilla donaciformis*	East	Medium to large rivers	Sand, gravel	

	Common Name	Scientific Name	Distribution	Habitat Preference	Substrate	Flow
40	Deertoe	*Truncilla truncata*		Medium streams to large rivers	Mud, gravel, sand	
41	Pondhorn	*Uniomerus tetralasmus*	South-central	Ponds, creeks, streams, rivers	Muck, sand	
42	Paper Pondshell	*Utterbackia imbecillis*	Northeast ¾	Ponds, lakes, impoundments, rivers	Muck	Slow
43	Ellipse	*Venustaconcha ellipsiformis*	Eastern 2/3	Small to medium streams	Sand, gravel	

Table Appendix 18- 11. Habitat preferences of SGCN – Terrestrial Snails

	Common Name	Scientific Name	Habitat	Distribution
1	Iowa Pleistocene Snail	*Discus macclintocki*	Forest	NE
2	Minnesota Pleistocene Succinea	*Novasuccinea n. Sp. Minnesota a*	Forest	NE
3	Iowa Pleistocene Succinea	*Novasuccinea n. Sp. Minnesota b*	Forest	NE
4	Hubricht's Vertigo	*Vertigo hubrichti*	Forest	NE
5	Bluff Vertigo	*Vertigo meramecensis*	Forest	NE

Appendix 19. SGCN grouped by major cover types/habitat classes

Table Appendix 19- 1. Habitat Preferences of SGCN - Forest Habitat

Forest-Associated SGCN		
Group	**Common Name**	**Comments**
Amphibians		
1	Blue-spotted Salamander	Shallow, fish-free, woodland ponds for breeding
2	Smallmouth Salamander	Woodland pools
3	Tiger Salamander	All aquatic habitat types, esp. permanent wetlands like lakes, ponds, and prairie marshes
4	Eastern Newt	Well vegetated woodland pools
5	Fowler's Toad	Woodlands, open areas near woodland edge, oak savanna
6	Woodhouse's Toad	Loess Hills woodlands & oak savanna
7	Eastern Gray Treefrog	Forests and woodlands, especially along river valleys
Reptiles		
1	Wood Turtle	Floodplain forests, rivers, riparian oak savanna
2	Common Five-lined Skink	Goat prairies, savannas, & rocky blufflands in forests along Mississippi River
3	Western Worm Snake	Forests and woodlands and oak savanna near rivers and streams
4	(Prairie) Ringneck Snake	Deciduous woodlands, oak savannas, and adjacent prairies
5	Eastern Hognose Snake	Oak savannas, woodlands, grasslands, bluff prairies
6	Plainbelly (Copperbelly) Water Snake	Mississippi River and associated backwaters and wet woodland
7	Western Rat Snake	Forested riparian areas, arboreal
8	Smooth Earth Snake	Moist woodland and savanna, riparian areas
9	Timber Rattlesnake	Deciduous forest, savanna, and goat prairies with limestone outcrops
10	Copperhead	Rocky forested hillsides and valleys adjacent to Mississippi and Des Moines rivers (SE corner of state).
Birds		
1	Ruffed Grouse	Prefers large forests or woodlands containing areas of high stem density
2	Bald Eagle	Prefers riparian forest
3	Red-shouldered Hawk	Prefers riparian forest with sloughs
4	Broad-winged Hawk	Large contiguous forests, woodlands and oak savannas
5	American Woodcock	Prefers moist brushy woodlands w/openings
6	Yellow-billed Cuckoo	Prefers forest-woodland-savanna thickets w/4' to 8' shrubs
7	Black-billed Cuckoo	Prefers woodland thickets w/2' to 6' shrubs, especially riparian
8	Eastern Screech-owl	Riparian forests, woodlands, savannas

Forest-Associated SGCN		
Group	**Common Name**	**Comments**
9	Long-eared Owl	Open woodlands, savannas, edges, especially in conifer plantations
10	Chuck-will's-widow	Oak hickory woodlands, mixed deciduous woodlands
11	Whip-poor-will	Prefers un-grazed forest w/open understory
12	Red-headed Woodpecker	Oak savanna and mature open woodlands with snags
13	Northern Flicker	Oak savanna and mature open woodlands with snags
14	American Kestrel	Oak savanna and wooded farmsteads with large trees
15	Peregrine Falcon	Nests in rocky cliffs along major rivers
16	Eastern Wood-pewee	Oak forest & woodlands, oak savanna
17	Olive-sided Flycatcher (NB)	Feeds along forest openings and edges
18	Acadian Flycatcher	Prefers riparian areas of large, mature, un-fragmented forests
19	Veery	Prefers moist forests w/low tree & shrub understory
20	Wood Thrush	Prefers large mature, moist forest w/closed canopy & shrubby component
21	Bohemian Waxwing (NB)	Coniferous or mixed forest
22	Worm-eating Warbler	Prefers large, un-fragmented forests w/shrub understory
23	Golden-winged Warbler	Prefers forest and woodland openings with shrubs and grass
24	Bay-breasted Warbler (NB)	Forests and woodlands, nests in conifers
25	Canada Warbler (NB)	Prefers mature forest w/shrubby undergrowth
26	Prothonotary Warbler	Prefers swampy, mature riparian forest
27	Kentucky Warbler	Prefers large riparian forest, especially ravine areas with shrubby forest understory
28	Cerulean Warbler	Prefers large, mature, un-fragmented oak forest
29	White-winged Crossbill (NB)	Dependent upon coniferous forest
Butterflies		
1	Pipevine Swallowtail	Old growth woodlands, SE corner of Iowa
2	Zebra Swallowtail	Mesic lowland forests. PawPaw is larval host
3	Spicebush Swallowtail	Preferred larval hostplant Spicebush, also prickly ash and sassafras
4	Harvester	Woodlands. Associated with wooly aphid colonies, which feed on alder.
5	Hickory Hairstreak	Oak hickory woodlands. Shagbark hickory is larval hostplant.
6	White M Hairstreak	Decidous open woodlands, savannas. Oak is larval hostplant
7	Ozark Baltimore Checkerspot	Open, dry woodlands in far southeast Iowa
8	Compton Tortoiseshell	Large areas of mature forest in far Northeastern Iowa
9	Hayhurst's Scallopwing	Wooded groves, Loess Hills woodland, floodplain forest
10	Juvenal's Duskywing	Oak woodlands, oaks are larval hostplant
11	Columbine Duskywing	Rocky wooded ravines
Mammals		
1	Elliot's Short-tailed Shrew	Forests, woodlands, savannas, grasslands
2	Southern Short-tailed Shrew	Forests, shrublands, grasslands, wetlands

Forest-Associated SGCN		
Group	**Common Name**	**Comments**
3	Northern Long-eared Bat	Forests and woodlands, forage in forest understory, roost in live or dead trees and in wooden buildings and structures in summer
4	Indiana Bat	Forage along forested riparian areas. Summer roosts in trees behind loose peeling bark.
5	Silver-haired Bat	Forage in woodland clearings and edges or along riparian areas. Roost in live or dead trees. Often winter in occupied houses in woodlands.
6	Eastern Pipistrelle	Forage along riparian areas and forest edges. Summer roosts in live trees or structures.
7	Evening Bat	Forage along forested riparian areas and forest edges. Summer roosts in trees or structures.
8	Southern Flying Squirrel	Mature oak-hickory forests, woodlands with snags
9	Woodland Vole	Deciduous forest with leaf litter
10	Gray Fox	Moderate to mature, diverse mixed forest
11	Spotted Skunk	Oak savanna, open woodland-grassland
12	Ermine	Prefers meadows bordering forests, marshes and riparian woodlands
Terrestrial Snails		
1	Iowa Pleistocene Snail	Algific slopes
2	Minnesota Pleistocene Succinea	Maderate cliffs
3	Iowa Pleistocene Succinea	Maderate cliffs
4	Hubricht's Vertigo	Algific slopes
5	Bluff Vertigo	Limestone and dolomite cliffs and outcrops

SGCN Associated with Specific Forest Habitats

Table Appendix 19- 1- A. Cliff and Algific Talus Slopes

Maderate Cliffs and Algific Talus Slopes-Associated SGCN		
Group	**Common Name**	**Comments**
Terrestrial Snails		
1	Iowa Pleistocene Snail	Algific slopes
2	Minnesota Pleistocene Succinea	Maderate cliffs
3	Iowa Pleistocene Succinea	Maderate cliffs
4	Hubricht's Vertigo	Algific slopes
5	Bluff Vertigo	Limestone and dolomite cliffs and outcrops

Table Appendix 19- 1- B. Open Woodland and Savannah – areas of relatively less dense canopy cover
(canopy cover ranging from ~25% in savanna, up to ~60% for open woodland)

Open Woodlands and Savannas-Associated SGCN		
Group	**Common Name**	**Comments**
Amphibians		
1	Cope's Gray Treefrog	Near wetlands in oak savannas, woodland edges, and grasslands
Reptiles		
1	Ornate Box Turtle	Savannas with sandy soil, sand prairies
2	Slender Glass Lizard	Savannas with sandy or loose soil
3	Common Five-lined Skink	Rocky woodland openings, bluff prairies within woodlands
4	Six-lined Racerunner	Sand prairie, bluff prairie, Loess Hills prairie, savanna
5	(Prairie) Ringneck Snake	Bluff prairies and adjacent deciduous woodlands, grassland/woodland edges
6	Eastern Hognose Snake	Oak savannas, woodlands, grasslands, bluff prairies
7	Prairie Kingsnake	Oak savannas, sand prairies, woodland edges
8	Speckled Kingsnake	Oak savannas, grasslands, and woodland edges
9	Smooth Green Snake	Oak savannas, grasslands
10	Gopher (Bull) Snake	Oak savannas, sand prairie, bluff prairie
11	Graham's Crayfish Snake	Wetlands or creeks within woodlands, sandy soils with abundant crayfish.
12	(Northern) Redbelly Snake	Grassland/woodland edges, dry sandy areas, near water sources
13	Timber Rattlesnake	Steep bluffs, goat prairie, oak savannas, oak-hickory woodlands
Birds		
1	Swainson's Hawk	Prefers savanna over woodland
2	Ruffed Grouse	Prefers large forests or woodlands containing areas of high stem density
3	American Woodcock	Moist brushy woodlands
4	Black-billed Cuckoo	Woodland thickets w/2'-6' shrubs, especially riparian
5	Yellow-billed Cuckoo	Prefers woodland thickets w/4' to 8' shrubs
6	Barn Owl	Prefers savanna over woodland
7	Long-eared Owl	Prefers areas of woodland-grassland interface, especially prefers large conifer stands
8	Chuck-will's-widow	Oak hickory woodlands, mixed deciduous woodlands
9	Eastern Whip-poor-will	Open woodlands, forests with open understory
10	Red-headed Woodpecker	Oak savannas preferred
11	Northern Flicker	Oak savannas, open woodlands, grassland/woodland edges
12	Eastern Kingbird	Grassland/woodland edges
13	Loggerhead Shrike	Thorny shrubs/trees in savanna/grasslands
14	Bell's Vireo	Thickets in savanna/grasslands
15	Bewick's Wren	Oak savannas, open woodlands with strong shrub component
16	Golden-winged Warbler	Prefers woodland openings with shrubby understory vegetation

Open Woodlands and Savannas-Associated SGCN		
Group	**Common Name**	**Comments**
17	Eastern Meadowlark	Prefers savanna over open grasslands
18	Baltimore Oriole	Oak savannas, open woodlands, woodland edges, parks
Butterflies		
1	Zebra Swallowtail	Riparian areas
2	Harvester	Woodlands, associated with wooly aphid colonies, which feed on alders
3	Edward's Hairstreak	Savannas, forest edge or clearings
4	Hickory Hairstreak	Oak-hickory woodlands. Shagbark hickory is larval hostplant.
5	Striped Hairstreak	Margins of woodlands - openings and edges of bedrock glades
6	White M Hairstreak	Oak savannas and woodlands, oaks are larval hostplants
7	Henry's Elfin	Open woodlands with redbud trees
8	Silvery Blue	Open, dry woodlands, and prairies
9	Ozark Baltimore Checkerspot	Open, dry woodlands in far southeast Iowa
10	Southern Cloudywing	Limestone and sandstone glades, sand prairies, Loess Hills prairies
11	Hayhurst's Scallopwing	Wooded groves near sand prairie
12	Dreamy Duskywing	Savanna, scrubland, far Northeast Iowa only
13	Sleepy Duskywing	Oak savanna or woodlands adjacent to dry prairie
14	Juvenal's Duskywing	Oak woodlands, oaks are larval hostplant
15	Columbine Duskywing	Limestone and sandstone glades
16	Northern Broken-dash	Grasslands near woodland edges, generalist
17	Pepper and Salt Skipper	Woodland edges, forest openings
Mammals		
1	Elliot's Short-tailed Shrew	Forests, woodlands, savannas and grasslands
2	Northern Long-eared Bat	Forests and woodlands, forage in forest understory, roost in live or dead trees in summer
3	Franklin's Ground Squirrel	Savannas and prairies
4	Spotted Skunk	Primarily a savanna species; also grasslands and woodlands

Table Appendix 19- 1- C. Woodland Pools

Woodland Pools-Associated SGCN		
Group	**Common Name**	**Comments**
Amphibians		
1	Central Newt	Vicinity of woodland pools
2	Tiger Salamander	All aquatic habitat types, esp. lentic wetlands
3	Blue-spotted Salamander	Vicinity of woodland pools, adjacent to Cedar River
4	Smallmouth Salamander	Vicinity of woodland pools, especially in floodplains

Table Appendix 19- 2. Habitat Preferences of SGCN - Shrubland Habitat Class

Shrubland-Associated SGCN		
Group	**Common Name**	**Comments**
Amphibians		
1	Tiger Salamander	All aquatic habitat types, esp. permanent wetlands like lakes, ponds, and prairie marshes
Reptiles		
1	Northern Prairie Skink	Open shrubland with a strong grass component
2	Smooth Green Snake	Open shrubland with a strong grass component
3	Eastern Massasauga Rattlesnake	Especially willow thickets in spring and fall
Birds		
1	Black-crowned Night Heron	Wetlands ringed with shrubs
2	Northern Bobwhite	Combination of grassland, shrubs, open woods
3	Sharp-tailed Grouse (Ex)	Prefers shrubby grassland
4	Yellow-billed Cuckoo	Woodland thickets, 4’ to 8’ shrubs
5	Black-billed Cuckoo	Woodland thickets w/ 2’ to 6’ shrubs, esp. riparian
6	Eastern Kingbird	Shrubby grassland and savanna edges
7	Loggerhead Shrike	Thorny shrublands of open country and savanna
8	Bell's Vireo	Prefers brushy, tangled habitat along grasslands and savannas, especially in dogwoods
9	Bewick's Wren	Prefers shrubby oak savanna or open woodlands
10	Brown Thrasher	Prefers shrubby grasslands or savannas
11	Golden-winged Warbler	Prefers shrubby open woodlands and savanna
12	Field Sparrow	Favors shrubby successional habitat, old fields
13	American Tree Sparrow (NB)	In winter - hedgerows, shrubby fields, yards
14	Harris’s Sparrow (NB)	Winters in hedgerows, pastures, shelterbelts
Mammals		
1	Least Shrew	Shrubby riparian areas
2	Franklin’s Ground Squirrel	Open areas near shrubby edges, fencerows, railroad rights-of-way

Table Appendix 19- 3. Habitat Preferences of SGCN - Grassland Habitat

Grassland-Associated SGCN		
Group	**Common Name**	**Comments**
Amphibians		
1	Tiger Salamander	All aquatic habitat types, esp. grassland associated wetlands like permanent prairie marshes
2	Great Plains Toad	Grasslands, prairies, farm fields, in vicinity of water
3	Fowler’s Toad	Grassy areas near woodland edge, savanna, sandy areas
4	Woodhouse’s Toad	Woodland edge, Loess Hills

Grassland-Associated SGCN		
Group	**Common Name**	**Comments**
5	Cope's Gray Treefrog	Grasslands, savannas, woodland edges near wetlands
6	Crawfish Frog	Vicinity of prairie marshes, pastures, prairies
7	Northern Leopard Frog	Grasslands, wet meadows during non-breeding season, prairie marshes
8	Plains Spadefoot	Burrows in prairie (outside breeding season)
Reptiles		
1	Ornate Box Turtle	Sand prairie
2	Yellow Mud Turtle	Ephemeral wetlands in sand prairie
3	Slender Glass Lizard	Prairie/savanna with sandy or loose soil
4	Great Plains Skink	Rocky mixed and short grass prairie; prairie-forest edge
5	Northern Prairie Skink	Prairie and oak savanna
6	Six-lined Racerunner	Sand prairie
7	(Prairie) Ringneck Snake	Bluff prairies, oak savanna, grassy woodland edge
8	Western Hognose Snake	Sand prairie
9	Eastern Hognose Snake	Grasslands, savannas, grassy woodland edge
10	Prairie Kingsnake	High quality prairie to oldfield, oak savanna, and grassy woodland edge
11	Speckled Kingsnake	Native prairie to oldfield, oak savanna, and grassy woodland edge
12	Smooth Green Snake	Wet prairie; oldfield
13	Western Rat Snake	Grasslands during summer near wooded valleys
14	Western Fox Snake	Generalist, grasslands, savanna, wetlands, wooded valleys
15	Gopher (Bull) Snake	Sand prairie, bluff prairie, tallgrass prairie, oak savanna, pasture
16	Redbelly Snake	Grasslands, savanna, & woodland edges, near water sources
17	Plains Garter Snake	Generalist, especially in grasslands
18	Lined Snake	Grasslands, pastures, woodland edge
19	Eastern Massasauga Rattlesnake	Wet prairie, upland grassland adjacent to wetland
20	Timber Rattlesnake	Hill prairie within woodland or savanna, with limestone outcrops
21	Prairie Rattlesnake	Loess Hills prairie - mixed and short grass prairie
Birds		
1	Northern Pintail	Nests in grassland
2	Northern Bobwhite	Prefers medium ht. grasslands w/shrubs & forbs
3	Sharp-tailed Grouse (Ex)	Open prairie w/patches of trees or shrubs
4	Greater Prairie-Chicken	Prefers large grassland tracts +2,000 acres
5	Northern Harrier	Prefers large grassland tracts +100 acres
6	Swainson's Hawk	Sparsely treed grasslands, savannas, pastures, wooded farmsteads in open country
7	Yellow Rail (NB)	Wet meadows & fens w/sedges
8	Whooping Crane (NB)	Prefers large wetland complexes w/grasslands adjacent

Grassland-Associated SGCN		
Group	**Common Name**	**Comments**
9	Upland Sandpiper	Prefers short-to-medium ht. grasslands w/forbs.
10	Long-billed Curlew (NB)	Short, sparse grasslands with shallow wetlands
11	Pectoral Sandpiper (NB)	Uses wet grasslands, mudflats, and shorelines during migration
12	Buff-breasted Sandpiper (NB)	Uses short grasslands during migration
13	Wilson's Phalarope	Shallow marshes w/upland grass & forbs
14	Burrowing Owl	Prefers short height grasslands
15	Long-eared Owl	Forage in grasslands, also use mixed conifer/deciduous woodlands
16	Short-eared Owl	Prefers large grassland tracts +200 acres
17	Common Nighthawk	Grasslands w/bare areas for nesting
18	Northern Flicker	Open grassy areas near woodland edges, yards, parks
19	American Kestrel	Hunts in open grassland areas, woodland edge
20	Horned Lark	Sparse grasslands, agricultural fields
21	Purple Martin	Forage in open grassy areas
22	Sedge Wren	Prefers tall grass infrequently disturbed
23	Sprague's Pipit (NB)	Open grasslands
24	Smith's Longspur (NB)	Winters in short grasslands
25	Common Yellowthroat	Shrubby grasslands, wet meadows, marshes
26	Field Sparrow	Prefers old grassland fields w/shrubs
27	Grasshopper Sparrow	Prefers short grass w/forbs
28	Henslow's Sparrow	Prefers tall grass and infrequent disturbance; weedy
29	Le Conte's Sparrow (NB)	Prefers grassy meadows; marsh edges
30	Harris's Sparrow (NB)	Winters in pastures, hedgerows
31	Dickcissel	Prefers medium high grass w/sparse forbs
32	Bobolink	Prefers medium height grass w/forbs
33	Eastern Meadowlark	Prefers grass landscape with some trees
34	Western Meadowlark	Grasslands, meadows, pastures
Butterflies		
1	Olympia Marble	Prairies and grasslands
2	Reakirt's Blue	Native prairie
3	Silvery Blue	Open areas near woodlands, open woodlands
4	Melissa Blue	Prairies and grasslands
5	Aphrodite Fritillary	Native prairies, marshes and fens
6	Regal Fritillary	Prairie and open grasslands
7	Silver-bordered Fritillary	Wet meadows, wetlands
8	Gorgone Checkerspot	Xeric prairies
9	Common Ringlet	Prairies and open grassy areas
10	Eyed Brown	Wet meadows and wetlands

Grassland-Associated SGCN		
Group	**Common Name**	**Comments**
11	Monarch	Open areas and edges, where nectar is abundant
12	Southern Cloudywing	Open grasslands and woodland openings
13	Mottled Duskywing	Xeric prairie in Loess Hills, gravel ridges
14	Poweshiek Skipper	High quality prairie
15	Ottoe Skipper	Tallgrass prairie
16	Leonard's Skipper	Open grassy areas
17	Dakota Skipper	Tallgrass prairie
18	Crossline Skipper	Dry prairie, bluff prairie
19	Long Dash	Grasslands, wetland edges, roadsides
20	Northern Broken-dash	Grasslands, woodland edges, roadsides
21	Little Glassywing	Open fields, woodland edges
22	Arogos Skipper	Prairies and sand prairies
23	Byssus Skipper	Tallgrass prairie
24	Dusted Skipper	Bluestem grasslands and oldfields
25	Pepper and Salt Skipper	Grasslands, grassland/woodland edges
26	Common Roadside-Skipper	Xeric prairie
Crayfish		
1	Prairie Crayfish	Grasslands and prairies with poorly drained soils
Mammals		
1	Hayden's Shrew	Grasslands, wet meadows, riparian areas, wetlands
2	Elliot's Short-tailed Shrew	Forest, woodland, savanna, grassland
3	Least Shrew	Woodlands, savannas, grasslands, riparian areas
4	White-tailed Jackrabbit	Short grasslands
5	Franklin's Ground Squirrel	Tallgrass prairie, savanna and roadsides
6	Plains Pocket Mouse	Sand and Loess Hills prairies
7	Plains Pocket Gopher	Open grasslands, well drained soils
8	Southern Bog Lemming	Moist grasslands and pastures, wetland margins
9	Long-tailed Weasel	Generalist: grassland marshes
10	Least Weasel	Grassland, grassy riparian areas
11	Spotted Skunk	Grassland, savanna, shrubby woodland, and farmsteads

SGCN Associated with Specific Grassland Habitats

Table Appendix 19- 3- A. Goat and Bluff Prairies

Goat and Bluff Prairies-Associated SGCN		
Group	**Common Name**	**Comments**
Reptiles		
1	Common Five-lined Skink	Rocky woodland openings, bluff prairies within woodlands
2	Six-lined Racerunner	Sand prairie, bluff prairie, Loess Hills prairie, savanna
3	(Prairie) Ringneck Snake	Bluff prairies and savannas, adjacent woodlands
4	Eastern Hognose Snake	Oak savannas, woodlands, grasslands, bluff prairies
5	(Bull) Gopher Snake	Sand prairie, bluff prairie, tallgrass prairie, oak savanna, pasture
6	Timber Rattlesnake	Bluff prairies with rocky outcrops
Butterflies		
1	Olympia Marble	Prairies and grasslands
2	Edward's Hairstreak	Woodland clearings
3	Striped Hairstreak	Margins of woodlands - openings and edges of bedrock glades
4	Silvery Blue	Open areas near woodlands, open woodlands
5	Sleepy Duskywing	Dry prairie openings in oak woodlands
6	Columbine Duskywing	Limestone and sandstone glades
7	Ottoe Skipper	Dry prairies in Loess Hills and in NE in limestone and sandstone glades
8	Leonard's Skipper	Dry prairies in Loess Hills, in NE limestone glades
9	Crossline Skipper	Dry prairie, bluff prairie
10	Dusted Skipper	Dry prairie in Loess Hills, in NE limestone and sandstone glades
11	Common Roadside Skipper	Dry prairie

Table Appendix 19- 3- B. Sand Prairies

Sand Prairies-Associated SGCN		
Group	**Common Name**	**Comments**
Reptiles		
1	Ornate Box Turtle	Sand prairies
2	Yellow Mud Turtle	Ephemeral wetlands in sand prairie
3	Slender Glass Lizard	Prairie-savanna with sandy or loose soil
4	Six-lined Racerunner	Sand prairie, bluff prairie, Loess Hills prairie, savanna
5	Western Hognose Snake	Shortgrass prairies with sandy soils
6	(Prairie) Kingsnake	Sand prairies, grasslands
7	(Bull) Gopher Snake	Sand prairie, bluff prairie, tallgrass prairie, oak savanna, pasture
Mammals		
1	Plains Pocket Mouse	Sand and Loess Hills prairies

Table Appendix 19- 4. Habitat Preferences of SGCN - Wetlands Habitat

Wetland-Associated SGCN		
Group	**Common name**	**Comments**
Amphibians		
1	Smallmouth Salamander	Near woodlands
2	Tiger Salamander	All aquatic habitat types, esp. grassland associated wetlands like permanent prairie marshes
3	Eastern Newt	Well-vegetated, permanent woodland wetlands
4	Blanchard's Cricket Frog	Generalist (but near permanent water source)
5	Crawfish Frog	Permanent grassland wetlands with abundant crayfish burrows
6	Plains Spadefoot	Ephemeral pools for breeding
7	Northern Leopard Frog	Use wetland of prairies, savannas, and woodlands
8	Southern Leopard Frog	Use wetlands, ponds, backwaters, impoundments
Reptiles		
1	Snapping Turtle	Generalist in permanent water sources
2	Blanding's Turtle	Shallow, vegetated, permanent wetlands and ponds with mud bottoms
3	Yellow Mud Turtle	Ephemeral wetlands with sandy soil
4	Eastern Musk Turtle	Oxbows, backwaters, wetlands, ponds that are permanent, mud bottom, near Mississippi River
5	Northern Prairie Skink	Prairie-grasslands, often use wetland edge
6	Plainbelly Water Snake	Backwaters, woodland ponds, in and near Miss. River
7	Diamondback Water Snake	Well-vegetated rivers, oxbows, backwaters, ponds
8	Common Water Snake	Ponds, wetlands, backwaters, and lakes
9	Smooth Green Snake	Prairie-grasslands, often use wetland edge
10	Western Fox Snake	Often use wetland edge
11	Graham's Crayfish Snake	Ponds, wetlands, floodplains, creeks, sandy bottoms, with abundant crayfish burrows
12	Western Ribbon Snake	Marshes, ponds, wetlands, rivers and streams
13	Eastern Massasauga Rattlesnake	Sedge meadow, open marsh edge, near large rivers, backwaters
Birds		
1	Trumpeter Swan	Large prairie marshes w/emergent vegetation
2	American Wigeon	Wetlands and shallow ponds
3	Blue-winged Teal	Marshes, wetlands and shallow ponds
4	Northern Pintail	Prairie marshes w/upland vegetation
5	Canvasback	Bulrush & cattail prairie marsh
6	Redhead	Cattail & bulrush hemi-marshes
7	Ring-necked Duck	Cattail & bulrush hemi-marshes, small lakes and ponds
8	Greater Scaup (NB)	Lakes, rivers, wetlands
9	Red-necked Grebe	Cattail & bulrush hemi-marshes, vegetated shallow lakes

Wetland-Associated SGCN		
Group	**Common name**	**Comments**
10	Eared Grebe	Cattail & bulrush hemi-marshes, vegetated Shallow lakes
11	American White Pelican	Riparian areas w/islands
12	American Bittern	Large prairie marshes w/upland grassland
13	Little Blue Heron (NB)	Mudflats, shallow water, dredge spoil islands in rivers
14	Black-crowned Night-Heron	Prairie marshes w/emergent veg. and/or shrubs/trees
15	White-faced Ibis	Prairie marshes with emergent veg, wetlands
16	Northern Harrier	Prairie/grasslands assoc. w/marshes
17	Yellow Rail (NB)	Wet meadows & fens w/sedges
18	Black Rail (NB)	Wet meadows & fens w/ sedges
19	King Rail	Sedge meadow zones of wetland edges
20	Common Gallinule	Prairie hemi-marshes
21	Whooping Crane (NB)	Large wetland complex w/wet meadows/hay fields
22	Black-bellied Plover (NB)	Shallow wetland, usually with mud flats
23	American Golden-Plover (NB)	Mud flats, shallow wetlands
24	Piping Plover	Riparian open, sandy beaches & sandbars
25	Lesser Yellowlegs (NB)	Shallow wetland, usually with mud flats
26	Whimbrel (NB)	Shallow wetland, usually with mud flats
27	Hudsonian Godwit (NB)	Moderate vegetated shorelines of marsh
28	Marbled Godwit (NB)	Moderate vegetated shorelines of marsh
29	Ruddy Turnstone (NB)	Rocky and sandy shores, mudflats
30	Red Knot (NB)	Shallow wetland, usually with mud flats, shorelines
31	Stilt Sandpiper (NB)	Sheltered muddy wetland pools
32	Sanderling (NB)	Mudflats and shorelines
33	White-rumped Sandpiper (NB)	Shallow wetland, usually with mud flats
34	Buff-breasted Sandpiper (NB)	Short-grass areas near water
35	Pectoral Sandpiper (NB)	Shallow wetland, usually with mud flats
36	Semipalmated Sandpiper (NB)	Shallow wetland, usually with mud flats, shorelines
37	Short-billed Dowitcher (NB)	Shallow wetland, usually with mud flats
38	Long-billed Dowitcher (NB)	Shallow wetland, usually with mud flats
39	Wilson’s Snipe	Rivers, streams, vegetated wetlands
40	Wilson's Phalarope	Shallow marshes w/upland grass & forbs
41	Franklin’s Gull	Wetlands, sandy beaches
42	Least Tern	Open sandy beaches, sandbars of riparian areas
43	Caspian Tern (NB)	Shorelines, riverine islands
44	Black Tern	Large prairie marsh w/emergent vegetation
45	Forster’s Tern	Large prairie marsh w/emergent vegetation
46	Sedge Wren	Tall rank grassland ringing marsh

Wetland-Associated SGCN		
Group	**Common name**	**Comments**
47	Le Conte's Sparrow (NB)	Prefers grassy meadows; marsh edges
Butterflies		
1	Purplish Copper	Wet-mesic prairies, marshes and wet meadows
2	Acadian Hairstreak	Wet prairies, fens, sedge meadows and marshes
3	Aphrodite Fritillary	Prairie, prairie wetlands, fens
4	Siver-bordered Fritillary	Fens, wet meadows and marshes
5	Baltimore Checkerspot	Fens, wet meadows and marshes
6	Eyed Brown	Marshes, fens, wet prairies
7	Northern Broken-dash	Generalist, including fens, prairies,woodlands
8	Mulberry Wing	Marshes and fens
9	Long Dash	In NE Iowa, associated with fens and wet prairies, although uses dry prairies in NW Iowa
10	Broad-winged Skipper	Marshes and fens
11	Two-spotted Skipper	Fens, wet meadows
12	Black Dash	Fens, wet prairies, marshes
13	Dion Skipper	Wetlands with sedges, fens
Crayfish		
1	Calico Crayfish	Sloughs, floodplains
Dragonflies & Damselflies		
1	Spotted Spreadwing	Wetlands, ephemeral and permanent
2	Amber-winged Spreadwing	Wetlands and ponds
3	Sweetflag Spreadwing	Wetlands
4	Boreal Bluet	
5	Canada Darner	Generalist
6	Swamp Darner	Wooded backwaters
7	Plains Emerald	
8	Carolina Saddlebags	
Fish		
1	Starhead Topminnow	Oxbows
2	Topeka Shiner	Oxbows
Mammals		
1	Hayden's Shrew	Grasslands, wet meadows, wetlands, riparian areas
2	Southern Bog Lemming	Bogs, moist grassland
3	Spotted Skunk	Riparian corridors and wet meadows
4	Plains Pocket Gopher	Wet meadows
5	Long-tailed Weasel	Wetlands, grasslands & woodlands near water
6	Least Weasel	Grassland/wetland margins & riparian corridors

SGCN Associated with Specific Wetland Habitats

Table Appendix 19- 4- A. Fens

Fens-Associated SGCN		
Group	**Common Name**	**Comments**
Birds		
1	Yellow Rail (NB)	Fens, wet sedge meadows
Butterflies		
1	Acadian Hairstreak	Wet prairies, fens, sedge meadows and marshes
2	Aphrodite fritillary	Prairies, wetlands, fens
3	Silver-bordered fritillary	Fens, wet prairie, and meadows
4	Baltimore Checkerspot	Wetlands, fens, and bogs
5	Eyed Brown	Fens, wet prairies, and marshes
6	Long Dash	Fens, wet prairies in Northeast (dry prairie in West)
7	Northern Broken-dash	Fens, xeric prairie, forest/woodland
8	Mulberry Wing	Wetlands, fens
9	Broad-winged Skipper	Wetlands, fens
10	Dion Skipper	Sedge wetlands, fens
11	Black Dash	Fens, wet prairies, marshes
12	Two-spotted Skipper	Sedge meadows and marshes, fens

Table Appendix 19- 5. Habitat Preferences of SGCN - Agricultural Lands

Agricultural Lands-Associated SGCN		
Group	**Common Name**	**Comments**
Amphibians		
1	Tiger Salamander	All aquatic habitat types, including ponds in pastures and fields
2	Crayfish Frog	Flooded fields, pasture
3	Great Plains Toad	Pasture ponds
4	Plains Spadefoot	Ephemeral pools in ag fields
Reptiles		
1	Ornate Box Turtle	Pasture and agricultural fields with sandy soil
2	Slender Glass Lizard	Pasture and grassland field edges
3	Six-lined Racerunner	Sandy soil in grassland field edges
4	Prairie Kingsnake	Hayfields and grassy field edges
5	(Bull) Gopher Snake	Hayfields and pasture
6	Plains Garter Snake	Uplands- grasslands, farm areas, suburban areas
7	Lined Snake	Grasslands including pastures, suburban areas
8	Eastern Massasauga Rattlesnake	Grassed waterways, grassy field edges
Birds		

Agricultural Lands-Associated SGCN		
Group	**Common Name**	**Comments**
1	Northern Pintail	Nests in grassland
2	Northern Bobwhite	Prefers medium height grasslands w/shrubs & forbs, also nests in grassland field edges
3	Sharp-tailed Grouse (Ex)	Open prairie w/patches of trees or shrubs
4	Greater Prairie-Chicken	Prefers large grassland tracts +2,000 acres, pastureland interspersed with native grassland, can nest in grassland field edges and in large CRP grasslands
5	Northern Harrier	Prefers large grassland tracts +100 acres, also nests in large CRP grasslands
6	Swainson's Hawk	Pastures with large trees, grasslands
7	Yellow Rail (NB)	Wet meadows & fens w/sedges
8	Whooping Crane (NB)	Prefers large wetland complexes w/grasslands adjacent, will use pastures and alfalfa fields
9	Upland Sandpiper	Prefers short-to-medium height grasslands w/forbs, will use no-till soybean and alfalfa fields
10	Buff-breasted Sandpiper (NB)	Short-grass areas near water
11	Wilson's Phalarope	Shallow marshes w/upland grass & forbs
12	Burrowing Owl	Prefers short height grasslands, pastures
13	Short-Eared Owl	Prefers large grassland tracts +200 acres, also nests in large CRP grasslands
14	Common Nighthawk	Grasslands w/bare areas for nesting, forages for insects over pastures, hayfields, and cropfields
15	Chimney Swift	Declining preference as more chimney availability is reduced, forages for insects over pastures, hayfields and cropfields
16	Horned Lark	Sparse grasslands, nests in pastures and no-till soybean fields
17	Sedge Wren	Prefers tall grass infrequently disturbed, nests in older CRP grasslands
18	Field Sparrow	Prefers old grassland fields w/shrubs, nests in older CRP grasslands
19	Grasshopper Sparrow	Prefers short grass w/forbs, can nest in larger grassland field edges or short CRP grasslands
20	Henslow's Sparrow	Prefers tall grass and infrequent disturbance; weedy, will use no-till soybean and alfalfa fields
21	Le Conte's Sparrow (NB)	Prefers grassy meadows, marsh edges
22	Dickcissel	Prefers medium high grass w/sparse forbs, nests in older CRP grasslands and old fields
23	Bobolink	Prefers medium height grass w/forbs, also nests in large, medium height CRP grasslands
24	Eastern Meadowlark	Prefers trees in grass landscape, nests in CRP grasslands and hayfields not cut before mid-July
25	Western Meadowlark	Grasslands, meadows, pastures, nests in CRP grasslands and hayfields not cut before mid-July

Agricultural Lands-Associated SGCN		
Group	**Common Name**	**Comments**
Butterflies		
1	Pipevine Swallowtail	Roadsides
2	Purplish Copper	Open fields, pastures
3	Gorgone checkerspot	Oldfields, pastures, roadsides
4	Regal Fritillary	Open grasslands, CRP grasslands
5	Monarch	Open areas and edges, where nectar is abundant, CRP grasslands
6	Dusted Skipper	Oldfields
Mammals		
1	White-tailed Jackrabbit	Fields of small grain, short grass, hayfields, and grassland field edges
2	Franklin's Ground Squirrel	CRP grasslands and hayfields, pasture, and grassland field edges
3	Spotted Skunk	Farmsteads, utilize CRP grasslands, pastures, and grassland field edges
4	Plains Pocket Gopher	Alfalfa fields, CRP grasslands, pastures, and grassland field edges

Table Appendix 19- 6. Habitat Preferences of SGCN - River Habitat
(including Mississippi River pools, and including riparian corridors/floodplains)

River Habitat-Associated SGCN		
Group	**Common Name**	**Comments**
Amphibians		
1	Mudpuppy	Clean rivers and streams, especially with rocky or cobblestone bottoms
2	Blanchard's Cricket Frog	Mud banks of rivers, streams, lakes and wetlands
3	Pickerel Frog	Cold, clear-water rivers and streams
4	Northern Leopard Frog	Generalist using many types of water bodies
Reptiles		
1	Snapping Turtle	Generalist using many types of water bodies
2	Wood Turtle	Riparian corridors with adjacent floodplain forest and sandy shores and sandbars for nesting
3	Northern Map Turtle	Rivers and streams with oxbows
4	Southern Map Turtle	Mississippi River and associated oxbows
5	False Map Turtle	Slow moving portions of large rivers and associated oxbows
6	Common Musk Turtle	Slow moving rivers with mud bottoms and oxbows
7	Smooth Softshell	Large rivers preferred with sandy bottoms and level sandbars for nesting
8	Spiny Softshell	Rivers, streams, large lakes and adjacent sandy areas for nesting
9	Plainbelly (Copperbelly) Water Snake	Mississippi River and associated backwaters
10	Diamondback Water Snake	Mississippi and associated large rivers, backwaters, oxbows, ponds

River Habitat-Associated SGCN		
Group	**Common Name**	**Comments**
11	Western Ribbon Snake	Wetlands, ponds, rivers, streams
12	Eastern Massasauga	Wetlands adjoining rivers
13	Western Massasauga	Wetlands adjoining rivers
Birds		
1	Greater Scaup (NB)	Rivers, wetlands
2	Lesser Scaup	Mississippi River
3	Common Loon (NB)	In winter - Rivers, lakes, open water
4	American White Pelican	Islands within river corridors
5	Little Blue Heron (NB)	Mudflats, shallow water, dredge spoil islands
6	Black-crowned Night-Heron	Rivers, streams, wetlands
7	Bald Eagle	Riparian forest
8	Red-shouldered Hawk	Riparian forest with sloughs and backwater areas
9	Black-bellied Plover (NB)	Shorelines, flooded fields
10	American Golden-Plover (NB)	Shorelines, agricultural fields, mudflats, beaches, shortgrass grasslands during migration
11	Piping Plover	Sandy beaches, sand bars, Missouri River
12	Lesser Yellowlegs (NB)	Shallow water, shoreline
13	Whimbrel (NB)	Shorelines, beaches
14	Hudsonian Godwit (NB)	Shorelines, mudflats, flooded fields during migration
15	Marbled Godwit (NB)	Shorelines, mudflats, beaches during migration
16	Ruddy Turnstone (NB)	Rocky shorelines during migration
17	Red Knot (NB)	Shorelines
18	Sanderling (NB)	Shorelines
19	Semipalmated Sandpiper (NB)	Shorelines
20	White-rumped Sandpiper (NB)	Shorelines
21	Pectoral Sandpiper (NB)	Shorelines
22	Stilt Sandpiper (NB)	Shorelines
23	Buff-breasted Sandpiper (NB)	Shorelines
24	Short-billed Dowitcher (NB)	Shorelines
25	Long-billed Dowitcher (NB)	Shorelines
26	Wilson’s Snipe	Rivers, streams, wetlands
27	American Woodcock	Wooded riparian areas, woodlands
28	Least Tern	Shoreline, sandy beaches, Missouri River
29	Caspian Tern (NB)	Shoreline, riverine islands
30	Belted Kingfisher	Rivers, streams, wetlands
31	Peregrine Falcon	Riparian forest, Mississippi River bluffs
32	Bank Swallow	Rivers and streams

River Habitat-Associated SGCN		
Group	**Common Name**	**Comments**
33	Veery	Deciduous wooded shrubby riparian areas
34	Prothonotary Warbler	Wooded backwater areas of bottomland forest
Crayfish		
1	Calico Crayfish	Floodplains of rivers, sloughs
2	Golden Crayfish	Rivers, streams
3	Virile Crayfish	Rivers, streams, ponds
Dragonflies & Damselflies		
1	Midland Clubtail	Rivers, streams
2	Pale Snaketail	Rivers & streams with fast flow & cobble substrate
3	Brimstone Clubtail	Fast flowing, open rivers & streams
4	Elusive Clubtail	Rivers and streams with sandy substrate
5	Arrow Clubtail	Rivers with sandy substrate
6	Stream Cruiser	Medium to large streams & rivers
7	Royal River Cruiser	Rivers, streams, lakes
8	Smoky Shadowdragon	Rivers and larger sized streams with fast flow
9	Stygian Shadowdragon	Mississippi River
Fish		
1	Chestnut lamprey	Rivers, including Mississippi
2	Silver lamprey	Mississippi River, spawn in shallow streams and tributaries on gravel riffles
3	Lake sturgeon	Large rivers and lakes with sand, cobble and rock substrate
4	Pallid sturgeon	Missouri River. Turbid waters with sand and gravel substrate
5	Shovelnose sturgeon	Large rivers, turbid waters
6	Paddlefish	Medium to large rivers, backwater, and impoundments
7	American Eel	Rivers, large streams and lakes
8	Skipjack herring	Medium to large rivers and large impoundments with sand and gravel substrate
9	Gravel chub	Large streams and rivers with gravel substrate
10	Plains minnow	Silt bottom
11	Pallid shiner	Rivers and streams, sand and muck bottom
12	Redfin shiner	Rivers and streams, sand and muck bottom
13	Shoal chub	Rivers, sand, cobble and silt substrate
14	Sturgeon chub	Warm, turbid rivers
15	Sicklefin chub	Large, turbid rivers with sand and gravel substrate
16	Ghost shiner	Rivers, streams
17	Blacknose shiner	Cool vegetated waters with sand bottom
18	Ozark minnow	Gravel and rock substrate
19	Silverband shiner	Open channels/swift currents, tolerates silt

River Habitat-Associated SGCN		
Group	**Common Name**	**Comments**
20	Weed shiner	Rivers, streams, sand substrate
21	Topeka shiner	Rivers, streams with clear waters, off-channel areas
22	Channel shiner	
23	Pugnose minnow	Clear vegetated waters with silt, sand and gravel substrate
24	Flathead chub	Turbid rivers
25	Longnose dace	Clear waters with gravel and rock substrate
26	Blue sucker	Large rivers
27	Black buffalo	Rivers, impoundments, backwaters
28	Spotted sucker	Rivers, streams, firm substrate
29	River redhorse	Clear rivers and streams with no silt
30	Black redhorse	Rivers, streams, gravel and rock substrate
31	Blue catfish	Rivers, backwaters
32	Slender madtom	Rivers, streams
33	Tadpole madtom	Vegetated rivers, streams, lakes, impoundments, backwaters with slow flow & muck substrate
34	Freckled madtom	Rivers, streams
35	Brook trout	Cool rivers and streams with sand, gravel, cobble or rock substrate and moderate to fast flow
36	Trout perch	Rivers, streams, sand substrate
37	Burbot	Deep, cold rivers & lakes
38	Northern (longear) sunfish	
39	Western sand darter	Rivers with sand substrate, slow to moderate flow
40	Crystal darter	Streams, small rivers with sand and gravel substrate
41	Mud darter	Rivers, backwaters, sand and muck substrate
42	Bluntnose darter	Streams, small to medium rivers, backwaters, sand, muck substrate, slow flow
43	Orangethroat darter	Streams to small rivers with sand, cobble, gravel and bedrock substrate and moderate to fast flow
44	Banded darter	Rivers, streams, cobble and gravel substrate
45	Logperch	Rivers, streams, lakes, impoundments, sand and gravel substrate
46	Blackside darter	Rivers, streams, sand and gravel substrate
47	Slenderhead darter	Rivers, streams, cobble, gravel and bedrock substrate
48	River darter	Large rivers, gravel and rock substrate
Mammals		
1	Indiana Bat	Wooded riparian areas
2	Silver-haired Bat	Wooded riparian areas
3	Eastern Pipistrelle	Wooded riparian areas
4	Evening Bat	Wooded riparian areas

River Habitat-Associated SGCN		
Group	**Common Name**	**Comments**
5	Ermine	Wooded riparian areas
Mussels		
1	Mucket	Medium to large rivers, firm gravel substrate
2	Three Ridge	Small to large rivers and lakes with gravel, sand or mud substrate
3	Flat floater	Rivers, lakes, ponds, mud and silt substrate, slow or no flow
4	Rock pocketbook	Medium to large rivers, mud and sand substrate
5	Spectacle case	Large rivers, mud and sand substrate
6	Purple wartyback	Medium to large rivers, gravel substrate
7	Butterfly	Large rivers, sand and gravel substrate
8	Elephant ear	Large rivers, mud, sand, and gravel substrate
9	Snuffbox	Medium to large rivers, gravel substrate
10	Ebonyshell	Large, deep rivers, sand and gravel substrate
11	Higgins' eye pearlymussel	Large rivers, sand and gravel substrate
12	Fatmucket	Small to large rivers and streams, lakes, reservoirs
13	Yellow sandshell	Medium to large rivers, sand and gravel substrate
14	White heelsplitter	Medium to large rivers, mud, gravel substrate
15	Fluted shell	Medium to large rivers, mud sand and gravel substrate
16	Black sandshell	Medium to large rivers, gravel, firm sand substrate
17	Washboard	Large rivers, gravel, mud substrate
18	Threehorn wartyback	Medium to large rivers, gravel substrate
19	Hickorynut	Large rivers, sand and gravel substrate
20	Bullhead (Sheepnose)	Medium to large rivers, sand and gravel substrate
21	Pyramid pigtoe	Large rivers, gravel-sand substrate
22	Round pigtoe	Rivers, streams, firm sand and gravel substrate
23	Pink heelsplitter	Medium to large rivers
24	Pink papershell	Medium to large rivers
25	Monkeyface	Medium to large rivers, gravel substrate
26	Wartyback	Large rivers, sand and gravel substrate
27	Pimpleback	Rivers, streams
28	Mapleleaf	Medium to large rivers, gravel, sand substrates
29	Salamander mussel	Rivers
30	Pistolgrip	Medium to large rivers, mud, sand and gravel substrate
31	Fawnsfoot	Medium to large rivers , sand and gravel substrate
32	Deertoe	Medium to large rivers, mud, sand, and gravel substrates
33	Pondhorn	Inland rivers, streams, ponds, muck and sand substrate
34	Paper pondshell	Mud substrate

Table Appendix 19- 7. Habitat Preferences of SGCN - Stream Habitat
(including riparian corridors/floodplains)

Stream Habitat-Associated SGCN		
Group	**Common Name**	**Comments**
Amphibians		
1	Common Mudpuppy	Permanent rivers & streams with gravel bottoms
2	Blanchard's Cricket frog	Mud banks of rivers, streams, lakes and wetlands
3	Crawfish Frog	Streams or ponds within grasslands (presumed extirpated)
4	Pickerel Frog	Cold water streams, rivers, and impoundments
5	Northern Leopard Frog	All aquatic habitat types
Reptiles		
1	Snapping turtle	Uses most types of water bodies
2	Wood turtle	Rivers and streams and adjacent floodplains
3	Northern map turtle	Rivers and streams
4	Spiny softshell	Rivers, streams, large lakes
5	Western worm snake	Woodland-savanna-grassland riparian areas
6	Common water snake	Streams, backwaters, ponds, marshes, lakes
7	Western fox snake	Woodland-savanna-grassland riparian areas
8	Graham's crayfish snake	Floodplains of streams, creeks, wetlands, sloughs
9	Western ribbon snake	Rivers, streams, wetlands, ponds
10	Smooth earth snake	Moist deciduous forests and edge habitats, often in valleys of wooded rivers and streams
Birds		
1	Little Blue Heron (NB)	Mudflats, shallow water, dredge spoil islands
2	Black-crowned Night-Heron	Rivers, streams, wetlands
3	Bald Eagle	Riparian forest
4	Red-shouldered Hawk	Riparian forest
5	Black-bellied Plover (NB)	Shorelines, flooded fields
6	American Golden-Plover (NB)	Shorelines, agricultural fields, mudflats, beaches, shortgrass grasslands during migration
7	Lesser Yellowlegs (NB)	Shallow water
8	Whimbrel (NB)	Shorelines, beaches
9	Hudsonian Godwit (NB)	Shorelines, mudflats, flooded fields during migration
10	Marbled Godwit (NB)	Shorelines, mudflats, beaches during migration
11	Ruddy Turnstone (NB)	Rocky shorelines during migration
12	Red Knot (NB)	Shorelines
13	Sanderling (NB)	Shorelines
14	Semipalmated Sandpiper (NB)	Shorelines
15	White-rumped Sandpiper (NB)	Shorelines
16	Pectoral Sandpiper (NB)	Shorelines

Stream Habitat-Associated SGCN		
Group	**Common Name**	**Comments**
17	Stilt Sandpiper (NB)	Shorelines
18	Buff-breasted Sandpiper (NB)	Shorelines
19	Short-billed Dowitcher (NB)	Shorelines
20	Long-billed Dowitcher (NB)	Shorelines
21	Wilson's Snipe	Rivers, streams, wetlands
22	American Woodcock	Wooded riparian areas, woodlands
23	Caspian Tern (NB)	Shoreline, riverine islands
24	Belted Kingfisher	Rivers, streams, wetlands
25	Peregrine Falcon	Riparian forest, Mississippi River bluffs
26	Acadian Flycatcher	Deciduous, wooded riparian areas
27	Bank Swallow	Nests in cut-banks of rivers and streams
28	Veery	Deciduous wooded riparian areas
29	Prothonotary Warbler	Bottomland forest; wooded backwater areas of rivers and streams
Butterflies		
1	Zebra Swallowtail	Riparian woodlands
2	Harvester	Wooded streams
3	Acadian Hairstreak	Riparian areas in woodlands or grasslands
4	Striped Hairstreak	Streamside prairies, woodland openings & edges
5	Hayhurst's Scallopwing	Floodplain forest
Crayfish		
1	Devil Crayfish	Streams, creeks
2	Calico Crayfish	Floodplains, sloughs
3	Golden Crayfish	Rivers, streams and creeks
4	Northern Clearwater Crayfish	Cool water streams
5	Virile Crayfish	Rivers, streams, and ponds
Dragonflies & Damselflies		
1	Paiute dancer	Small streams, marshy springs
2	Boreal bluet	Streams with slow flow, fishless ponds, lakes
3	Western forktail	Heavily vegetated ponds, lakes, and slow flow streams with mud substrate
4	Variable darner	Lakes, ponds, streams
5	Midland clubtail	Rivers and streams
6	Sulpher-tipped clubtail	Ponds, lakes, streams, and creeks with mud substrate
7	Rapids clubtail	Rocky creeks
8	Rusty snaketail	Sandy or rocky creeks
9	Pale snaketail	Rivers and streams with fast flow and cobble substrate
10	Sioux snaketail	Streams with sandy bottoms

Stream Habitat-Associated SGCN		
Group	**Common Name**	**Comments**
11	Westfall's snaketail	Clear forest streams with strong riffles and cobble substrate
12	Brimstone clubtail	Strong-flowing, open streams and rivers
13	Elusive clubtail	Rivers and streams with sandy substrate
14	Arrow clubtail	Rivers with sandy substrate
15	Stream cruiser	Rivers and streams
16	Smoky shadowdragon	Fast-flowing rivers and streams
17	Plains emerald	Streams
Fish		
1	Northern brook lamprey	Streams with muck bottoms
2	American brook lamprey	Small to medium rivers & streams
3	American eel	Rivers, large streams, lakes
4	Largescale stoneroller	Clear, medium to large streams, gravel substrate
5	Gravel chub	Large streams and rivers, gravel substrate
6	Plains minnow	Rivers and streams with slow flows, silt bottoms
7	Redfin shiner	Rivers, streams, and creeks
8	Ghost shiner	Rivers, streams
9	Blacknose shiner	Cool water streams, sand substrate
10	Ozark minnow	Fast moving streams with gravel or rock substrate
11	Weed shiner	Rivers and streams with sand bottoms
12	Topeka shiner	Slow-flowing rivers & streams with clear water, off-channel areas
13	Pugnose minnow	Vegetated lakes, impoundments, streams with slow flow
14	Southern redbelly dace	
15	Longnose dace	Fast moving rivers and streams with clear water and gravel or rock bottoms
16	River redhorse	Large streams and rivers with clear water
17	Black redhorse	Rivers and streams with gravel or rock bottoms
18	Brown bullhead	Slow moving streams, lakes, ponds, backwaters, impoundments
19	Slender madtom	Rivers and streams with moderate to fast flow
20	Tadpole madtom	Slow moving rivers and streams, backwaters, impoundments, vegetated lakes
21	Freckled madtom	Rivers and streams with moderate to slow flow
22	Central mudminnow	Vegetated streams and backwaters
23	Brook trout	Cold and cool water streams and rivers with moderate to fast flow and sand, gravel or rock substrate
24	Trout perch	Rivers and streams with sand substrate
25	Banded killifish	Lakes, ponds, streams with slow flow
26	Starhead topminnow	Backwaters, streams and creeks with muck bottoms and slow to no flow

Stream Habitat-Associated SGCN		
Group	**Common Name**	**Comments**
27	Blackstripe topminnow	Turbid streams
28	Plains topminnow	Clear prairie streams with moderate flow
29	Mottled sculpin	Clear, cool water rivers and streams with sand, gravel or rock substrate
30	Slimy sculpin	Cold, fast flowing streams with rock substrate
31	Bluntnose darter	Rivers, streams, and backwaters with sand or muck bottoms
32	Iowa darter	Cool water streams, ponds and lakes with no or slow flow and muck or sand bottoms
33	Least darter	Vegetated creeks with slow flow
34	Orangethroat darter	Rivers and streams with moderate to fast flow and sand, coble, gravel or bedrock substrate
35	Banded darter	Large streams and rivers with moderate flow and gravel or cobble substrate
36	Logperch	Rivers and streams, lakes and impoundments, sand or gravel substrate
37	Blackside darter	Small rivers and streams with slow flow and sand or gravel substrate
38	Slenderhead darter	Rivers and streams with moderate to fast flow and cobble, gravel or bedrock substrate
Mammals		
1	Indiana Bat	Wooded riparian areas
2	Silver-haired Bat	Wooded riparian areas
3	Eastern Pipistrelle	Wooded riparian areas
4	Evening Bat	Wooded riparian areas
5	Ermine	Wooded riparian areas
Mussels		
1	Elktoe	Streams, sand and gravel substrate
2	Slippershell	Streams and creeks, mud and sand substrate
3	Clylinder	Small creeks, mud and sand substrate
4	Spike	Streams and lakes, firm sand and gravel substrate
5	Wabash pigtoe	Rivers, streams, creeks, gravel and sand substrate
6	Fatmucket	Rivers, streams, resevoirs
7	Creek heelsplitter	Streams and creeks, sand and gravel substrate
8	Pondmussel	Small creeks and ponds, sand and muck substrate
9	Round pigtoe	Rivers and streams, firm sand and gravel substrate
10	Pimpleback	Small streams to large rivers
11	Strange floater	Small to medium streams, mud, sand and gravel substrate
12	Deertoe	Medium streams to large rivers, mud, gravel sand substrate
13	Pondhorn	Ponds, creeks, streams, rivers, muck and sand substrate

Stream Habitat-Associated SGCN		
Group	**Common Name**	**Comments**
14	Ellipse	Small to medium streams, sand and gravel substrate

Table Appendix 19- 8. Habitat Preferences of SGCN – Lakes, Flood Control Reservoirs, On-stream Impoundments, and Surface Mines.

(This table includes species using shoreline and immediately adjacent uplands.)

Lakes, Reservoirs, Impoundments & Surface Mines-Associated SGCN		
Group	**Common Name**	**Comments**
Amphibians		
1	Tiger salamander	All aquatic habitat types, esp. permanent wetlands like lakes, ponds, and prairie marshes
2	Common mudpuppy	On-stream impoundments with gravel bars for reproduction
3	Blanchard's cricket frog	Rivers, streams, lakes, wetlands
4	Pickerel frog	On-stream impoundments, cold water rivers, streams
5	Northern leopard frog	All aquatic habitats
6	Southern leopard frog	On-stream impoundments, wetlands, ponds, backwaters
Reptiles		
1	Snapping turtle	All aquatic habitat types
2	Spiny softshell	Large lakes, rivers, streams
3	Prairie skink	Grasslands with loose soil and rocky areas adjacent to marshes or lakes
4	Speckled kingsnake	Grassy uplands adjacent to lakes and large ponds
5	Common water snake	Lakes, ponds, wetlands, streams, backwaters
6	Smooth green snake	Grassy uplands adjacent to lakes and impoundments
7	Western fox snake	Grassy uplands adjacent to lakes and wetlands
8	(Northern) Redbelly snake	Grassy uplands adjacent to lakes and wetlands
Birds		
1	Greater Scaup (NB)	Rivers, lakes, wetlands
2	Common Loon (NB)	Large clear lakes in summer. In winter - lakes rivers, open water
3	American White Pelican	Reservoirs, impoundments, rivers
4	Little Blue Heron (NB)	Mudflats, shallow water, dredge spoil islands
5	Bald Eagle	Reservoirs, impoundments with forested edges
6	Black-bellied Plover (NB)	Shorelines, flooded fields
7	American Golden-Plover (NB)	Shorelines, agricultural fields, mudflats, beaches, shortgrass grasslands during migration
8	Lesser Yellowlegs (NB)	Shallow water, wetland edges
9	Whimbrel (NB)	Shorelines, beaches
10	Hudsonian Godwit (NB)	Shorelines, mudflats, flooded fields during migration
11	Marbled Godwit (NB)	Shorelines, mudflats, beaches during migration

Lakes, Reservoirs, Impoundments & Surface Mines-Associated SGCN		
Group	**Common Name**	**Comments**
12	Ruddy Turnstone (NB)	Rocky shorelines during migration
13	Red Knot (NB)	Shorelines, wetland edges
14	Sanderling (NB)	Shorelines, wetland edges
15	Semipalmated Sandpiper (NB)	Shorelines, wetland edges
16	White-rumped Sandpiper (NB)	Shorelines, wetland edges
17	Pectoral Sandpiper (NB)	Shorelines, wetland edges
18	Stilt Sandpiper (NB)	Shorelines, wetland edges
19	Buff-breasted Sandpiper (NB)	Short-grass areas near water
20	Short-billed Dowitcher (NB)	Shorelines, wetland edges
21	Long-billed Dowitcher (NB)	Shorelines, wetland edges
22	Caspian Tern (NB)	Shoreline, riverine islands
23	Bank Swallow	Reservoirs, quarries, exposed banks near water
Dragonflies & Damselflies		
1	Boreal bluet	Ponds, lakes
2	Western forktail	Vegetated ponds, lakes, and slow flow streams with mud substrate
3	Variable darner	Lakes, ponds, streams
4	Sulphur-tipped clubtail	Ponds, lakes, streams with mud substrate
5	Royal river cruiser	Lakes, rivers
6	Slender baskettail	Lakes, ponds, backwaters
Fish		
1	Silver lamprey	Rivers, impoundments, lakes
2	Lake sturgeon	Large rivers and lakes
3	Paddlefish	Impoundments
4	American eel	Rivers, large streams and lakes
5	Skipjack herring	Large rivers and impoundments
6	Pearl dace	Ponds and small lakes
7	Pugnose shiner	Clear, vegetated lakes
8	Blacknose shiner	Cool water rivers, streams and lakes
9	Pugnose minnow	Vegetated lakes, impoundments, and streams
10	Black buffalo	Rivers, impoundments, backwaters
11	Brown bullhead	Ponds, lakes, backwaters, impoundments, streams
12	Tadpole madtom	Vegetated lakes, impoundments, backwaters, rivers and streams
13	Redfin (Grass) pickerel	Vegetated backwaters, ponds, and small lakes
14	Pirate perch	Vegetated lakes, ponds, and backwaters
15	Burbot	Deep, cold lakes and rivers
16	Banded killifish	Lakes, ponds, and streams
17	Iowa darter	Cool creeks, ponds, and lakes

Lakes, Reservoirs, Impoundments & Surface Mines-Associated SGCN		
Group	**Common Name**	**Comments**
18	Logperch	Rivers, streams, lakes and impoundments
Mussels		
1	Fatmucket	Rivers, streams, lakes, reservoirs
2	Paper pondshell	Lakes, ponds, rivers, impoundments

Table Appendix 19- 9. Habitat Preferences of SGCN – Backwater and Oxbow Habitats

Backwater and Oxbow Habitats-Associated SGCN		
Group	**Common Name**	**Comments**
Amphibians		
1	Tiger salamander	Generalist using many types of water bodies
2	Northern leopard frog	Generalist using many types of water bodies
3	Southern leopard frog	Wetlands, ponds, backwaters, impoundments
Reptiles		
1	Snapping turtle	Generalist using many types of water bodies
2	Southern map turtle	Mississippi River and associated oxbows
3	False map turtle	Slow portions, especially oxbows, of large rivers
4	Eastern musk turtle	Herbaceous wetlands, backwaters, and spring fed ponds adjacent to sandy uplands
5	Plainbelly (Copperbelly) Water Snake	Mississippi River and associated backwaters and wet woodland
6	Diamondback Water Snake	Rivers, ponds, backwaters, oxbows
7	Common water snake	Lakes, ponds, marshes, streams, backwaters
Dragonflies & Damselflies		
1	Slender baskettail	Lakes, ponds, backwaters
Fish		
1	Paddlefish	Medium to large rivers, backwater, and impoundments
2	Western silvery minnow	Backwaters with sand or muck substrate
3	Mississippi silvery minnow	Backwaters
4	Topeka shiner	Rivers, streams, oxbows
5	Black buffalo	Backwaters, rivers, and impoundments
6	Brown bullhead	Ponds, lakes, backwaters, impoundments, and streams
7	Blue catfish	Rivers and backwaters
8	Tadpole madtom	Vegetated lakes, impoundments, backwaters, creeks, and rivers
9	Grass pickerel	Vegetated backwaters, ponds, and small lakes
10	Central mudminnow	Vegetated streams and backwaters
11	Pirate perch	Vegetated lakes, ponds, and backwaters
12	Starhead topminnow	Heavily vegetated creeks, oxbows, and backwaters, muck bottoms

Backwater and Oxbow Habitats-Associated SGCN		
Group	**Common Name**	**Comments**
13	Blackstripe topminnow	Turbid backwaters and streams
14	Plains topminnow	Clear, quiet, vegetated backwaters
15	Mud darter	Rivers and backwaters
16	Bluntnose darter	Medium or smaller sized rivers, streams, backwaters

Table Appendix 19- 10. Habitat Preferences of SGCN - Pond Habitat

Pond Habitat-Associated SGCN		
Group	**Common Name**	**Comments**
Amphibians		
1	Tiger salamander	All aquatic habitat types, esp. permanent wetlands including lakes, ponds, and prairie marshes
2	Blanchard's cricket frog	Mud banks of ponds, lakes, streams, wetlands
3	Crawfish frog (Ex)	Ponds & streams within grasslands and with abundant crayfish
4	Pickerel frog	Cold water streams, rivers, impoundments and ponds
5	Northern leopard frog	All aquatic habitat types
6	Southern leopard frog	Wetlands, ponds, backwaters, impoundments
Reptiles		
1	Snapping turtle	Aquatic habitat generalist
2	Blanding's turtle	Well-vegetated, shallow wetlands. Ponds have more limited use in Iowa by Blanding's.
3	Eastern musk turtle	Spring fed ponds near sandy uplands
4	Prairie kingsnake	Grasslands near lakes or large ponds
5	Diamondback water snake	Rivers, backwaters, oxbows, ponds
6	Common water snake	Lakes, ponds, marshes, streams, backwaters
7	Graham's crayfish snake	Ponds, sloughs, wetlands, floodplains, creeks
8	(Northern) Redbelly Snake	Woodland and adjacent grasslands near water
9	Western ribbon snake	Herbaceous wetland, ponds, streams, rivers
Birds		
1	Trumpeter Swan	Wetlands, ponds
2	Purple Martin	Ponds near towns
Crayfish		
1	Virile crayfish	Rivers, streams, ponds lacking predatory fish
Dragonflies & Damselflies		
1	Spotted spreadwing	Ponds
2	Amber-winged spreadwing	Shallow ponds and wetlands
3	Sweetflag spreadwing	
4	Prairie bluet	

Pond Habitat-Associated SGCN		
Group	**Common Name**	**Comments**
5	Taiga bluet	Ponds and wetlands
6	Boreal bluet	Fishless ponds, lakes, and slow flow streams
7	Alkali bluet	Ponds and lakes
8	Western forktail	Heavily vegetated ponds, lakes, and slow flow streams with mud substrate
9	Sedge sprite	Ponds and wetlands
10	Canada darner	Wetlands, pond edges
11	Variable darner	Lakes, ponds, streams
12	Sulphur-tipped clubtail	Ponds, lakes, streams with mud substrate
13	Slender baskettail	Lakes, ponds, and backwaters
Fish		
1	Pearl dace	Ponds and small lakes
2	Brown bullhead	Ponds, lakes, backwaters, impoundments, and streams
3	Grass pickerel	Vegetated backwaters, ponds, and small lakes
4	Pirate perch	Vegetated lakes, ponds, and backwaters
5	Banded killifish	Lakes, ponds, streams
6	Iowa darter	Cool creeks, ponds, and lakes
Mussels		
1	Flat floater	Ponds, lakes, rivers
2	Pondmussel	Small creeks and ponds
3	Pondhorn	Ponds, creeks, streams, rivers
4	Paper pondshell	Ponds, lakes, impoundments, rivers

Table Appendix 19- 11. Summary of Habitat Preferences of SGCN by Habitat Class.

Individual species are assigned to more than one habitat type if appropriate, so the total number of species exceeds the total number of SCCN.

Habitat Class	Amphibians	Reptiles	Birds	Butterflies	Crayfish	Dragonflies & Damselflies	Fish	Mammals	Mussels	Terrestrial Snails	Total
Terrestrial Habitat Classes	**28**	**55**	**149**	**56**	**2**	**8**	**2**	**35**	**0**	**5**	**340**
Forests	7	10	29	11	-	-	-	12	-	5	74
Shrubland	1	3	14	-	-	-	-	2	-	-	20
Grasslands	8	21	34	26	1	-	-	11	-	-	101
Wetlands	8	13	47	13	1	8	2	6	-	-	98
Agricultural Lands	4	8	25	6	-	-	-	4	-	-	47
Aquatic Habitat Classes	**23**	**47**	**88**	**5**	**9**	**46**	**126**	**10**	**54**	**0**	**408**
River	4	13	34	-	3	9	48	5	34	-	150
Stream	5	10	29	5	5	17	38	5	14	-	128
Lake, Reservoir, Impoundment	6	8	23	-	-	6	18	-	2	-	63
Backwater/Oxbow	2	7	-	-	-	1	16	-	-	-	26
Pond	6	9	2	-	1	13	6	-	4	-	41
Total	**51**	**102**	**237**	**61**	**11**	**54**	**128**	**45**	**54**	**5**	**748**

Appendix 20. Level II Threats to Iowa's Wildlife

Appendix 21- 1. Level II Threats to Amphibians

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level II Threats – Amphibians	Grassland	Rowcrop	Wetland	Woodland
1.1 Housing & Urban Areas	M	L	L	H
1.2 Commercial & Industrial Areas	L	L	L	-
1.3 Tourism & Recreation Areas	L	-	M	L
2.1 Annual & Perennial Non-Timber Crops	VH	NA	H	H
2.2 Wood & Pulp Plantations	-	-	-	-
2.3 Livestock Farming & Ranching	M-L	Not a Threat	L	H
2.4 Marine & Freshwater Aquaculture	-	-	-	-
3.1 Oil & Gas Drilling	-	-	-	-
3.2 Mining & Quarrying	L	-	L	L
3.3 Renewable Energy	L	-	-	L
4.1 Roads & Railroads	M	L	H	VH
4.2 Utility & Service Lines	-	L	L	L
4.3 Shipping Lanes	-	-	-	-
4.4 Flight Paths	-	-	L	-
5.1 Hunting & Collecting Terrestrial Animals	L	-	M	L
5.2 Gathering Terrestrial Plants	-	-	-	-
5.3 Logging & Wood Harvesting	-	-	-	H-L
5.4 Fishing & Harvesting Aquatic Resources	-	-	-	-
6.1 Recreational Activities	L	L	-	L
6.2 War, Civil Unrest & Military Exercises	-	-	-	-
6.3 Work & Other Activities	-	VH	-	-
7.1 Fire & Fire Suppression	M	-	L	H-M
7.2 Dams & Water Management/Use	-	VH	H	L
7.3 Other Ecosystem Modifications	M	-	L	H
7.4 Removing/Reducing Human Maintenance	M	Not a Threat	M-L	H
8.1 Invasive Non-native Alien Plants & Animals	L	Unknown	H	H
8.2 Problematic Native Plants & Animals	L	-	M	H
8.3 Introduced Genetic Material	-	Unknown	-	-
8.4 Pathogens & Microbes	L	Unknown	L	H
9.1 Household Sewage & Urban Waste Water	-	-	M	L
9.2 Industrial & Military Effluents	-	-	L	L
9.3 Agricultural & Forestry Effluents	-	L	H	M

Level II Threats – Amphibians	Grassland	Rowcrop	Wetland	Woodland
9.4 Garbage & Solid Waste	-	-	-	-
9.5 Air-borne Pollutants	L	M-L	-	L
9.6 Excess Energy	-	-	-	-
10.1 Volcanoes	-	-	-	-
10.2 Earthquakes/tsunamis	-	-	-	-
10.3 Avalanches/mudslides	-	-	-	-
11.1 Ecosystem Encroachment	Not a threat within next 10 years	Not a threat within next 10 years	Not a threat within next 10 years	Not a threat within next 10 years
11.2 Changes in Geochemical Regimes	Unknown	Unknown	Unknown	H
11.3 Changes in Temperature Regimes	M	M-L	H-M	Not a Threat
11.4 Changes in Precipitation & Broad-scale Hydrological Regimes	H	H	H-M	Not a Threat
11.5 Severe/extreme Weather Events	L	H	L	M

Appendix 21- 2. Level II Threats to Reptiles

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level II Threats – Reptiles	Grassland	Rivers	Rowcrop	Wetland	Woodland
1.1 Housing & Urban Areas	M	L	L	L	M
1.2 Commercial & Industrial Areas	L	L	L	L	-
1.3 Tourism & Recreation Areas	L	-	-	M	L
2.1 Annual & Perennial Non-Timber Crops	VH	H	NA	H	H
2.2 Wood & Pulp Plantations	-	-	-	-	-
2.3 Livestock Farming & Ranching	M	H-M	Not a Threat	H-M	H
2.4 Marine & Freshwater Aquaculture	-	L	-	L	-
3.1 Oil & Gas Drilling	-	-	-	-	-
3.2 Mining & Quarrying	L	-	-	L	L
3.3 Renewable Energy	M	-	-	L	L
4.1 Roads & Railroads	H	M	L	H	H
4.2 Utility & Service Lines	L	L	L	L	L
4.3 Shipping Lanes	-	L	-	-	-
4.4 Flight Paths	-	-	-	L	-
5.1 Hunting & Collecting Terrestrial Animals	H	L	-	L	L
5.2 Gathering Terrestrial Plants	-	-	-	-	-
5.3 Logging & Wood Harvesting	Not a Threat	-	-	-	Not a Threat

Level II Threats – Reptiles	Grassland	Rivers	Rowcrop	Wetland	Woodland
5.4 Fishing & Harvesting Aquatic Resources	-	VH	-	H	-
6.1 Recreational Activities	L	-	L	L	M
6.2 War, Civil Unrest & Military Exercises	-	-	-	-	-
6.3 Work & Other Activities	H	-	VH	-	-
7.1 Fire & Fire Suppression	VH	-	-	L	H
7.2 Dams & Water Management/Use	-	M	M	H	L
7.3 Other Ecosystem Modifications	H	L	-	L	M-L
7.4 Removing/Reducing Human Maintenance	H	Not a Threat	Not a Threat	M-L	M
8.1 Invasive Non-native Alien Plants & Animals	H	-	Unknown	H-L	H
8.2 Problematic Native Plants & Animals	H	H	-	H	H
8.3 Introduced Genetic Material	-	Unknown	Unknown	Unknown	-
8.4 Pathogens & Microbes	L	L	-	L	M-L
9.1 Household Sewage & Urban Waste Water	L	M-L	-	M	L
9.2 Industrial & Military Effluents	L	L	-	L	L
9.3 Agricultural & Forestry Effluents	L	H	L	H	L
9.4 Garbage & Solid Waste	L	L	-	-	L
9.5 Air-borne Pollutants	M	-	L	H	L
9.6 Excess Energy	-	L	-	-	-
10.1 Volcanoes	-	-	-	-	-
10.2 Earthquakes/tsunamis	-	-	-	-	-
10.3 Avalanches/mudslides	-	-	-	-	-
11.1 Ecosystem Encroachment	Not a threat within the next 10 years	Not a threat within the next 10 years	Not a threat within the next 10 years	Not a threat within the next 10 years	Not a threat within the next 10 years
11.2 Changes in Geochemical Regimes	Unknown	Unknown	Unknown	Unknown	Unknown
11.3 Changes in Temperature Regimes	M	L	M	H-M	M
11.4 Changes in Precipitation & Broad-scale Hydrological Regimes	H	H-M	H	H-M	H
11.5 Severe/extreme Weather Events	M	H	M	M	M

Appendix 21- 3. Level II Threats to Birds

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level II Threats – Birds	Grassland	Shrubland	Rowcrop	Woodland	Wetland
1.1 Housing & Urban Areas	L	M	L	M	L
1.2 Commercial & Industrial Areas	L	L	L	-	L
1.3 Tourism & Recreation Areas	L	L	-	L	-
2.1 Annual & Perennial Non-Timber Crops	VH	H	NA	H	H
2.2 Wood & Pulp Plantations	-	-	-	-	-
2.3 Livestock Farming & Ranching	H	M	Not a Threat	H	M
2.4 Marine & Freshwater Aquaculture	-	-	Not a Threat	-	Not a Threat
3.1 Oil & Gas Drilling	-	-	-	-	-
3.2 Mining & Quarrying	L	-	-	L	L
3.3 Renewable Energy	M	-	L	L	M
4.1 Roads & Railroads	M	M	-	H	H
4.2 Utility & Service Lines	L	L	L	L	M
4.3 Shipping Lanes	-	-	Not a Threat	-	Not a Threat
4.4 Flight Paths	-	-	-	-	L
5.1 Hunting & Collecting Terrestrial Animals	-	-	-	Not a Threat	-
5.2 Gathering Terrestrial Plants	-	-	-	-	-
5.3 Logging & Wood Harvesting	-	-	-	H-M	-
5.4 Fishing & Harvesting Aquatic Resources	-	-	Not a Threat	-	L
6.1 Recreational Activities	L	L	L	H-L	L
6.2 War, Civil Unrest & Military Exercises	-	-	Not a Threat	-	-
6.3 Work & Other Activities	H	-	M	-	-
7.1 Fire & Fire Suppression	VH	H	-	H	M
7.2 Dams & Water Management/Use	-	L	VH	-	H
7.3 Other Ecosystem Modifications	H-M	L	L	H-M	L
7.4 Removing/Reducing Human Maintenance	H	L	Not a Threat	M	L
8.1 Invasive Non-native Alien Plants & Animals	VH	H	L	H	H
8.2 Problematic Native Plants & Animals	H	M	-	H	M
8.3 Introduced Genetic Material	M	-	Unknown	-	Unknown

Level II Threats – Birds	Grassland	Shrubland	Rowcrop	Woodland	Wetland
8.4 Pathogens & Microbes	Unknown	Unknown	Unknown	H	L
9.1 Household Sewage & Urban Waste Water	L	L	-	L	L
9.2 Industrial & Military Effluents	L	-	-	L	L
9.3 Agricultural & Forestry Effluents	L	L	L	L	VH
9.4 Garbage & Solid Waste	L	-	-	L	Unknown
9.5 Air-borne Pollutants	H	M	L	L	-
9.6 Excess Energy	Not a Threat	-	-	-	-
10.1 Volcanoes	-	-	-	-	-
10.2 Earthquakes/tsunamis	-	-	-	-	-
10.3 Avalanches/mudslides	-	-	-	-	-
11.1 Ecosystem Encroachment	Not a threat within the next 10 years	Not a threat within the next 10 years	Not a threat within the next 10 years	Not a threat within the next 10 years	Not a threat within the next 10 years
11.2 Changes in Geochemical Regimes	Unknown	Unknown	Unknown	Unknown	Unknown
11.3 Changes in Temperature Regimes	M	M	H-L	M	H
11.4 Changes in Precipitation & Broad-scale Hydrological Regimes	H	H	H-L	H	H
11.5 Severe/extreme Weather Events	H	M	H-L	M	H

Appendix 21- 4. Level II Threats to Butterflies

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level II Threats – Butterflies	Grassland	Rowcrop	Wetland	Woodland
1.1 Housing & Urban Areas	M	-	L	L
1.2 Commercial & Industrial Areas	L	L	L	-
1.3 Tourism & Recreation Areas	L	Not a Threat	-	L
2.1 Annual & Perennial Non-Timber Crops	VH	NA	H	M
2.2 Wood & Pulp Plantations	-	Not a Threat	-	-
2.3 Livestock Farming & Ranching	M-L	Not a Threat	M-L	L
2.4 Marine & Freshwater Aquaculture	-	-	-	-
3.1 Oil & Gas Drilling	-	-	-	-
3.2 Mining & Quarrying	L	-	L	L
3.3 Renewable Energy	M-L	Not a Threat	L	L
4.1 Roads & Railroads	L	Not a Threat	L	L
4.2 Utility & Service Lines	L	L	L	Not a Threat

Level II Threats – Butterflies	Grassland	Rowcrop	Wetland	Woodland
4.3 Shipping Lanes	-	-	-	-
4.4 Flight Paths	-	-	-	-
5.1 Hunting & Collecting Terrestrial Animals	L	-	-	-
5.2 Gathering Terrestrial Plants	-	-	-	L
5.3 Logging & Wood Harvesting	-	-	-	M
5.4 Fishing & Harvesting Aquatic Resources	-	-	-	-
6.1 Recreational Activities	L	-	L	-
6.2 War, Civil Unrest & Military Exercises	-	-	-	-
6.3 Work & Other Activities	M	M	-	-
7.1 Fire & Fire Suppression	VH-M	-	L	L
7.2 Dams & Water Management/Use	-	L	H	-
7.3 Other Ecosystem Modifications	M	-	L	L
7.4 Removing/Reducing Human Maintenance	M	Not a Threat	L	M
8.1 Invasive Non-native Alien Plants & Animals	M	Not a Threat	H	L
8.2 Problematic Native Plants & Animals	M	Not a Threat	M	L
8.3 Introduced Genetic Material	L	Unknown	Unknown	-
8.4 Pathogens & Microbes	L	Unknown	L	M-L
9.1 Household Sewage & Urban Waste Water	-	-	L	-
9.2 Industrial & Military Effluents	-	-	L	-
9.3 Agricultural & Forestry Effluents	L	-	M	L
9.4 Garbage & Solid Waste	-	-	-	-
9.5 Air-borne Pollutants	H	M-L	-	L
9.6 Excess Energy	-	-	-	-
10.1 Volcanoes	-	-	-	-
10.2 Earthquakes/tsunamis	-	-	-	-
10.3 Avalanches/mudslides	-	-	-	-
11.1 Ecosystem Encroachment	Not a threat within next 10 years	-	Not a threat within next 10 years	L
11.2 Changes in Geochemical Regimes	Unknown	Unknown	Unknown	-
11.3 Changes in Temperature Regimes	M	M	M	M
11.4 Changes in Precipitation & Broad-scale Hydrological Regimes	H-M	H	H	M-L
11.5 Severe/extreme Weather Events	L	L	L	L

Appendix 21- 5. Level II Threats to Crayfish

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level II Threats – Crayfish	All Aquatic Habitat Types
1.1 Housing & Urban Areas	M
1.2 Commercial & Industrial Areas	M
1.3 Tourism & Recreation Areas	-
2.1 Annual & Perennial Non-Timber Crops	M
2.2 Wood & Pulp Plantations	-
2.3 Livestock Farming & Ranching	M
2.4 Marine & Freshwater Aquaculture	L
3.1 Oil & Gas Drilling	-
3.2 Mining & Quarrying	L
3.3 Renewable Energy	L
4.1 Roads & Railroads	L
4.2 Utility & Service Lines	L
4.3 Shipping Lanes	L
4.4 Flight Paths	-
5.1 Hunting & Collecting Terrestrial Animals	-
5.2 Gathering Terrestrial Plants	-
5.3 Logging & Wood Harvesting	L
5.4 Fishing & Harvesting Aquatic Resources	L
6.1 Recreational Activities	-
6.2 War, Civil Unrest & Military Exercises	-
6.3 Work & Other Activities	-
7.1 Fire & Fire Suppression	-
7.2 Dams & Water Management/Use	VH
7.3 Other Ecosystem Modifications	M
7.4 Removing/Reducing Human Maintenance	-
8.1 Invasive Non-native Alien Plants & Animals	H
8.2 Problematic Native Plants & Animals	L
8.3 Introduced Genetic Material	Unknown
8.4 Pathogens & Microbes	Unknown
9.1 Household Sewage & Urban Waste Water	L
9.2 Industrial & Military Effluents	L
9.3 Agricultural & Forestry Effluents	H
9.4 Garbage & Solid Waste	L
9.5 Air-borne Pollutants	L
9.6 Excess Energy	L
10.1 Volcanoes	-

Level II Threats – Crayfish	All Aquatic Habitat Types
10.2 Earthquakes/tsunamis	-
10.3 Avalanches/mudslides	-
11.1 Ecosystem Encroachment	Not a threat within the next 10 years
11.2 Changes in Geochemical Regimes	Unknown
11.3 Changes in Temperature Regimes	M
11.4 Changes in Precipitation & Broad-scale Hydrological Regimes	H-M
11.5 Severe/extreme Weather Events	L

Appendix 21- 6. Level II Threats to Dragonflies and Damselflies

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level II Threats – Dragonflies & Damselflies	Grassland	Rivers	Rowcrop	Wetland	Woodland
1.1 Housing & Urban Areas	M	L	-	L	L
1.2 Commercial & Industrial Areas	L	L	-	L	-
1.3 Tourism & Recreation Areas	L	L	Not a Threat	-	L
2.1 Annual & Perennial Non-Timber Crops	VH	-	NA	VH	H
2.2 Wood & Pulp Plantations	-	-	-	-	-
2.3 Livestock Farming & Ranching	L	L	Not a Threat	L	L
2.4 Marine & Freshwater Aquaculture	-	L	-	-	-
3.1 Oil & Gas Drilling	-	-	-	-	-
3.2 Mining & Quarrying	L	L	Not a Threat	L	L
3.3 Renewable Energy	L	L	-	-	L
4.1 Roads & Railroads	L	L	Not a Threat	M	-
4.2 Utility & Service Lines	-	-	-	L	-
4.3 Shipping Lanes	-	-	-	-	-
4.4 Flight Paths	-	-	-	L	-
5.1 Hunting & Collecting Terrestrial Animals	-	-	-	-	-
5.2 Gathering Terrestrial Plants	-	-	-	-	-
5.3 Logging & Wood Harvesting	-	-	-	-	L
5.4 Fishing & Harvesting Aquatic Resources	-	-	-	-	-
6.1 Recreational Activities	-	-	-	-	-
6.2 War, Civil Unrest & Military Exercises	-	-	-	-	-

Level II Threats – Dragonflies & Damselflies	Grassland	Rivers	Rowcrop	Wetland	Woodland
6.3 Work & Other Activities	L	-	L	-	-
7.1 Fire & Fire Suppression	M	-	-	L	-
7.2 Dams & Water Management/Use	-	H	VH	VH	-
7.3 Other Ecosystem Modifications	-	-	-	-	-
7.4 Removing/Reducing Human Maintenance	L	-	Not a Threat	-	-
8.1 Invasive Non-native Alien Plants & Animals	Unknown	Unknown	Unknown	Unknown	Unknown
8.2 Problematic Native Plants & Animals	-	-	-	L	-
8.3 Introduced Genetic Material	Unknown	Unknown	Unknown	Unknown	Unknown
8.4 Pathogens & Microbes	-	-	-	Unknown	-
9.1 Household Sewage & Urban Waste Water	-	L	-	L	-
9.2 Industrial & Military Effluents	-	M	-	L	-
9.3 Agricultural & Forestry Effluents	-	VH	-	H	-
9.4 Garbage & Solid Waste	-	-	-	-	-
9.5 Air-borne Pollutants	L	-	L	-	-
9.6 Excess Energy	-	-	-	-	-
10.1 Volcanoes	-	-	-	-	-
10.2 Earthquakes/tsunamis	-	-	-	-	-
10.3 Avalanches/mudslides	-	-	-	-	-
11.1 Ecosystem Encroachment	-	-	-	-	-
11.2 Changes in Geochemical Regimes	Unknown	Unknown	Unknown	Unknown	Unknown
11.3 Changes in Temperature Regimes	M	M	M	M	M
11.4 Changes in Precipitation & Broad-scale Hydrological Regimes	H	H	H	H	H
11.5 Severe/extreme Weather Events	L	L	L	L	L

Appendix 21- 7. Level II Threats to Fish

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level II Threats – Fish	All Aquatic Habitat Types
1.1 Housing & Urban Areas	H
1.2 Commercial & Industrial Areas	M
1.3 Tourism & Recreation Areas	-
2.1 Annual & Perennial Non-Timber Crops	M
2.2 Wood & Pulp Plantations	-
2.3 Livestock Farming & Ranching	H
2.4 Marine & Freshwater Aquaculture	M
3.1 Oil & Gas Drilling	-
3.2 Mining & Quarrying	M
3.3 Renewable Energy	M
4.1 Roads & Railroads	L
4.2 Utility & Service Lines	L
4.3 Shipping Lanes	L
4.4 Flight Paths	-
5.1 Hunting & Collecting Terrestrial Animals	-
5.2 Gathering Terrestrial Plants	-
5.3 Logging & Wood Harvesting	L
5.4 Fishing & Harvesting Aquatic Resources	L
6.1 Recreational Activities	-
6.2 War, Civil Unrest & Military Exercises	-
6.3 Work & Other Activities	-
7.1 Fire & Fire Suppression	-
7.2 Dams & Water Management/Use	VH
7.3 Other Ecosystem Modifications	M
7.4 Removing/Reducing Human Maintenance	-
8.1 Invasive Non-native Alien Plants & Animals	H
8.2 Problematic Native Plants & Animals	L
8.3 Introduced Genetic Material	Unknown
8.4 Pathogens & Microbes	L
9.1 Household Sewage & Urban Waste Water	L
9.2 Industrial & Military Effluents	L
9.3 Agricultural & Forestry Effluents	H
9.4 Garbage & Solid Waste	L
9.5 Air-borne Pollutants	L
9.6 Excess Energy	L
10.1 Volcanoes	-

10.2 Earthquakes/tsunamis	-
10.3 Avalanches/mudslides	-
11.1 Ecosystem Encroachment	Not a significant impact within next 10 years
11.2 Changes in Geochemical Regimes	Unknown
11.3 Changes in Temperature Regimes	H
11.4 Changes in Precipitation & Broad-scale Hydrological Regimes	M
11.5 Severe/extreme Weather Events	L

Appendix 21- 8. Level II Threats to Mammals

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level II Threats – Mammals	Grassland	Rivers	Rowcrop	Wetland	Woodland
1.1 Housing & Urban Areas	L	L	L	L	M
1.2 Commercial & Industrial Areas	L	L	L	L	-
1.3 Tourism & Recreation Areas	L	-	-	Not a Threat	M-L
2.1 Annual & Perennial Non-Timber Crops	VH	VH	NA	VH	H
2.2 Wood & Pulp Plantations	-	-	-	-	-
2.3 Livestock Farming & Ranching	M	H	Not a Threat	M	M
2.4 Marine & Freshwater Aquaculture	-	-	-	-	-
3.1 Oil & Gas Drilling	-	-	-	-	-
3.2 Mining & Quarrying	L	-	-	-	L
3.3 Renewable Energy	L	-	L	L	L
4.1 Roads & Railroads	M	L	L	M	M
4.2 Utility & Service Lines	Not a Threat	L	L	L	L
4.3 Shipping Lanes	-	L	-	L	-
4.4 Flight Paths	-	-	-	-	-
5.1 Hunting & Collecting Terrestrial Animals	L	-	-	-	Not a Threat
5.2 Gathering Terrestrial Plants	-	-	-	-	-
5.3 Logging & Wood Harvesting	-	-	-	-	H-L
5.4 Fishing & Harvesting Aquatic Resources	-	-	-	-	-
6.1 Recreational Activities	L	-	L	-	M
6.2 War, Civil Unrest & Military Exercises	-	-	-	-	-
6.3 Work & Other Activities	M	-	M	-	-
7.1 Fire & Fire Suppression	M	-	-	L	M

Level II Threats – Mammals	Grassland	Rivers	Rowcrop	Wetland	Woodland
7.2 Dams & Water Management/Use	-	H	L	VH	L
7.3 Other Ecosystem Modifications	H	L	-	L	L
7.4 Removing/Reducing Human Maintenance	H	Not a Threat	Not a Threat	M-L	M
8.1 Invasive Non-native Alien Plants & Animals	H	L	M	L	L
8.2 Problematic Native Plants & Animals	M	-	-	L	L
8.3 Introduced Genetic Material	Unknown	Unknown	Unknown	Unknown	Unknown
8.4 Pathogens & Microbes	L	Unknown	Unknown	Unknown	M
9.1 Household Sewage & Urban Waste Water	L	M-L	-	L	L
9.2 Industrial & Military Effluents	L	L	-	L	L
9.3 Agricultural & Forestry Effluents	L	H	L	H	L
9.4 Garbage & Solid Waste	L	-	L	-	L
9.5 Air-borne Pollutants	L	-	L	-	-
9.6 Excess Energy	-	-	-	-	-
10.1 Volcanoes	-	-	-	-	-
10.2 Earthquakes/tsunamis	-	-	-	-	-
10.3 Avalanches/mudslides	-	-	-	-	-
11.1 Ecosystem Encroachment	Not a threat within next 10 years	Not a threat within next 10 years	Not a threat within next 10 years	Not a threat within next 10 years	Not a threat within next 10 years
11.2 Changes in Geochemical Regimes	Unknown	L	Unknown	-	Not a threat within next 10 years
11.3 Changes in Temperature Regimes	-	-	-	-	Not a threat within next 10 years
11.4 Changes in Precipitation & Broad-scale Hydrological Regimes	M	H	L	H	Not a threat within next 10 years
11.5 Severe/extreme Weather Events	L	H	L	M	Not a threat within next 10 years

Appendix 21- 9. Level II Threats to Mussels

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level II Threats – Mussels	All Aquatic Habitat Types
1.1 Housing & Urban Areas	M
1.2 Commercial & Industrial Areas	L
1.3 Tourism & Recreation Areas	M
2.1 Annual & Perennial Non-Timber Crops	VH
2.2 Wood & Pulp Plantations	-
2.3 Livestock Farming & Ranching	VH
2.4 Marine & Freshwater Aquaculture	L
3.1 Oil & Gas Drilling	-
3.2 Mining & Quarrying	L
3.3 Renewable Energy	L
4.1 Roads & Railroads	H
4.2 Utility & Service Lines	M
4.3 Shipping Lanes	L
4.4 Flight Paths	-
5.1 Hunting & Collecting Terrestrial Animals	-
5.2 Gathering Terrestrial Plants	-
5.3 Logging & Wood Harvesting	L
5.4 Fishing & Harvesting Aquatic Resources	H
6.1 Recreational Activities	M
6.2 War, Civil Unrest & Military Exercises	-
6.3 Work & Other Activities	-
7.1 Fire & Fire Suppression	L
7.2 Dams & Water Management/Use	VH
7.3 Other Ecosystem Modifications	L
7.4 Removing/Reducing Human Maintenance	-
8.1 Invasive Non-native Alien Plants & Animals	M
8.2 Problematic Native Plants & Animals	-
8.3 Introduced Genetic Material	-
8.4 Pathogens & Microbes	-
9.1 Household Sewage & Urban Waste Water	H
9.2 Industrial & Military Effluents	H
9.3 Agricultural & Forestry Effluents	VH
9.4 Garbage & Solid Waste	L
9.5 Air-borne Pollutants	-
9.6 Excess Energy	M
10.1 Volcanoes	-

Level II Threats – Mussels	All Aquatic Habitat Types
10.2 Earthquakes/tsunamis	-
10.3 Avalanches/mudslides	-
11.1 Ecosystem Encroachment	Unknown
11.2 Changes in Geochemical Regimes	L
11.3 Changes in Temperature Regimes	H
11.4 Changes in Precipitation & Broad-scale Hydrological Regimes	VH
11.5 Severe/extreme Weather Events	VH

Appendix 21- 10. Level II Threats to Terrestrial Snails

Impact level: **L** = Low, **M** = Medium, **H** = High, **VH** = Very High (Negligible threats demarked with a dash)

Level II Threats to Terrestrial Snails	Driftless Area Forest
1.1 Housing & Urban Areas	M
1.2 Commercial & Industrial Areas	-
1.3 Tourism & Recreation Areas	L
2.1 Annual & Perennial Non-Timber Crops	M
2.2 Wood & Pulp Plantations	-
2.3 Livestock Farming & Ranching	L
2.4 Marine & Freshwater Aquaculture	-
3.1 Oil & Gas Drilling	-
3.2 Mining & Quarrying	L
3.3 Renewable Energy	L
4.1 Roads & Railroads	M
4.2 Utility & Service Lines	L
4.3 Shipping Lanes	-
4.4 Flight Paths	-
5.1 Hunting & Collecting Terrestrial Animals	-
5.2 Gathering Terrestrial Plants	-
5.3 Logging & Wood Harvesting	H
5.4 Fishing & Harvesting Aquatic Resources	-
6.1 Recreational Activities	L
6.2 War, Civil Unrest & Military Exercises	-
6.3 Work & Other Activities	-
7.1 Fire & Fire Suppression	M
7.2 Dams & Water Management/Use	L
7.3 Other Ecosystem Modifications	M
7.4 Removing/Reducing Human Maintenance	L

8.1 Invasive Non-native Alien Plants & Animals	M
8.2 Problematic Native Plants & Animals	M
8.3 Introduced Genetic Material	-
8.4 Pathogens & Microbes	L
9.1 Household Sewage & Urban Waste Water	L
9.2 Industrial & Military Effluents	L
9.3 Agricultural & Forestry Effluents	L
9.4 Garbage & Solid Waste	-
9.5 Air-borne Pollutants	L
9.6 Excess Energy	-
10.1 Volcanoes	-
10.2 Earthquakes/tsunamis	-
10.3 Avalanches/mudslides	-
11.1 Ecosystem Encroachment	Not a threat within next 10 years
11.2 Changes in Geochemical Regimes	Unknown
11.3 Changes in Temperature Regimes	H
11.4 Changes in Precipitation & Broad-scale Hydrological Regimes	H-M
11.5 Severe/extreme Weather Events	H

Appendix 21. Climate Change Vulnerability Report for Species of Conservation Concern in Iowa

This assessment was conducted from 2009-2011. The SGCN included were those designated at that time and differ from the SGCN in the 2015 revision.

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Abstract

Climate change is currently affecting wildlife populations across the globe and will increasingly become an important concern for wildlife managers. The Iowa Department of Natural Resources worked in collaboration with wildlife experts from across the state to create this climate change vulnerability assessment of species of interest and species of conservation need in Iowa. NatureServe's Climate Change Vulnerability Index tool was used, along with species specific assessments and predictions of Iowa's future climate, in order to produce information about the degree to which each species may be affected by climate change by the end of the 21st century. The results show that about 44% of the Iowa species assessed will be vulnerable to climate change. The purpose of this assessment is to help inform management efforts and identify wildlife populations that may be of conservation need in the future. Managers should use the results of this assessment, as well as continued monitoring, to design and implement effective conservation practices as climate change continues to affect Iowa's landscape.

Explanation and Purpose of Assessment

Climate change is transforming ecosystems across the Earth and affecting wildlife populations adapted to current climatic characteristics that are rapidly becoming a part of the past (Parmesan and Yohe 2003). Many of the climate changes being seen have occurred within the last 50 years. These changes are predicted to continue and likely increase (Glick et al., 2011). Heavy rain and extended drought are becoming more extreme and more common (Glick et al., 2011). Seasonal changes in temperature are affecting the timing of plant and animal life cycle events such as blooming, migration, and breeding. These changes in phenology have a cascade effect that can decouple important ecological symbioses that are essential for the survival of many species.

The Iowa Climate Change Impacts Committee prepared a report in 2011 highlighting data showing the changes that have already occurred in Iowa over the last 50 years and predicted that these changes would continue into the future (Mutel 2011). Nightly low temperatures and daily high temperatures in the winter have increased. However, the daily maximum temperatures in summer have decreased. Precipitation patterns have shifted towards wetter springs and drier autumns and humidity levels in Iowa have also increased (Mutel 2011). Higher humidity levels augment the amount of moisture in the atmosphere which can increase the occurrence and severity of storms. The model used by the Iowa Climate Change Impacts Committee shows that there will be a 21% increase in precipitation by 2040. They point out that this could lead to a 50% increase in streamflow in the Upper Mississippi River basin, indicating that the potential for flooding will also increase. Earlier and quicker snow melt will also contribute to increased streamflow, runoff, and flooding.

Changes in climate will impact wildlife in different ways. Habitat loss and change can increase the spread of non-native species and cause the decline of native species that may no longer be able to survive where they have adapted to live. Stream temperatures are predicted to increase, which will affect species that are dependent on cold water. Higher temperatures may further shift the timing of life cycle events like migration, hibernation, breeding, and flowering. Changes in species life cycle events can increase the occurrence of disease and can decouple important

species interactions. These impacts are already being seen in the Midwest and across the globe. Habitat fragmentation and loss is a challenge that wildlife already faces, and this will exacerbate the effects of climate change. The complex effects of climate change and varying degree to which climate change will affect different species makes the challenges associated with this phenomenon a complicated conservation management issue.

In response to the environmental impacts of climate change, managers are going to have to adapt their practices as the threats facing wildlife populations shift with the climate. The current challenges wildlife populations face may intensify the effects of climate change, making threatened species more vulnerable. Conversely, species that were once common may become less common.

The climate assessment detailed in this document builds on research that was done to identify species of greatest conservation need for the Iowa Wildlife Action Plan, which was drafted to help managers keep common species common and understand what species are of conservation need. This assessment identifies species which may be vulnerable to climate change in order to improve and inform management strategies that will have to address any increased vulnerability of species and habitats.

Methodology

The Iowa Climate Change Vulnerability Assessment predicted climate vulnerability for 330 species in the state. Iowa's Species of Greatest Conservation Need (SGCN), as determined by the Iowa Wildlife Action Plan, were included, as well as several non-SGCN species that are associated with key habitats.

NatureServe's Climate Change Vulnerability Index tool (CCVI), which is available for free download at https://connect.natureserve.org/science/climate-change, was used to complete this assessment. This method was chosen because of its low cost and its relatively rapid means of assessing a large number of species. The predicted climate changes used in the assessment were derived from www.climatewizard.org , which produces climate change predictions on geographical temperature and precipitation shifts. These predictions are based on various user-chosen settings. For this assessment a medium emission scenario was selected and multiple General Circulation Models were averaged to predict climatic conditions at the end of the 21st century in Iowa.

NatureServe's Climate Change Vulnerability Index tool combines information about predicted climatic conditions with information from individual species assessments to determine the potential degree to which each species will be affected by climate change. The Iowa Wildlife Action Plan Implementation Committee has a Wildlife Working Group, which oversees a group of taxonomic subcommittees, one for each taxon covered by the Action Plan. Members of these taxonomic subcommittees, which are populated by experts in the relevant taxa, collaborated to complete the species assessments. The CCVI tool considers species exposure and species sensitivity in order to make a prediction about the possible affects climate change will have on a population. Species exposure covers the degree to which temperature and precipitation is predicted to change across the species' range. Species sensitivity includes species characteristics such as diet, habitat preferences, genetic variation within the population, and dispersal abilities which are indicators of how resilient or adaptable a population may be to the effects of climate change.

This project did not evaluate the vulnerability of species to all potential threats. It is solely focused on vulnerability to *climate* change. The species assessments identify factors that make a species vulnerable specifically to climate change, separate from any unrelated threats that the species may currently be facing. Is it important to identify how a species will specifically be vulnerable to climate change independently of current environmental challenges because current environmental issues may change with the climate, making it possible that species that are currently

of conservation need may benefit from climate change. Conversely, species that are not of conservation concern today may decline in the future if they are particularly susceptible to the environmental effects of climate change.

General Findings

Out of the 335 Iowa species that were assessed, 151 species, or about 45%, were predicted to be vulnerable to climate change (Table Appendix 21- 1). About 33% of the species assessed were presumed stable and about 22% were predicted to have population increases (Table Appendix 21- 1). Overall, the mollusks, amphibians, and reptiles appeared to be the most vulnerable taxa. The mollusks had the highest number of extremely vulnerable species (38 species or 95%) and did not have any species that were predicted to increase (Figure Appendix 21- 1). Amphibians and reptiles also did not include any species that were predicted to increase. One amphibian species was presumed stable and the reptiles had two presumed stable species (Figure Appendix 21- 1). The breeding birds had the highest percent (61%) of species with populations that were predicted to increase (Figure Appendix 21- 1). Only seven of the breeding birds were predicted to be vulnerable to climate change (Table Appendix 21- 1). In reality, a higher percentage of the birds assessed will likely be vulnerable to climate change due to the threats they face outside of Iowa during different parts of their life cycle. The mammals, fish, and odonates had the majority of their species fall into either the presumed stable or likely to increase categories. Out of these three taxa the fish had the highest number of vulnerable species (Fish = 29, Mammals = 9, Odonates = 12).

Table Appendix 21- 1. Number of species in each index category by taxonomic group

	Amphibians	Reptiles	Breeding Birds	Fish	Mammals	Mollusks	Butterflies	Odonates	Total
Extremely Vulnerable	5	8	1	3	2	38	10	5	**72**
Highly Vulnerable	1	6	0	4	3	0	4	3	**21**
Moderately Vulnerable	2	7	6	22	4	1	12	4	**58**
Presumed Stable	1	2	28	37	10	1	18	13	**110**
Increase Likely	0	0	54	8	7	0	2	3	**74**
Total	**9**	**23**	**89**	**74**	**26**	**40**	**46**	**28**	

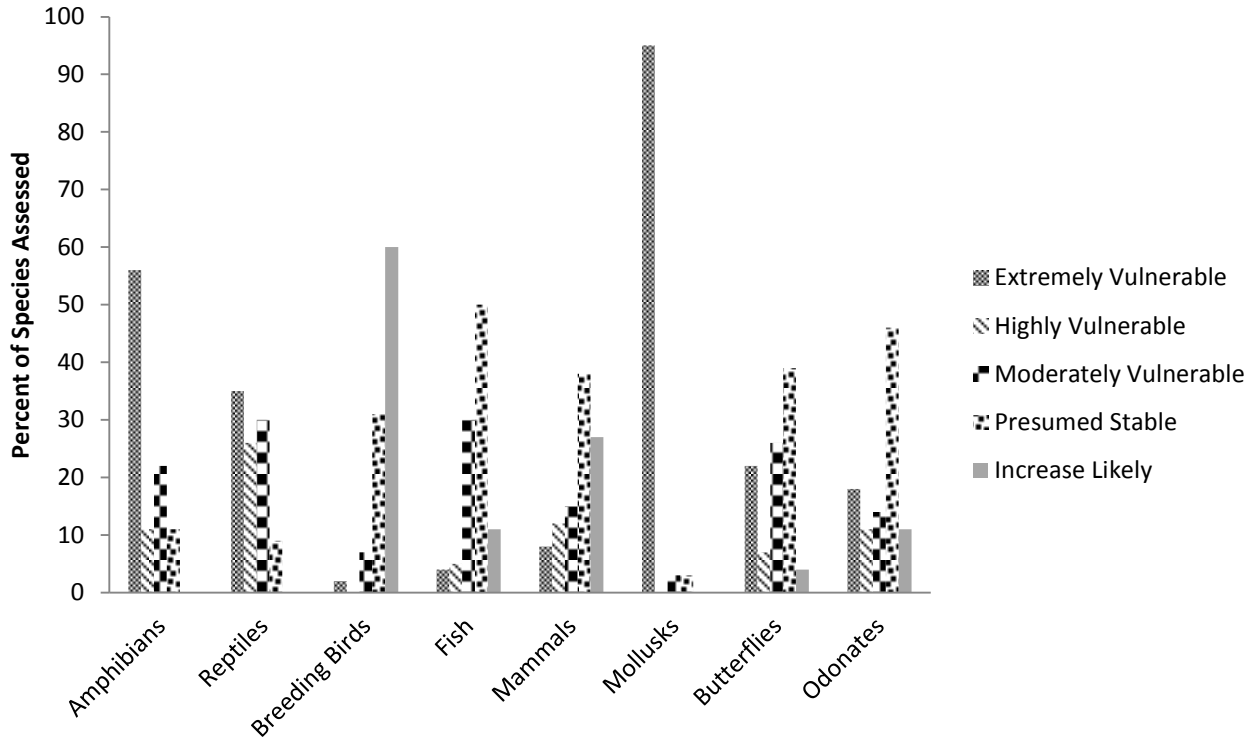

Figure Appendix 21- 1. The percent of species per taxon in each vulnerability index category

Results by Taxonomic Group:

Amphibians

The amphibian taxon was predicted to be very vulnerable to climate change. In this assessment the amphibian and one non-SGCN species were considered. All of the nine species assessed, except the Plains Spadefoot, are predicted to be vulnerable to climate change, and two-thirds were predicted to be extremely or highly vulnerable (

Table Appendix 21- 2). This assessment predicted that, in response to climate change, two of the amphibian species, the Smallmouth Salamander (*Ambystoma laterale*) and the Crawfish Frog (*Lithobates areolata*), may expand their current ranges. Crawfish Frogs haven't been documented in Iowa since the 1940's, so any occurrence in Iowa would represent a re-expansion into formerly inhabited range. Although amphibians are generally fairly mobile, they cannot travel extremely long distances and may face barriers to movement, such as roads and other anthropogenic and natural features on the landscape. These barriers could prevent them from escaping the effects of climate change by traveling to a suitable niche in a new location. Dispersal and range shifts may also put species into areas with new predators and different prey availability. Species that have specific habitat and temperature requirements may also have difficulty finding a new location that fits their needs. Changes in temperature are also associated with susceptibility to disease and can change breeding times in this taxon (Kingsbury and Gibson 2012).

Table Appendix 21- 2. Climate change vulnerability of amphibians assessed in Iowa

Species names in bold are either federally or state listed as threatened or endangered. See appendix 14 for NatureServe's state rank definitions and appendix 15 for specific threatened and endangered species listings. Common names with an asterisk (*) were non-SGCN species during time of assessment (2009-2011).

	Species	State Rank	Associated Habitat	Index Score
1	Cricket Frog (*Acris crepitans*)	S3?	Shallow wetlands/streams	Extremely Vulnerable
2	**Blue-spotted Salamander (*Ambystoma laterale*)**	S1	Woodland pools/open woods	Extremely Vulnerable
3	Smallmouth Salamander (*Ambystoma texanum*)	S3	Woodland pools/open woods	Extremely Vulnerable
4	**Mudpuppy (*Necturus maculosus*)**	S2	Clean rivers, streams, lakes, and reservoirs	Extremely Vulnerable
5	**Central Newt (*Notophthalmus viridescens*)**	SNR	Vegetated woodland ponds, roadside flooded ditches and adjacent habitat	Extremely Vulnerable
6	*Eastern Tiger Salamander (*Ambystoma tigrinum*)	S5	Habitat generalist	Highly Vulnerable
7	Great Plains Toad (*Anaxyrus cognatus*)	S4	Prairie/nonnative grassland	Moderately Vulnerable
8	**Crawfish Frog (*Lithobates areolata*)**	S1	Prairie marshes, ponds and river floodplains	Moderately Vulnerable
9	Plains Spadefoot (*Spea bombifrons*)	S4	Loess Hills	Presumed Stable

Reptiles

All reptile species of greatest conservation need and one non-SGCN species were assessed. Only two of the 23 reptile species assessed were predicted to maintain stable populations and no species were predicted to increase, leaving 21 reptile species that are predicted to be vulnerable to climate change (Table Appendix 21- 3). Reptiles face many of the same adaptation challenges as amphibians. Anthropogenic and natural barriers can inhibit dispersal of reptile species into a habitat with preferred characteristics. Temperature and habitat requirements also limit the number of areas reptiles will be able to move into. As with any species, reptiles with a more generalized diet and less specific habitat requirements may have a better response to the predicted changes in climate. Changes in temperature have also been linked to shifts in sex ratios because incubation temperature affects sex determination in some reptile species (Mitchell and Janzen 2010). This could affect the success of reproduction and thus influence the persistence of a species.

Table Appendix 21- 3. Climate change vulnerability of reptiles assessed in Iowa

Species names in bold are either federally or state listed as threatened or endangered. See appendix 14 for NatureServe's state rank definitions and appendix 15 for specific threatened and endangered species listings. Common names with an asterisk (*) were non-SGCN species during time of assessment (2009-2011).

	Species	State Rank	Habitat Preference	Index Score
1	**Yellow Mud Turtle (*Kinosternon flavescens*)**	S1	Shallow, ephemeral pools adjacent nearly pure sand soils	Extremely Vulnerable
2	**Great Plains Skink (*Eumeces (Plestiodon) obsoletus*)**	S1	Rocky/loess prairie and forest edge	Extremely Vulnerable
3	**Copperbelly Water Snake (*Nerodia erythrogaster neglecta*)**	S1	Backwater sloughs, forested wetland	Extremely Vulnerable

	Species	State Rank	Habitat Preference	Index Score
4	**Massasauga (*Sistrurus catenatus*)**	S1	Early successional wetland and upland grassland	Extremely Vulnerable
5	**Prairie Rattlesnake (*Crotalus viridis*)**	S1	Prairie	Extremely Vulnerable
6	**Blanding's Turtle (*Emydoidea blandingii*)**	S3	Shallow well-vegetated wetlands	Extremely Vulnerable
7	**Common Musk Turtle (*Sternotherus odoratus*)**	S2	Backwaters and spring fed ponds adjacent to sandy uplands	Extremely Vulnerable
8	**Wood Turtle (*Glyptemys insculpta*)**	S1	Floodplain forest, rivers	Extremely Vulnerable
9	**Ornate Box Turtle (*Terrapene ornatus*)**	S2	Sand/loess prairie, savanna	Highly Vulnerable
10	**Slender Glass Lizard (*Ophisaurus attenuates*)**	S1	Prairie, pastures, forest edge, savanna	Highly Vulnerable
11	Northern Prairie Skink (*Eumeces (Plestiodon) septentrionalis*)	S3	Sandy/loess prairie-forest edge, wetland edge	Highly Vulnerable
12	Smooth Green Snake (*Opheodrys (Liochlorophis) vernalis*)	S3	Old field, savanna, wet prairie and marsh	Highly Vulnerable
13	Timber Rattlesnake (*Crotalus horridus*)	S3	Forested areas near rock outcrops, woodland, hill prairie	Highly Vulnerable
14	**Western Worm Snake (*Caphophis vermis*)**	S2	Rocky wetlands	Highly Vulnerable
15	Six-lined Racerunner (*Aspidoscelis sexlineatus*)	S3	Sand/loess prairie, savanna	Moderately Vulnerable
16	**Diamondback Water Snake (*Nerodia rhombifer*)**	S2	Quiet pools and backwater sloughs	Moderately Vulnerable
17	Prairie Kingsnake (*Lampropeltis calligaster*)	S3	Woodland edge, open woodland, grassland, savanna	Moderately Vulnerable
18	Smooth Earth Snake (*Virginia valeriae*)	S3	Rocky woodland	Moderately Vulnerable
19	Bullsnake (*Pituophis catenifer sayi*)	S3	Prairie, deciduous woodland edge, savanna	Moderately Vulnerable
20	**Western Hognose Snake (*Heterodon nasicus*)**	S1	Sand/loess prairie	Moderately Vulnerable
21	**Speckled Kingsnake (*Lampropeltis getula holbrooki*)**	S1	Prairie, woodland edge, savanna	Moderately Vulnerable
22	**Copperhead (*Agkistrodon contortrix*)**	S1	Forested, rocky hillsides	Presumed Stable
23	*Five-lined Skink (*Plestiodon fasciatus*)	S4	Forest	Presumed Stable

Breeding Birds

Iowa's breeding bird Species of Greatest Conservation Need and 26 non-SGCN species were assessed. Only 7 of the breeding birds were predicted to be vulnerable to climate change in Iowa (Table Appendix 21- 4). Twenty-eight species were presumed stable and 54 were likely to increase. Twenty of Iowa's breeding birds are predicted to shift or expand their range and possibly leave the state.

Generally, the version of the CCVI used in Iowa's assessment considers birds to be less vulnerable to climate change because of their ability to travel long distances, and thus escape from the negative effects of climate change in their current habitats. However, mobility does not necessarily reduce a species' vulnerability to climate change. As with other species, when birds move into new regions they will face competition for resources with species that are already in that area and may experience new predation pressure. In addition, many of the birds that breed in Iowa only spend a portion of their life cycle here and often travel long distances to get to non-breeding and wintering habitat. This actually increases their vulnerability in many cases because they will face the effects of climate change, not only in Iowa but also in different regions of the United States, as well as in Mexico and Central and South America (Marra et al., 2014). Generally there is a drying trend predicted for the southeastern U.S., Mexico, and the Caribbean which is where many Iowa breeding birds spend the winter months. Amount of rainfall on wintering grounds is known to have an effect on timing of migration, body condition, and annual reproductive success for birds. If migration times shift too much, birds could arrive too early or too late to get the resources they need, such as insects or seeds and fruits that are only available in adequate amounts at certain times of the year. Birds have already been documented breeding earlier in the season (Townsend et al., 2013) and migrating earlier to breeding sites (Marra et al., 2008). These changes will only increase as the climate continues to change.

The complexity of full life cycle conservation for birds wasn't taken into account with the tool used for this assessment. This means that although the majority of Iowa's breeding birds were predicted to have stable or increasing populations under the predicted conditions in Iowa, they may face challenges in other parts of the world that, in turn, affect their status in Iowa. The Full Annual Cycle Climate Change Vulnerability Assessment conducted by Marra et al. (2014) assessed various full life cycle characteristics including migration distance, habitat and diet specialization at breeding and wintering grounds, and breeding site fidelity for 46 migratory birds of the Upper Midwest and Great Lakes region. These characteristics affect bird species adaptability to climate change, regardless of mobility, because if they are not able to find specific resources in the areas they inhabit they will be at risk. Often migratory birds have habitat and food requirements that are different in breeding and non-breeding areas which could create a situation where a species faces challenges in both places. Additionally, if a species returns to the same breeding site each year, it may not be likely to move to a new breeding location if conditions are not suitable.

Of the 46 birds assessed in the Full Annual Cycle Climate Change Vulnerability Assessment, nine were classified as highly vulnerable to climate change. This included four species that we assessed (highlighted in gray in Table Appendix 21- 4 below) which were not ranked as highly vulnerable to climate change. These species were the Black Tern, Forster's Tern, Whip-poor-will, and the Worm-eating Warbler. Our tool indicated that the two tern species were presumed to maintain stable populations, and the Worm-eating Warbler and Whip-poor-will were predicted to have increased populations. The Black Tern and Forster's Tern are heavily reliant on wetland habitat. Predicted temperature increases in Mexican and South American non-breeding habitats and predicted drying in the upper Midwest could mean these birds will face a doubled effect of climate change due to changes in each location that may be harmful. Additionally, the Forster's Tern relies on coldwater aquatic prey that could be at risk as temperatures increase. The Whip-poor- will was rated highly vulnerable in the Full Annual Cycle Climate Change Vulnerability Assessment because it has high breeding site fidelity and specialized diet and habitat needs. Information gaps about Whip-poor-will's non-breeding requirements prevented a more detailed prediction of why this species is highly vulnerable. Information gaps in our understanding of the full life cycle of various species could also mean that these species face threats of which we are not even yet aware. Finally, the Worm-eating Warbler was ranked highly vulnerable because of high breeding site fidelity and its specific preference for large, mature forest habitat. Habitat specificity is a general risk for most species. It is especially problematic for the Worm-eating Warbler

because large, mature forests are at high risk to climate change which is predicted to increase the occurrence of fires and predation by parasites.

Conservation efforts in Iowa that take into consideration the full life cycle of birds could require species' statuses to be updated to reflect all of the challenges a species faces, including those that occur outside the state. Within the state, it will be important to provide as much habitat diversity as possible in order to support numerous species. Establishing partnerships with entities outside of the state for conservation, monitoring, and research efforts will also be key for ensuring that birds which currently breed in Iowa will continue to breed and migrate through the state.

Table Appendix 21- 4. Climate change vulnerability of birds assessed in Iowa

Species names in bold are either federally or state listed as threatened or endangered. See appendix 14 for NatureServe's state rank definitions and appendix 15 for specific threatened and endangered species listings. Common names with an asterisk (*) were non-SGCN species during time of assessment (2009-2011). Species highlighted in gray were predicted to be highly vulnerable to climate change in The Full Annual Cycle Climate Change Vulnerability Assessment conducted by Marra et al (2014).

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
1	*Hooded Merganser (*Lophodytes cucullatus*)	S2	Backwater	Extremely Vulnerable	
2	**Long-eared Owl (*Asio otus*)**	S2	Open woodland, savanna, deciduous forest	Moderately Vulnerable	May shift range/leave
3	American Bittern (*Botaurus lentiginosus*)	S2	Herbaceous wetland	Moderately Vulnerable	
4	**King Rail (*Rallus elegans*)**	SNR	Herbaceous wetland	Moderately Vulnerable	May expand range
5	Brown Creeper (*Certhis Americana*)	S3	Deciduous and riparian forest	Moderately Vulnerable	May shift range
6	*Wood Duck (*Aix sponsa*)	S5	Backwater	Moderately Vulnerable	
7	*Ring-necked Pheasant (*Phasianus cochicus*)	SNR	Cool season grasses	Moderately Vulnerable	
8	**Barn Owl (*Tyto alba*)**	S1	Savanna	Presumed Stable	May expand range
9	Prothonotary Warbler (*Protonotaria citrea*)	S3	Riparian forest	Presumed Stable	May expand range
10	Swainson's Hawk (*Buteo swainsoni*)	S3	Savanna and open woodland	Presumed Stable	
11	Veery (*Catharus fuscescens*)	SNR	Riparian and deciduous forest	Presumed Stable	May shift range/leave
12	Bobolink (*Dolichonyx oryzivorus*)	S4	Warm season herbaceous grassland and agricultural land	Presumed Stable	
13	Greater Prairie-Chicken (*Tympanachus cupido*)	S1	Agricultural land and warm season herbaceous grassland	Presumed Stable	
14	Northern Bobwhite (*Colinus virginianus*)	S5	Warm season herbaceous grassland, shrubland, and agricultural land	Presumed Stable	May expand range
15	Black Tern (*Chlidonias niger*)	S1	Herbaceous wetland	Presumed Stable	

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
16	Black-crowned Night-heron (*Nycticorax nycticorax*)	S3	Herbaceous wetland and wet shrubland	Presumed Stable	
17	Common Gallinule(*Gallinula galeata*)	S2	Herbaceous Wetland	Presumed Stable	May expand range
18	Forster's Tern (*Sterna forsteri*)	S2	Herbaceous wetland	Presumed Stable	
19	Bell's Vireo (*Vireo bellii*)	S3	Shrubland and savanna	Presumed Stable	May expand range
20	Least Bittern (Lxobrychus exilis)	S3	Herbaceous Wetland	Presumed Stable	
21	**Least Tern (Sterna antillarum)**	S1	Herbaceous wetland	Presumed Stable	
22	Loggerhead Shrike (*Lanius ludovicianus*)	S3	Savanna and shrubland	Presumed Stable	
23	Sandhill Crane (*Grus canadensis*)	S1	Herbaceous wetland, Warm season herbaceous grassland, and agricultural land	Presumed Stable	May shift range/leave
24	Yellow-crowned Night-Heron (*Nyctanassa violacea*)	S3	Herbaceous wetland and riparian forest	Presumed Stable	May expand range
25	Ruffed Grouse (*Bonasa umbellus*)	S4	Dense forest and open woodland	Presumed Stable	
26	Eastern Meadowlark (*Sturnella magna*)	S4	Warm season herbaceous grassland, savanna, and agricultural land	Presumed Stable	
27	Field Sparrow (*Spizella pusilla*)	S5	Shrubland, Warm season herbaceous grassland, and agricultural land	Presumed Stable	
28	Grasshopper Sparrow (*Ammodramus savannarum*)	S4	Warm season herbaceous grassland and agricultural land	Presumed Stable	
29	**Henslow's Sparrow (*Ammodramus henslowii*)**	S3	Warm season herbaceous grassland and agricultural land	Presumed Stable	May expand range
30	Red-headed Woodpecker (*Melanerpe erythrocephalus*)	S5	Savanna, open woodland, and deciduous forest	Presumed Stable	
31	White-eyed Vireo (*Vireo griseus*)	S2	Open woodland and shrubland	Presumed Stable	May expand range
32	*Eastern Towhee (*Pipilo erythrophthalmus*)	S4	Shrubland	Presumed Stable	
33	*Pileated Woodpecker (*Dryocopus pileatus*)	S3	Forest	Presumed Stable	
34	*Northern Parula (*Parula americana*)	S3	Wet forest/woodland	Presumed Stable	
35	*American Redstart (*Setophaga ruticilla*)	S4	Wet forest/woodland	Presumed Stable	

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
36	Blue-winged Warbler (*Vermivora pinus*)	S3	Deciduous forest and shrubland	Increase Likely	
37	Cerulean Warbler (*Dendroica cerulean*)	S2	Deciduous forest	Increase Likely	
38	Hooded Warbler (*Wilsonia citrina*)	S1	Deciduous forest	Increase Likely	
39	Kentucky Warbler (*Oporornis formosus*)	S1	Deciduous and riparian forest	Increase Likely	May expand range
40	Louisiana Waterthrush (*Seiurus motacilla*)	S3	Deciduous and riparian forest	Increase Likely	
41	Osprey (*Pandion haliaetus*)	SNR	Herbaceous wetland and riparian forest	Increase Likely	
42	Peregrine Falcon (*Falco perigrinus*)	S1	Deciduous and riparian forest	Increase Likely	
43	**Red-shouldered Hawk (*Buteo lineatus*)**	S2	Riparian forest	Increase Likely	
44	Worm-eating Warbler (*Helmitheros vermivorus*)	S2	Deciduous forest	Increase Likely	May expand range
45	Wood Thrush (*Hylocichla mustelina*)	S4	Deciduous and riparian forest	Increase Likely	
46	Dickcissel (*Spiza americana*)	S4	Agricultural land and warm season herbaceous grassland	Increase Likely	
47	Sedge Wren (*Cistothorus platensis*)	S4	Warm season herbaceous grassland, herbaceous wetland, and agricultural land	Increase Likely	
48	American Woodcock (*Scolopax minor*)	S4	Deciduous forest, open wetland, and riparian forest	Increase Likely	
49	*Common Nighthawk (*Chordeiles minor*)	S5	Warm season herbaceous grassland, savanna, and agricultural land	Increase Likely	
50	**Northern Harrier (*Circus cyaneus*)**	S2	Warm season herbaceous grassland, marsh, and agricultural land	Increase Likely	
51	**Piping Plover (*Charadrius melodus*)**	S1	Herbaceous wetland	Increase Likely	
52	**Short-eared Owl (*Asio flammeus*)**	S1	Warm season herbaceous grassland and agricultural land	Increase Likely	
53	Upland Sandpiper (*Bartramia longicauda*)	S3	Warm season herbaceous grassland and agricultural land	Increase Likely	
54	Wilson's Phalarope (*Phalaropus tricolor*)	SNR	Herbaceous wetland, Warm season herbaceous grassland, and agricultural land	Increase Likely	
55	Yellow-billed Cuckoo (*Coccyzus americanus*)	S3	Deciduous forest, shrubland, and open woodland	Increase Likely	May expand range

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
56	Acadian Flycatcher (*Empidonax virescens*)	S3	Deciduous and riparian forest	Increase Likely	May expand range
57	Bald Eagle (*Haliaeetus leucodephala*)	S3	Deciduous and riparian forest	Increase Likely	
58	Black-and-white Warbler (*Mniotilta varia*)	SNR	Deciduous forest	Increase Likely	
59	Black-billed Cuckoo (*Coccyzus erythropthalmus*)	S3	Deciduous and riparian forest open woodland, and shrubland	Increase Likely	
60	Broad-Winged Hawk (*Bueo platypterus*)	S3	Deciduous forest	Increase Likely	
61	Whip-poor-will (*Caprimulgus vociferous*)	S5	Deciduous forest and open woodland	Increase Likely	
62	Bewick's Wren (*Thryomanes bewickii*)	S2	Open woodland and shrubland	Increase Likely	May expand range
63	Willow Flycatcher (*Empidonax traillii*)	S4	Wet shrubland	Increase Likely	
64	Yellow-breasted Chat (*Icteria virens*)	S3	Open woodland/savanna and shrubland	Increase Likely	May expand range
65	Chimney Swift (*Chaetura pelagic*)	S5	Towns and cities	Increase Likely	
66	Least Flycatcher (*Empidonax minimus*)	S1	Deciduous forest and open woodland	Increase Likely	
67	Northern Mockingbird (*Mimus polyglottos*)	S3	Open woodland/savanna and shrubland	Increase Likely	
68	*Lark Sparrow (*Chondestes grammacus*)	S4	Grassland	Increase Likely	
69	Northern Pintail (*Anas acuta*)	S2	Herbaceous wetland, Warm season herbaceous grassland, and agricultural land	Increase Likely	
70	Canvasback (*Aythya valisineria*)	S2	Herbaceous wetland	Increase Likely	
71	Redhead (*Aythya americana*)	S2	Herbaceous wetland	Increase Likely	
72	Trumpeter Swan (*Cygnus buccinator*)	S2	Herbaceous wetland	Increase Likely	May shift range/leave
73	*Belted Kingfisher (*Megnaceryle alcyon*)	S4	River	Increase Likely	
74	*Northern Rough-winged Swallow (*Stelgidopteryx serripennis*)	S5	River	Increase Likely	
75	*Spotted Sandpiper (*Actitis macularius*)	S3	River	Increase Likely	
76	*Great Blue Heron (*Ardea Herodias*)	S3	Backwater	Increase Likely	
77	*Brown Thrasher (*Toxostoma rufum*)	S5	Shrubland	Increase Likely	
78	*Gray Catbird (*Dumetella caroliniensis*)	S5	Shrubland	Increase Likely	
79	*Indigo Bunting (*Passerina cyanea*)	S5	Woodland	Increase Likely	
80	*Northern Flicker (*Colaptes auratus*)	S5	Woodland	Increase Likely	

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
81	*Eastern Bluebird (*Contopus virens*)	S4	Savanna	Increase Likely	
82	*Eastern Wood-pewee (*Contopus virens*)	S4	Savanna	Increase Likely	
83	*American Kestrel (*Falco Sparverius*)	S5	Savanna	Increase Likely	
84	*Yellow Warbler (*Dendroica petechia*)	S4	Wet shrubland	Increase Likely	
85	*Common Yellowthroat (*Geothlypis trichas*)	S5	Wet shrubland	Increase Likely	
86	*Scarlet Tanager (*Piranga olivacea*)	S4	Forest	Increase Likely	
87	*Ovenbird (*Seiurus aurocapilla*)	S4	Forest	Increase Likely	
88	*Green Heron (*Butorides virescens*)	S3	Stream	Increase Likely	
89	*Warbling Vireo (*Vireo gilvus*)	S5	Wet forest/woodland	Increase Likely	

Fish

All of Iowa's fish species of greatest conservation need were assessed along with one non-SGCN species that is presumed to be extirpated. The presumed extirpated species (state rank SX) was included in order to understand if possible reintroduction is practical in Iowa in the context of climate change. Twenty-nine fish species or nearly 40% were predicted to be vulnerable to climate change (Table Appendix 21- 5). In general fish may have to deal with habitat destruction from an increased number of extreme weather events such as flooding or drought that are associated with climate change. Changes in water temperature may also affect some species. Twenty-six fish species are predicted to shift or expand their ranges or possibly leave the state. However, fish are limited to water bodies and therefore, face barriers to dispersal such as dams that may prevent a population for adjusting its range to a more suitable habitat.

Table Appendix 21- 5. Climate change vulnerability of fish assessed in Iowa

Species names in bold are either federally or state listed as threatened or endangered. See appendix 14 for NatureServe's state rank definitions and appendix 15 for specific threatened and endangered species listings. Common names with an asterisk (*) were non-SGCN species during time of assessment (2009-2011).

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
1	Crystal Darter (*Crystallaria asprella*)	S1	Small to medium fast flowing rivers with sand/gravel substrate	Extremely Vulnerable	May expand range
2	Ironcolor Shiner (*Notropis chalybaeus*)	SX	Slow flowing streams and river with sandy substrate	Extremely Vulnerable	May expand range
3	Paddlefish (*Polyodon spathula*)	S3	Medium to large rivers, backwaters, and impoundments with minimal flow	Extremely Vulnerable	
4	**Topeka Shiner (*Notropis topeka*)**	S2	Rivers, creeks, streams, and backwaters with minimal flow	Highly Vulnerable	
5	River Redhorse (*Moxostoma carinatum*)	SNR	Rivers and large creeks with clear water	Highly Vulnerable	

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
6	Trout-perch (*Percopsis omiscomaycus)*	S3	Streams and rivers with sandy substrate	Highly Vulnerable	
7	**Western Sand Darter (*Ammocrypta clara*)**	S2	Medium to large rivers with slow to moderate flow and sandy substrate	Highly Vulnerable	May expand range
8	Ozark Minnow (*Notropis nubilus*)	S3	Fast flowing creeks and medium to small rivers with rock/gravel substrate	Moderately Vulnerable	
9	Southern Redbelly Dace (*Phoxinus erythrogaster*)	S4	Small streams/creeks	Moderately Vulnerable	
10	Banded Killifish (*Fundulus diaphanous*)	S2?	Lakes, ponds, and streams with slow flows	Moderately Vulnerable	
11	Blackchin Shiner (*Notropis heterodon*)	SX	Lakes and streams with sand/gravel substrate	Moderately Vulnerable	
12	**Bluntnose Darter (*Etheostoma chlorosoma*)**	SX	Small to medium rivers, creeks, and backwaters with minimal slow and sandy/mucky substrate	Moderately Vulnerable	May expand range
13	Brook Trout (*Salvelinus fontinalis*)	S3	Cool creeks, streams, and small rivers with sand, gravel, cobble, or rocky substrate and moderate to fast water flow	Moderately Vulnerable	
14	**Burbot (*Lota lota*)**	S3	Deep, cold lakes and rivers	Moderately Vulnerable	May shift range/leave
15	Central Mudminnow (*Umbra limi*)	S3	Slow flowing, vegetated streams and backwaters	Moderately Vulnerable	
16	Redfin (Grass) Pickerel (*Esox americanus*)	S3	Ponds, backwaters, and small lakes with vegetated edges and minimal flows	Moderately Vulnerable	
17	Longnose Dace (*Rhinichthys cataractae*)	S3	Small to medium fast flowing rivers with clear water and rock/gravel substrate	Moderately Vulnerable	
18	Mud Darter (*Etheostoma asprigene*)	S3	Slow flowing rivers and backwaters with mucky/silty substrate	Moderately Vulnerable	May expand range
19	**Orangethroat Darter (*Etheostoma spectabile*)**	S2	Creeks and small rivers with fast to moderate flow; sand, cobble, bedrock, gravel substrate	Moderately Vulnerable	May expand range
20	Pirate Perch (*Aphredoderus sayanus*)	S3	Vegetated lakes, ponds, and backwater	Moderately Vulnerable	May expand range
21	Plains Minnow (*Hybognathus placitus*)	S4	Slow flowing rivers and streams with silty substrate	Moderately Vulnerable	
22	Spottail Shiner (*Notropis hudsonius*)	SNR	Lakes and large rivers with sandy/rocky substrate	Moderately Vulnerable	

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
23	Silver Lamprey (*Ichthyomyzon unicuspis*)	S3	Large rivers, impoundments, and lakes	Moderately Vulnerable	
24	Starhead Topminnow (*Fundulus dispar*)	SX	Creeks, backwaters, and oxbows with mucky substrate and no flow	Moderately Vulnerable	May expand range
25	**Weed Shiner (*Notropis texanus*)**	S2	Creeks and small to medium rivers with sandy substrate	Moderately Vulnerable	May expand range
26	Western Silvery Minnow (*Hybognathus argyritis*)	S1	Backwaters with silty/mucky substrate	Moderately Vulnerable	
27	Greater Redhorse (*Moxostoma valenciennesi*)	SNR	Medium to large rivers with moderate to fast flow and no silt	Moderately Vulnerable	
28	Silverband Shiner (*Notropis shumardi*)	SX	Large turbid rivers with moderate to fast flow and silty, sandy, or gravel substrate	Moderately Vulnerable	May expand range
29	Skipjack Herring (*Alosa chrysochloris*)	S3	Medium to large rivers and large impoundments with sand and gravel substrate	Moderately Vulnerable	May expand range
30	Banded Darter (*Etheostoma zonale*)	S3	Rivers and large creeks with moderate flow and cobble or gravel substrate	Presumed Stable	
31	**Black Redhorse (*Moxostoma duqesnei*)**	S2	Creeks and small to medium rivers with rocky/gravel substrate	Presumed Stable	
32	Blackside Darter (*Percina maculate*)	S3	Creeks and medium to small rivers with sand/gravel substrate and slow flowing water	Presume Stable	
33	**Pearl Dace (*Margariscus margarita*)**		Ponds and small lakes with sand/gravel substrate	Presumed Stable	
34	Redfin Shiner (*Lythrurus umbratilis*)	S4	Rivers, creeks, and streams	Presumed Stable	
35	Slenderhead Darter (*Percina phoxocephala*)	S3	Creeks and medium to small rivers with sand/gravel substrate and slow flowing water	Presumed Stable	
36	Tadpole Madtom (*Noturus gyrinus*)	S3	Lakes, impoundments, backwaters, creeks, and rivers with vegetation, minimal flow, and mucky substrate	Presumed Stable	
37	**American Brook Lamprey (*Lampetra appendix*)**	S3	Creeks and medium to small rivers	Presumed Stable	
38	Blue Catfish (*Ictalurus furcatus*)	S4	Rivers and backwaters	Presumed Stable	May expand range

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
39	Brown Bullhead (*Ameiurus nebulosus*)	S3	Ponds, lakes, impoundments, and slow flowing streams	Presumed Stable	
40	**Chestnut Lamprey (*Ichtyomyzon castaneus*)**	S2	Medium to large rivers	Presumed Stable	
41	**Freckled Madtom (*Noturus nocturnes*)**	S2	Moderately flowing creeks and rivers	Presumed Stable	May expand range
42	Goldeye (*Hiodon alosoides*)	SNR	Backwaters, lakes, and medium to large rivers	Presumed Stable	
43	Gravel Chub (*Erimystax x-punctatus*)	S3	Rivers and large creeks with gravel substrate	Presumed Stable	
44	Iowa Darter (*Etheostoma exile*)	S4	Cool creeks, ponds, and lakes with mucky/silty substrate and slow or no flow	Presumed Stable	
45	Largescale Stoneroller (*Campostoma oligolepis*)	S3	Clear medium to large streams with gravel substrate	Presumed Stable	May expand range
46	**Least Darter (*Etheostoma microperca*)**	S1	Slow flowing vegetated creeks	Presumed Stable	
47	*Longear Sunfish (*Lepomis megalotis*)	SX		Presumed Stable	
48	Longnose Gar (*Lepisosteus osseus*)	S3	Vegetated lakes, impoundments, and backwaters	Presumed Stable	
49	Mississippi Silvery Minnow (*Hybognathus nuchalis*)	S3?	Backwaters with minimal flow	Presumed Stable	May expand range
50	Mottled Sculpin (*Cottus bairdii*)	S2	Clear, cool creeks and small rivers with sand/gravel/rocky substrate	Presumed Stable	
51	Northern Logperch (*Percina caprodes*)	S3	Impoundments, lakes, and moderately to fast flowing creeks, streams, rivers, and lakes with sand/gravel substrate	Presumed Stable	
52	Pallid Shiner (*Hybopsis amnis*)	S3	Medium to large rivers with sandy/mucky substrate	Presumed Stable	May expand range
53	Plains Topminnow (*Fundulus sciadicus*)	SH	Creeks, streams, and backwaters with moderate flow	Presumed Stable	
54	Pugnose Minnow (Opsopoeodus emiliae)	S3	Vegetated lakes, impoundments, and slow flowing streams	Presumed Stable	May expand range
55	Shovelnose Sturgeon (*Scaphirhynchus platorynchus*)	S4	Large, turbid rivers	Presumed Stable	
56	**Pugnose Shiner (*Notropis anogenus*)**	S1	Clear, vegetated lakes with silt/sand/gravel substrate	Presumed Stable	

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
57	Spotted Sucker (*Minytrema melanops*)	S3	Small to medium slow flowing rivers with firm substrate	Presumed Stable	May expand range
58	River Darter (*Percina shumardi*)	S3	Large fast flowing rivers with rocky/gravel substrate	Presumed Stable	
59	Slender Madtom (*Noturus exilis*)	S3	Medium to large streams and small to medium rivers with moderate to fast flow	Presumed Stable	May expand range
60	Slimy Sculpin (*Cottus cognatus*)	S3	Cold, fast flowing streams with rocky substrate	Presumed Stable	May shift range/leave
61	Blue Sucker (*Cycleptus elongates*)	S3	Large rivers	Presumed Stable	May expand range
62	Ghost Shiner (*Notropis buchanani*)	S3	Slow flowing large creeks, and small to medium rivers	Presumed Stable	May expand range
63	Sicklefin Chub (*Macrhybopsis meeki*)	S1	Large turbid rivers with gravel/sand substrate	Presumed Stable	
64	Shoal Chub (*Macrhybopsis gelida*)	SNR	Moderate to fast flowing rivers with sand/cobble substrate	Presumed Stable	
65	Spotted Gar (*Lepisosteus oculatus*)	SNR	Moderately flowing medium to large rivers	Presumed Stable	May expand range
66	Sturgeon Chub (*Macrhybopsis gelida*)	SH	Warm, turbid rivers	Presumed Stable	
67	American Eel (*Anguilla rostrata*)	S3?	Lakes and large streams	Increase Likely	
68	Black Buffalo (*Ictiobus niger*)	S3	Backwaters, rivers, and impoundments	Increase Likely	May expand range
69	Blackstripe Topminnow (*Fundulus notatus*)	S3	Turbid streams and backwaters	Increase Likely	May expand range
70	Bowfin (*Amia calva*)	S3	Lakes and backwaters	Increase Likely	
71	Flathead Chub (*Platygobio gracilis*)	S3	Turbid rivers	Increase Likely	
72	**Lake Sturgeon (*Acipenser fulvescens*)**	S1	Large rivers and large lakes with sand/gravel/rock substrate	Increase Likely	
73	Northern Brook Lamprey (*Ichthyomyzon fosser*)	SNR	Moderate to fast flowing streams with mucky substrate	Increase Likely	
74	**Blacknose Shiner (*Notropis heterolepis*)**	S2	Cool creeks, small rivers, and lakes with sandy substrate	Increase Likely	

Mammals

The assessment showed mixed results for mammals. Half of the mammal species assessed were predicted to be vulnerable to climate change, five of which were extremely or highly vulnerable and four of which are moderately vulnerable (Table Appendix 21- 6). Populations for the other half of the mammals assessed are likely to remain stable and the Northern Long-eared Bat (*Myotis septentrionalis*) is predicted to increase. The eight non-SGCN mammals assessed were predicted to either maintain stable populations or increase. The Indiana Bat (*Myotis sodalis*) and the Evening Bat (*Nycticeius humeralis*) were predicted to expand their ranges and the Meadow Vole (*Microtus*

pennsylvanicus) was predicted to shift its range or possibly leave. It is important to recall that these predictions do not take into account the other threats to species persistence (e.g., White-nose Syndrome) as this assessment evaluated impacts attributable to climate change only. Mammals are a fairly mobile taxon and therefore may effectively adapt to climate change by moving to more suitable habitat. However, some species have specific habitat requirements or are dependent on other species for resources which may make them less capable of adapting to environmental changes by shifting their range.

Table Appendix 21- 6. Climate change vulnerability of mammals assessed in Iowa

Species names in bold are either federally or state listed as threatened or endangered. See appendix 14 for NatureServe's state rank definitions and appendix 15 for specific threatened and endangered species listings. Common names with an asterisk (*) were non-SGCN species during time of assessment (2009-2011).

	Species	State Rank	Habitat Preference	Index Score
1	**Plains Pocket Mouse (*Perognathus flavescens*)**	S2	Prairie, sand, and loess	Extremely Vulnerable
2	Plains Pocket Gopher (*Geomys bursarius*)	S5	Grassland with warm season herbaceous grasses	Extremely Vulnerable
3	Franklin's Ground Squirrel (*Spermophilus franklinii*)	S3	Tallgrass prairie, savanna, and roadsides	Highly Vulnerable
4	**Red-backed Vole (*Myodes gapperi*)**	S2	Forest	Highly Vulnerable
5	Woodland Vole (*Microtus pinetorum*)	S3	Forest	Highly Vulnerable
6	Short-tailed Shrew (*Blarina hylophaga*)	SNR	Forest, woodland, savanna, and grassland	Moderately Vulnerable
7	Southern Flying Squirrel (*Glaucomys volans*)	S4	Forest	Moderately Vulnerable
8	**Southern Bog Lemming (*Synaptomys cooperi*)**	S3	Moist grassland	Moderately Vulnerable
9	White-tailed Jackrabbit (*Lepus townsendii*)	S3	Shortgrass prairie and pasture	Moderately Vulnerable
10	**Indiana Bat (*Myotis sodalis*)**	S1	Forest, upland, and riparian areas	Presumed Stable
11	Evening Bat (*Nycticeius humeralis*)	S3	Forest and riparian areas	Presumed Stable
12	Hayden's Shrew (*Sorex haydeni*)	S4	Grassland, woodland, and riparian areas	Presumed Stable
13	**Least Shrew (*Cryptotis parva*)**	S2	Woodland, savanna, grassland, and riparian areas	Presumed Stable
14	Red Squirrel (*Tamiasciurus hudsonicus*)	S3	Forest	Presumed Stable
15	Bobcat (*Lynx rufus*)	S3	Forest, woodland, and grassland	Presumed Stable
16	Gray Fox (*Urocyon cineoargenteus*)	S3	Forest and woodland	Presumed Stable
17	**Eastern Spotted Skunk (*Spilogale putorius*)**	S1	Grassland, savanna, forest, and farmsteads	Presumed Stable
18	*Prairie Vole (*Microtus ochrogaster*)	S3	Warm season herbaceous grasses	Presumed Stable

	Species	State Rank	Habitat Preference	Index Score
19	*Meadow Vole (*Microtus pennsylvanicus*)	S5	Cool season grassland and herbaceous wetland	Presumed Stable
20	Northern Long-eared Bat (*Myotis septentrionalis*)	S4	Forest	Increase Likely
21	*Fox Squirrel (*Sciurius niger*)	S5	Woodland and savanna	Increase Likely
22	*White-footed Deermouse (*Peromyscus leucopus*)	S5	Shrubland	Increase Likely
23	*Deer Mouse	S5	Agricultural land	Increase Likely
24	*Grasshopper Mouse (*Onychomys leucogaster*)	S3	Agricultural land	Increase Likely
25	*Western Harvest Mouse (*Reithrodontomys megalotis*)	S4	Agricultural land and warm season herbaceous grasses	Increase Likely
26	*American Beaver (*Castor canadensis*)	S5	Wet shrubland	Increase Likely

Mollusks

Eleven Iowa resident snails and all of the mussel species of greatest conservation need were assessed. Ten of the eleven snails (Table Appendix 21- 7) and all of the mussels (Table Appendix 21- 8) were predicted to be moderately or extremely vulnerable. Only one species, the Flamed Disc/Tigersnail (*Anguispira alternata*) was not determined to be vulnerable to climate change. Mollusks, in general, are more susceptible to climate change because they have limited mobility and some species have specific temperature and habitat requirements. Microclimates such as algific slopes are rare and the snail species that depend on them won't have access to an alternative environment if this unique habitat is altered too drastically. Mussels depend on fish hosts for dispersal, which are also subject to the effects of climate change, as they may shift their range or experience population declines. Only three of the mollusks were predicted to expand their range. These were the Wartyback (*Quadrula nodulata*), Ellipse (*Venustaconcha ellipsiformis*), and Elktoe (*Alasmidonta marginata*).

Table Appendix 21- 7. Climate change vulnerability of terrestrial snails assessed in Iowa

Species names in bold are either federally or state listed as threatened or endangered. See appendix 14 for NatureServe's state rank definitions and appendix 15 for specific threatened and endangered species listings. Common names with an asterisk (*) were non-SGCN species during time of assessment (2009-2011).

	Species	State Rank	Habitat Preference	Index Score
1	*Ice Thorn (*Carychium exile*)	SNR	Forest	Extremely Vulnerable
2	*Cherrystone Drop (*Hendersonia occulta*)	S3	Algific slopes within wet forests/woodland	Extremely Vulnerable
3	*Striped Whitelip (*Webbhelix multilineata*)	SNR	Wet forest/woodland	Extremely Vulnerable
4	*Six-whorl Vertigo (*Vertigo morsei*)	SNR	Wet shrubland/herbaceous wetland	Extremely Vulnerable
5	*Tapered Vertigo (*Vertigo elatior*)	SU	Wet forest/woodland and herbaceous wetland	Extremely Vulnerable
6	Bluff Vertigo (*Vertigo meramecensis*)	S1	Mesic, carbonate cliffs within hardwood forests that are covered in decomposed leaf litter, ferns, or moss and have patches of bare rock or scree.	Extremely Vulnerable

	Species	State Rank	Habitat Preference	Index Score
7	Iowa Pleistocene Snail (*Discus macclintocki*)	S1	Only found on maderate cliffs	Extremely Vulnerable
8	Minnesota Pleistocene Succinea (*Novasuccinea sp. Minnesota a)*	S1	Maderate cliffs	Extremely Vulnerable
9	Iowa Pleistocene Succinea (*Novasuccinea sp. Minnesota b*)	S1	Maderate cliffs	Extremely Vulnerable
10	Hubricht's Vertigo (*Vertigo hubrichti*)	S1	Forested algific slopes	Extremely Vulnerable
11	*Flamed Disc (Tigersnail) (*Anguispira alternata*)	SNR	Wet forest/woodland	Presumed Stable

Table Appendix 21- 8. Climate change vulnerability of mussels assessed in Iowa

Species names in bold are either federally or state listed as threatened or endangered. See appendix 14 for NatureServe's state rank definitions and appendix 15 for specific threatened and endangered species listings. Common names with an asterisk (*) were non-SGCN species during time of assessment (2009-2011).

	Species	State Rank	Habitat Preference	Index Score
1	**Cylindrical Papershell (*Anodontoides ferussacianus*)**	S2	Small creeks with mucky/silty substrate	Extremely Vulnerable
2	**Butterfly (*Ellipsaria lineolata*)**	S2	Large river with sand/gravel substrate	Extremely vulnerable
3	**Slippershell Mussel (*Alasmidonta viridis*)**	S1	Creeks and streams with mucky/sandy substrate	Extremely Vulnerable
4	Ebonyshell (*Fusconaia ebena*)	SX	Large, deep rivers with sand/gravel substrate	Extremely Vulnerable
5	Hickorynut (*Obovaria olivaria*)	SNR	Large river with sand/gravel substrate	Extremely Vulnerable
6	**Higgins Eye (*Lampsilis higginsii*)**	S1	Large river with sand/gravel substrate	Extremely Vulnerable
7	**Bullhead (Sheepnose) (*Plethobasus cyphyus*)**	S1	Medium to large rivers with sand/gravel substrate	Extremely Vulnerable
8	Rock Pocketbook (*Arcidens confragosus*)	S2	Medium to large rivers with sand/muck substrate	Extremely Vulnerable
9	**Round Pigtoe (*Pleurobema sintoxia*)**	S1	Streams and rivers with firm sand/gravel substrate	Extremely Vulnerable
10	**Yellow (Slough) Sandshell (*Lampsilis teres teres*)**	S2	Slow flowing rivers and backwaters with mucky substrate	Extremely Vulnerable
11	Lilliput (*Toxolasma parvum*)		Ponds, lakes, creeks, and rivers with sand/gravel/mucky substrate	Extremely Vulnerable
12	Yellow Sandshell (*Lampsilis teres anodontoides*)	S2	Medium to large rivers with sand/gravel substrate	Extremely Vulnerable
13	Pondmussel (*Ligumia sunrostrata*)	SX	Small creeks and ponds with sand/mucky substrate	Extremely Vulnerable
14	**Creeper/Strange Floater (*Strophitus undulatus undulatus*)**	S2	Small to medium streams with sand/gravel/muck substrate	Extremely Vulnerable
15	Fawnsfoot (*Truncilla donaciformis*)	SNR	Medium to large rivers with sand/gravel substrate	Extremely Vulnerable

	Species	State Rank	Habitat Preference	Index Score
16	Wartyback (*Quadrula nodulata*)	S1	Large rivers with sand/gravel substrate	Extremely Vulnerable
17	Monkeyface (*Quadrula metanerva*)	S2	Medium to large rivers with gravel substrate	Extremely Vulnerable
18	Paper Pondshell (*Utterbackia imbecillus*)	SNR	Ponds, lakes, impoundments, and slow flowing rivers with mucky substrate	Extremely Vulnerable
19	Pondhorn (*Uniomerus tetralasmus*)	SNR	Ponds, creeks, streams, and rivers with mucky/sandy substrate	Extremely Vulnerable
20	**Ellipse (*Venustaconcha ellipsiformis*)**	S2	Small to medium streams with sand/gravel substrate	Extremely Vulnerable
21	**Pistolgrip (*Tritogonia verrucosa*)**	S1	Medium to large rivers with sand/gravel/muck substrate	Extremely Vulnerable
22	Flutedshell (*Lasmigona costata*)	S2	Medium to large rivers with sand/gravel/muck substrate	Extremely Vulnerable
23	**Creek Heelsplitter (*Lasmigona compressa*)**	S2	Streams and creeks with sand/gravel substrate	Extremely Vulnerable
24	Spike (*Elliptio dilatata*)	S2	Streams and lakes with firm sand/gravel substrate	Extremely Vulnerable
25	**Purple Wartyback (*Cyclonaias turberculata*)**	S1	Medium to large rivers with gravel substrate	Extremely Vulnerable
26	**Spectaclecase (*Cumberlandia monodonta*)**	S1	Large fast flowing rivers with sand/muck substrate	Extremely Vulnerable
27	Elktoe (*Alasmidonta marginata*)	S3	Medium stream with moderate flow and sand/gravel substrate	Extremely Vulnerable
28	**Ozark Pigtoe (*Fusconaia ozarkensis*)**	SX	NA	Extremely Vulnerable
29	Flat Floater (*Anodonta suborbiculata*)	S3	Ponds, lakes, and rivers with muck/silt substrate - minimal to no water flow	Moderately Vulnerable

Butterflies

All butterfly species of greatest conservation need and nine other butterfly species found in Iowa were assessed. More than half of the butterfly species assessed (26 out of 46) were predicted to be vulnerable to climate change (

Table Appendix 21- 9). Almost one-third of the assessed species were determined to be extremely or highly vulnerable. Two species were predicted to increase, and these were not species of greatest conservation need. Butterflies are a fairly mobile group which would make dispersal possible to a certain degree. However, habitat fragmentation is of particular concern to Iowa's butterflies because of their reliance on prairie, grassland, and wetland habitats that are becoming less common on the landscape. Additionally, butterflies are associated with plants both as larval hosts and as sources of nectar for adults. Necessary host and nectar plants may also be affected by climate change. Plants that butterfly species rely on may become less common or the timing of their flowering events may shift out of balance with the butterfly life cycle. Migratory butterfly species will face the effects of climate change outside of Iowa as well, potentially increasing their vulnerability.

Table Appendix 21- 9. Climate change vulnerability of butterflies assessed in Iowa

Species names in bold are either federally or state listed as threatened or endangered. See Appendix 14 for NatureServe's state rank definitions and appendix 15 for specific threatened and endangered species listings. Common names with an asterisk (*) were non-SGCN species during time of assessment (2009-2011).

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
1	Mottled Duskywing (*Erynnis martialis*)	S3	Xeric prairie with warm season herbaceous grasses	Extremely Vulnerable	
2	Two-spotted Skipper (*Euphyes bimacula*)	S3	Sedge meadows and marshes	Extremely Vulnerable	
3	**Dakota Skipper (*Hesperia dacotae*)**	S1	Prairie with warm season herbaceous grasses	Extremely Vulnerable	
4	Leonard's Skipper (*Hesperia leonardus*)	S3	Open warm season herbaceous grassy areas and agricultural land	Extremely Vulnerable	
5	Ottoe Skipper (*Hesperia ottoe*)	S2	High quality mid/tallgrass prairie with warm season herbaceous grasses	Extremely Vulnerable	
6	*Crossline Skipper (*Polites origenes*)	S4	Dry, native prairie	Extremely Vulnerable	
7	Arogos Skipper (*Atrytone arogos*)	S2	Agricultural land, prairies and grasslands with warm season herbaceous grasses	Extremely Vulnerable	
8	**Byssus Skipper (*Problema byssus*)**	S2	Tallgrass prairie with warm season herbaceous grasses	Extremely Vulnerable	May expand range
9	Dusted Skipper (*Atrytonopsis hianna*)	S3	Agricultural land, bluestem grasslands, and oldfields with warm season herbaceous grasses	Extremely Vulnerable	
10	**Baltimore Checkerspot (*Euphydryas phaeton phaeton*)**	S2	Wetlands, fens, and bogs	Extremely Vulnerable	
11	Hickory Hairstreak (*Satyrium caryaevorum*)	S3	Forest	Highly Vulnerable	
12	**Mulberry Wing (*Poanes massasoit*)**	S2	Wetlands and fens	Highly Vulnerable	
13	**Common Ringlet (*Coenonympha tullia*)**	S1	Prairie and marsh edge, road ditches with warm season herbaceous grasses	Highly Vulnerable	
14	**Poweshiek Skipperling (*Oarisma Poweshiek*)**	S1	High quality prairie with warm season herbaceous grasses	Highly Vulnerable	
15	*Henry's Elfin (*Callophrys henrici*)	S3	Woodland	Moderately Vulnerable	
16	Acadian Hairstreak (*Satyrium acadica*)	S3	Riparian areas, wet forest/woodlands, and prairie	Moderately Vulnerable	
17	Purplish Copper (*Lycaena helloides*)	S3	Moist or disturbed areas/agricultural land	Moderately Vulnerable	

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
18	Melissa Blue (*Lycaena melissa*)	S3	Xeric prairie and gravel ridges with warm season herbaceous grasses	Moderately Vulnerable	
19	Regal Fritillary (*Speyeria idalia*)	S2	Agricultural land, prairie, and open grassland with warm season herbaceous grasses	Moderately Vulnerable	
20	Olympia Marble (*Euchloe olympia*)	S3	Open woods/savanna, river bluffs, poor soils, and grasslands with warm season herbaceous grasses	Moderately Vulnerable	
21	**Silvery Blue (*Glaucopsyche lygdamus*)**	S3	Prairie, open fields, and woodland openings, with warm season grasses	Moderately Vulnerable	
22	Edward's Hairstreak (*Satyrium edwardsii*)	S3	Woodlands, clearings, and areas of poor soil	Moderately Vulnerable	
23	Wild Indigo Duskywing (*Erynnis baptisiae*)	S3	Roadsides, prairie with herbaceous grasses, and agricultural land	Moderately Vulnerable	May expand range
24	Dion Skipper (*Euphyes dion*)	S3	Sedge wetlands	Moderately Vulnerable	
25	Broad-winged Skipper (*Poanes viator*)	S3	Wetland fens	Moderately Vulnerable	
26	Hayhurst's Scallopwing (*Staphylus hayhurstii*)	SNR	Floodplain forests, Loess Hills forest, Savanna	Moderately Vulnerable	May expand range
27	Zabulon Skipper (*Poanes zabulon*)	S3	Riparian, oldfield, woodland edges, and agricultural land	Presumed Stable	May expand range
28	Pipevine Swallowtail (*Battus philenor*)	S3	Forest, open fields, and roadsides	Presumed Stable	May expand range
29	*Great Spangled Fritillary (*Speyeria Cybele*)	S4	Woodland, forest edge, old fields, and roadsides	Presumed Stable	
30	Striped Hairstreak (*Satyrium liparops*)	S3	Forest opening and edges, prairie streamside	Presumed Stable	
31	Compton Tortoiseshell (*Nymphalis vaualbum*)	SNR	Large tracts of forest	Presumed Stable	May shift range/leave
32	White M Hairstreak (*Parrhasius m-album*)	SNR	Woodland and savanna	Presumed Stable	May shift range/leave
33	Aphrodite Fritillary (*Speyeria aphrodite*)	S4	High quality prairie with warm season herbaceous grasses, wetland, and fen habitat	Presumed Stable	
34	Pepper and Salt Skipper (*Amblyscirtes vialis*)	SNR	Edge of woods and grass waterways/agricultural land	Presumed Stable	
35	Common Roadside-Skipper (*Amblyscirtes vialis*)	S3	Dry prairie and limestone/sandstone glades	Presumed Stable	
36	Zebra Swallowtail (*Eurytides Marcellus*)	S1	Woodland along rivers	Presumed Stable	May expand range

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
37	Sleepy Duskywing (*Erynnis brizo*)	S3	Oak barrens sand or shale soils	Presumed Stable	
38	Dreamy Duskywing (*Erynnis icelus*)	S3	Woodland or edge habitat/savanna	Presumed Stable	
39	Columbine Duskywing (*Erynnis lucilius*)	S3	Rocky wooded ravines	Presumed Stable	
40	*Hobomok Skipper (*Poanes hobomok*)	S4	Woodland	Presumed Stable	
41	*Tawny-edged Skipper (*Polites themistocles*)	S5	Native prairie, old fields, and city parks	Presumed Stable	
42	*Northern Cloudywing (*Thorybes pylades*)	S4	Dry, open habitat in prairies and old fields	Presumed Stable	
43	*Delaware Skipper (*Anatrytone logan*)	S5	Marshes, pastures, meadows, native prairie, and roadsides	Presumed Stable	
44	Reakirt's Blue (*Echinargus isola*)	SNR	Native prairie with warm season herbaceous grasses	Presumed Stable	May expand range
45	*Summer Azure (Celastrina neglecta)	SNR	Woodland	Increase Likely	
46	*Eastern Tailed-blue (*Everes comynatas*)	S5	Generalist	Increase Likely	

Odonata

The dragonfly and damselfly species of greatest conservation need were assessed revealing mixed results for this group of organisms. Slightly fewer than half (12 out of 28 assessed) of the odonata appear to be vulnerable to the effects of climate change, with eight being extremely or highly vulnerable (Table Appendix 21- 10). Three species may experience population increases. Odonata are fairly capable of shifting their ranges in response to climate change. However, specific diet and habitat requirements may limit their ability to adapt to the changing environment. Some of these species also depend on ephemeral wetlands which may be permanently affected by extreme events such as drought.

Table Appendix 21- 10. Climate change vulnerability of odonates assessed in Iowa

Species names in bold are either federally or state listed as threatened or endangered. See appendix 14 for NatureServe's state rank definitions and appendix 15 for specific threatened and endangered species listings. Common names with an asterisk (*) were non-SGCN species during time of assessment (2009-2011).

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
1	Sioux Snaketail (*Ophiogomphus smithi*)	SNR	Sand bottomed streams	Extremely Vulnerable	
2	Prairie Bluet (*Coenagrion angulatum*)	S2	Lakes and ponds	Extremely Vulnerable	
3	Boreal Bluet (*Enallagma boreale*)	S1	Marsh	Extremely Vulnerable	
4	Sweetflag Spreadwing (*Lestes forcipatus*)	S1	Marshes and pond edges	Extremely Vulnerable	
5	Elegant Spreadwing (*Lestes inaequalis*)	S1	Ponds	Extremely Vulnerable	

	Species	State Rank	Habitat Preference	Index Score	Predicted Effect on Species Range
6	Paiute Dancer (*Argia alberta*)	S2	Small streams and road ditches	Highly Vulnerable	
7	Alkali Bluet (*Enallagma clausum*)	S2	Pond edges without vegetation	Highly Vulnerable	
8	Spotted Spreadwing (*Lestes congener*)	S2	Edges, pools, backwaters, and marshes	Highly Vulnerable	
9	Spangled Skimmer (*Libellula cyanea*)	S1	Artificial ponds and lakes	Moderately Vulnerable	May expand range
10	Rusty Snaketail (*Ophiogomphus rupinsulensis*)	S1	Sandy, rocky creeks	Moderately Vulnerable	
11	Emma's Dancer (*Argia emma*)	S1	Small streams	Moderately Vulnerable	
12	Vesper Bluet (*Enallagma vesperum*)	S2	Deep lakes and ponds	Moderately Vulnerable	
13	Carolina Saddlebags (*Tramea Carolina*)	S1	Marsh	Presumed Stable	May expand range
14	Blue-faced Meadowhawk (*Sympetrum ambiguum*)	S1	Temporary pools and oxbows	Presumed Stable	May expand range
15	Four-spotted Skimmer (*Libellula quadrimaculata*)	S2	Marshes and wooded ponds	Presumed Stable	
16	Stygian Shadowdragon (*Neurocordulia yamaskanensis*)	S1	Mississippi River	Presumed Stable	
17	Brimstone Clubtail (*Stylurus intricatus*)	S1	Sandy streams	Presumed Stable	
18	Rapids Clubtail (*Gomphus quadricolor*)	S1	Rocky creeks	Presumed Stable	
19	Sulphur-tipped Clubtail (*Gomphus militaris*)	S1	Lakes and artificial ponds	Presumed Stable	May expand range
20	Slaty Skimmer (*Libellula incesta*)	SNR	Old river oxbow	Presumed Stable	May expand range
21	Mocha Emerald (*Somatochlora linearis*)	SNR	Wooded edges/streams	Presumed Stable	May expand range
22	Cyrano Darner (*Nasiaeschna pentacantha*)	S1	Shaded creeks, lakes, and oxbows	Presumed Stable	
23	Blue-eyed Darner (*Rhionaeshna multicolor*)	S2	Small lakes, and ponds	Presumed Stable	
24	Green-striped Darner (*Aeshna verticalis*)	S1	Marshes and pond edges	Presumed Stable	
25	Variable Darner (*Aeshna interrupta*)	S2	Lakes, ponds, and streams	Presumed Stable	
26	Smoky Shadowdragon (*Neurocordulia molesta*)	S2	Large rivers	Increase Likely	May expand range
27	Royal River Cruiser (*Macromia taeniolata*)	S2	Lakes and rivers	Increase Likely	May expand range
28	Canada Darner (*Aeshna Canadensis*)	S2	Marshes and pond edges	Increase Likely	May shift range/leave

Additional Factors Considered

Regional Assessment

Iowa DNR participated in an effort to compare the results of the climate change vulnerability assessment described above across a broader region, including Illinois, Iowa and Nebraska. Four independent teams used NatureServe's Climate Change Vulnerability Index to assess the potential impacts of climate change to wildlife species across these three states. Some patterns that emerged from looking at the results within a broader regional context include the fact that over half of the >550 species assessed were vulnerable to climate change in at least one state, and that species dependent upon freshwater ecosystems were found likely to be at greater risk from climate change than more terrestrial species.

Potential Effects of Climate Change on Ranges and Prevalence of Non-native Species

The primary focus of this assessment is species of concern that are native to Iowa. However, when assessing the state's vulnerability to climate change it is also important to consider the effects of potentially invasive non-native species that may pose a threat to Iowa's biodiversity. In order to provide a more thorough report on Iowa's vulnerability to climate change, the Iowa Department of Natural Resources sought information about the risk of certain species to become invasive in Iowa through natural range expansion or artificial introduction. This type of assessment takes into consideration the current known ecological habitat and climate preferences of a species and compares it to predicted climate change scenarios in order to identify new regions where a species may thrive.

Six species were selected and assessed for the risk that they would become invasive in Iowa as the climate changes (Ingenloff et al. 2011). These species were selected based on their ability to colonize new regions, their risk to Iowa's native species if they successfully invaded, and the availability of adequate information about each species for use in the modeling tools. The process of assessing the potential risk of a species becoming invasive in Iowa promotes awareness about the potential for species that may not seem relevant now to become management concerns in the future. It also shows the usefulness of niche modeling for predicting which species may be of concern and which are unlikely to colonize Iowa's habitats. Information for Table Appendix 21- 11 was taken from the 2011 *Risk Analysis of the Invasive Potential of 6 Species in Iowa: Utilizing Ecological Niche Modeling to Assess Climatic Suitability in 2050 and 2090* document produced by the University of Kansas. It shows that the Asian Rock Pool Mosquito (*Aedes japonicas*) and the Red Swamp Crayfish (*Procambrius clarkii*) have a high risk of becoming invasive species in Iowa. These species are highly successful colonizers. The Asian Rock Pool Mosquito, a known carrier of West Nile virus, has already been documented in Iowa and although the Red Swamp Crayfish hasn't been found in Iowa yet, it has successfully colonized five of the world's seven continents due to its tolerance of a wide variety of habitat conditions. The New Zealand Mudsnail (*Potamopyrgus antipodarium*) and the Chinese Bushclover (*Lespedeza cuneata*) are also highly adaptable and have become invasive in other regions. However, they are classified at a moderate-high threat because they are currently not within close enough proximity to Iowa to be a serious threat. The Parrot-feather (*Myriophyllum aquaticum*) and Round Goby (*Neogobius melanostomus*) were considered only moderate risks because although they are known to successfully colonize new regions, they may not encounter suitable conditions in Iowa even as the climate changes. The same adaptive characteristics that make some of Iowa's native species adaptable to climate change, such as dispersal ability and flexibility in habitat and diet requirements, make non-native species successful invaders. As with the predictions for Iowa's native species, the model projections simply indicate what may be possible given the known parameters. Therefore, this data is meant to help managers prepare for a changing environment rather than specifically predict what Iowa's environment will be like in the future.

Table Appendix 21- 11. Non-native species that may become invasive in Iowa as climate change progresses
As determined by the 2011 *Risk Analysis of the Invasive Potential of 6 Species in Iowa: Utilizing Ecological Niche Modeling to Assess Climatic Suitability in 2050 and 2090* report produced by the University of Kansas.

Species	Native Region	Invasion Risk	Justification
Asian Rock Pool Mosquito (*Aedes japonicas*)	Japan and Korea	High	• Predicted increasing climatic suitability within Iowa • Successful colonizer • Already found in Iowa and neighboring states
Red Swamp Crayfish (*Procambarus clarkii*)	South central U.S. and northern Mexico	High	• Predicted large climatically suitable areas within Iowa and neighboring states • Has successfully colonized five continents • Disperses easily and quickly
New Zealand Mudsnail (*Potamopyrgus antipodarum*)	Lakes in rivers in New Zealand and nearby islands	Moderate-High	• History of high invasion capability due to adaptability • Generalist invader
Chinese Bushclover (*Lespediza cuneata*)	Korea, China, Taiwan, India, Japan, and Australia	Moderate-High	• Aggressive and hardy • Thrives in disturbed habitats and low quality soils • Dispersed via herbivores • Present in adjacent states
Round Goby (*Neogobius melanostomus*)	Black and Caspian Seas	Moderate	• Potential to be established in basis adjacent to Iowa • Future projections predict no suitability by 2050
Parrot-feather (*Myriophyllum aquaticum*)	Argentina, Bolivia, Brazil, Chile, Ecuador, Paraguay, and Peru	Moderate	• Established in nearby states • Dispersed by humans • Hardy

Implications

This climate change vulnerability assessment identified Iowa species that may be particularly susceptible to the effects of climate change and briefly covers the potential for invasive species to become a problem in the future. Despite identifying species that may be of increased conservation concern, the results of the assessment did not indicate any clear and specific reasons for the increased vulnerability of native species or threats of potential invasive species. There was no obvious correlation between habitat preference and vulnerability to climate change for the native species, indicating that all habitat types will contain species with varying levels of vulnerability. Therefore, before proceeding with any management plan, it may be most effective to identify a particular species or group of species that will be more intensely affected by climate change and then identify the ways the climate is affecting their habitat. However, in general, habitats that are more diverse are also more resilient to any sort of ecological challenges so managing for ecological diversity is still an important goal. State rank was also not directly correlated with the degree to which any species would be vulnerable to climate change. This shows that species that are now of conservation concern may not be as threatened in the future, and species that are prevalent today may not remain common as the climate changes. Additionally, species that currently do not thrive in Iowa may arrive in the state and

pose problems for native flora and fauna. Therefore, monitoring will continue to be an important source of information for the status of wildlife populations. Managing for habitat connectivity will be important for native species that may need to shift their ranges in response to climate change and vigilant prevention of non-native species translocation will continue to be important for preventing the spread of potential invasive species.

The NatureServe tool used in this assessment makes predictions about the vulnerability of populations based solely on risks associated with climate change. Managers must consider risk factors affecting these species that are not associated with climate change and combine that knowledge with the information in this assessment in order to design and implement future conservation efforts that will effectively address the needs of vulnerable species. Prioritizing species of concern is an efficient and cost-effective way of considering conservation challenges and future management approaches. However, as with any prediction of the future, there is uncertainty in the results of this assessment, and it should not be the only tool used to identify species of concern. The goals of this assessment were to promote discussion about climate change vulnerability, prioritize species, inform management, and identify possible focuses of future monitoring efforts and land acquisition. Being aware of the possible threats of climate change will be important for designing relevant and effective management practices in the years to come.

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Appendix 22. Conservation Measures Partnership's Taxonomy of Threats

Threats Taxonomy: World Conservation Union – Conservation Measures Partnership classification of direct threats to biodiversity (version 2.0). Despite the label "threats," the items on this list are not inherently positive or negative for wildlife or habitats. Rather, the list includes and categorizes all *potential* threats to species and natural communities.

Threats	Definition
1. Residential & Commercial Development	**Threats from human settlements or other non-agricultural land uses with a substantial footprint**
1.1 Housing & Urban Areas	Human cities, towns, and settlements including non-housing development typically integrated with housing
1.2 Commercial & Industrial Areas	Factories and other commercial centers
1.3 Tourism & Recreation Areas	Tourism and recreation sites with a substantial footprint
2. Agriculture & Aquaculture	**Threats from farming and ranching as a result of agricultural expansion and intensification, including silviculture, mariculture and aquaculture**
2.1 Annual & Perennial Non-Timber Crops	Crops planted for food, fodder, fiber, fuel, or other uses
2.2 Wood & Pulp Plantations	Stands of trees planted for timber outside of natural forests, often with non-native species
2.3 Livestock Farming & Ranching	Domestic terrestrial animals raised in one location on farmed or non-local resources (farming); also domestic or semi-domesticated animals allowed to roam in the wild and supported by natural habitats (ranching)
2.4 Marine & Freshwater Aquaculture	Aquatic animals raised in one location on farmed or non-local resources; also hatchery fish allowed to roam in the wild
3. Energy Production & Mining	**Threats from production of nonbiological resources**
3.1 Oil & Gas Drilling	Exploring for, developing, and producing petroleum and other liquid hydrocarbons
3.2 Mining & Quarrying	Exploring for, developing, and producing minerals and rocks
3.3 Renewable Energy	Exploring, developing and producing renewable energy
4. Transportation & Service Corridors	**Threats from long narrow transport corridors and the vehicles that use them including associated wildlife mortality**
4.1 Roads & Railroads	Surface transport on roadways and dedicated tracks
4.2 Utility & Service Lines	Transport of energy & resources
4.3 Shipping Lanes	Transport on and in freshwater and ocean waterways
4.4 Flight Paths	Air and space transport
5. Biological Resource Use	**Threats from consumptive use of "wild" biological resources including both deliberate and unintentional harvesting effects; also persecution or control of specific species**
5.1 Hunting and Collecting Terrestrial Animals	Killing or trapping terrestrial wild animals or animal products for commercial, recreation, subsistence, research or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch

Threats	Definition
5.2 Gathering Terrestrial Plants	Harvesting plants, fungi, and other non-timber/non-animal products for commercial, recreation, subsistence, research or cultural purposes, or for control reasons
5.3 Logging & Wood Harvesting	Harvesting trees and other woody vegetation for timber, fiber, or fuel
5.4 Fishing & Harvesting Aquatic Resources	Harvesting aquatic wild animals or plants for commercial, recreation, subsistence, research, or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch
6. Human Intrusions & Disturbance	**Threats from human activities that alter, destroy and disturb habitats and species associated with non-consumptive uses of biological resources**
6.1 Recreational Activities	People spending time in nature or traveling in vehicles outside of established transport corridors, usually for recreational reasons
6.2 War, Civil Unrest & Military Exercises	Actions by formal or paramilitary forces without a permanent footprint
6.3 Work & Other Activities	People spending time in or traveling in natural environments for reasons other than recreation, military activities, or research
7. Natural Systems Modification	**Threats from actions that convert or degrade habitat in service of "managing" natural or semi-natural systems, often to improve human welfare**
7.1 Fire & Fire Suppression	Suppression or increase in fire frequency and/or intensity outside of its natural range of variation
7.2 Dams & Water Management/Use	Changing water flow patterns from their natural range of variation either deliberately or as a result of other activities
7.3 Other Ecosystem Modifications	Other actions that convert or degrade habitat in service of "managing" natural systems to improve human welfare
7.4 Removing/Reducing Human Maintenance	Absence or reduction of current or historical maintenance regimes important for key ecological attributes. Includes regimes historically maintained by protected area staff, farmers and ranchers, indigenous peoples, private landowners, or any other resource manager
8. Invasive & Other Problematic Species & Genes	**Threats from non-native and native plants, animals, pathogens/microbes, or genetic materials that have or are predicted to have harmful effects on biodiversity following their introduction, spread and/or increase in abundance**
8.1 Invasive Non-Native/Alien Species	Harmful plants, animals, ~~pathogens and other microbes~~ not originally found within the ecosystem(s) in question and directly or indirectly introduced and spread into it by human activities (e.g. household pets, zebra mussels, purple loosestrife)
8.2 Problematic Native Species	Harmful plants, animals, or pathogens and other microbes that are originally found within the ecosystem(s) in question, but have become 'out-of-balance' or 'released' directly or indirectly due to human activities
8.3 Introduced Genetic Material	Human altered or transported organisms or genes
8.4 Pathogens & Microbes	Harmful native and non-native agents that cause disease or illness to a host, including bacteria, viruses, prions, fungi, and other microorganisms (e.g. Chytrid fungus, Dutch Elm Disease, Chronic Wasting Disease)
9. Pollution	**Threats from introduction of exotic and/or excess materials or energy from point and nonpoint sources**
9.1 Household Sewage & Urban Waste Water	Water-borne sewage and non-point runoff from housing and urban areas that include nutrients, toxic chemicals and/or sediments
9.2 Industrial & Military Effluents	Water-borne pollutants from industrial and military sources including mining, energy production, and other resource extraction industries that include nutrients, toxic chemicals and/or sediments

Threats	Definition
9.3 Agricultural & Forestry Effluents	Water-borne pollutants from agricultural, silvicultural, and aquaculture systems that include nutrients, toxic chemicals and/or sediments including the effects of these pollutants on the site where they are applied
9.4 Garbage & Solid Waste	Rubbish and other solid materials including those that entangle wildlife
9.5 Air-Borne Pollutants	Atmospheric pollutants from point and nonpoint sources
9.6 Excess Energy	Inputs of heat, sound, or light that disturb wildlife or ecosystems
10. Geological Events	**Threats from catastrophic geological events**
10.1 Volcanoes	Volcanic events
10.2 Earthquakes/Tsunamis	Earthquakes and associated events
10.3 Avalanches/Landslides	Avalanches or landslides
11. Climate Change	**Threats from long-term climatic changes which may be linked to global warming and other severe climatic/weather events that are outside of the natural range of variation, or potentially can wipe out a vulnerable species or habitat**
11.1 Ecosystem Encroachment	Large-scale effects of ecosystems shifting and impinging on other species and ecosystems.
11.2 Changes in Geochemical Regimes	Broad-scale changes in the geochemical conditions of ecosystems including ocean acidification (e.g. changes in atmospheric CO_2 affecting plant growth, loss of sediment leading to broad-scale subsidence)
11.3 Changes in Temperature Regimes	Broad-scale changes in temperature mean, variability, seasonality, and extremes, including changes in temperature extremes, increased average summer temperature, and decreased minimum winter/spring temperature
11.4 Changes in Precipitation & Broad-Scale Hydrological Regimes	Broad-scale changes in precipitation mean, variability, seasonality, and extremes, including decreased or increased precipitation, changes in timing of precipitation, changes in form of precipitation (e.g., snow vs rain; snowcover and snowpack where applicable), changes in evapotranspiration rates and hydrological cycles, and droughts and floods (e.g. droughts, changes in timing of rains, increased severity of floods, loss of snowcover)
11.5 Severe/Extreme Weather Events	Changes in frequency, timing and/or intensity of storms as well as severe weather events that threaten targets that have lost resilience

Appendix 23. Conservation Actons Taxonomy

Actions Taxonomy: World Conservation Union – Conservation Measures Partnership classification of direct threats to biodiversity (version 2.0). Because this Conservation Actions taxonomy was developed to be inclusive of all types of conservation across the globe, some actions listed below may not be particularly relevant to Implementation of this Plan, and inclusion here does not imply that this Plan recommends or supports undertaking any of the following actions. Recommended actions are listed in Chapter 6 on pages 3-13, with a cross-walk to the actions taxonomy presented in this Appendix. The purpose of providing the taxonomy is to provide an organizational framework by which conservation efforts can be presented across species groups or ecosystem types, across entities, and across states and regions.

Conservation Actions	Definition
A. Target Restoration/Stress Reduction Actions	**Actions to directly restore a target or mitigate a stress**
1. Land/Water Management	**Actions directed at conserving or restoring sites, ecosystems and the wider environment**
1.1 Site/Area Stewardship	Enhancing viability/mitigating stresses for sites and/or ecosystem targets
1.2 Ecosystem & Natural Processes (Re)Creation	Restoring missing or severely degraded ecosystems and ecosystem function, especially on a large scale
2. Species Management	**Actions directed at conserving or restoring specific species**
2.1 Species Stewardship	Enhancing viability/mitigating stresses to specific species targets within their current range
2.2 Species Re-Introduction & Translocation	Re-introducing species to places where they formerly occurred or to suitable future habitat or benign introductions of species to an ecosystem
2.3 Ex-Situ Conservation	Protecting biodiversity out of its native habitats with the aim of ultimately restoring it to these habitats
B. Behavioral Change / Threat Reduction Actions	**Actions to get people to stop direct threats or continue/increase positive behaviors**
3. Awareness Raising	**Actions designed to make people aware of key issues, thus leading to behavior change**
3.1 Outreach & Communications	Promoting desired behavioral change by providing information through various media and other channels
3.2 Protests & Civil Disobedience	Promoting desired behavioral change by conducting protests or other confrontational means
4. Law Enforcement & Prosecution	**Monitoring and enforcing compliance with existing laws, policies & regulations, and standards & codes at all levels**
4.1 Detection & Arrest	Detecting and/or directly stopping violations of existing laws, policies/regulations and standards/legal codes
4.2 Criminal Prosecution & Conviction	Ensuring sanctions for violations of existing laws, policies/regulations and standards/legal codes
4.3 Non-criminal Compliance Enforcement	Threatening or bringing non-criminal legal action to get individuals, organizations, or firms to change behavior
5. Livelihood, Economic & Moral Incentives	**Actions using livelihood, economic and moral incentives to directly influence behavior or to change attitudes that then lead to behavioral change**
5.1 Linked Enterprises & Livelihoods	Developing enterprises that directly depend on the maintenance of natural resources or provide substitute livelihoods as a means of changing behaviors or attitudes

Conservation Actions	Definition
5.2 Substitution & Alternative Livelihoods	Promoting alternative products and services that substitute for environmentally damaging ones
5.3 Market Forces	Using market mechanisms to change behaviors and attitudes
5.4 Valuation of / Payments for Ecosystem Services	Using direct or indirect payments for ascribing economic value to change behaviors and attitudes
5.5 Non-Monetary Values	Using intangible and moral values to change behaviors and attitudes
C. Enabling Condition Actions	**Actions that create the conditions necessary for other conservation efforts to succeed**
6. Conservation Design & Planning	**Actions to legally or formally protect sites and/or species**
6.1 Site/Area Protection	Legally or formally establishing or expanding public or private parks, reserves, and other protected areas roughly equivalent to IUCN Categories I-VI*
6.2 Easements & Resource Rights	Legally or formally establishing protection or easements of some specific aspect of the resource on private lands outside of IUCN Categories I-VI
6.3 Land/Water Use Planning & Zoning	Legally or formally designating land or water uses
6.4 Site/Area Planning & Monitoring	General planning and monitoring of public or private parks, reserves and other protected areas roughly equivalent to IUCN Categories I-VI*
6.5 Site Infrastructure	Creating and maintaining the physical infrastructure for protected areas and other conservation sites
6.6 Species Designation, Planning & Monitoring	General designation and management of specific plant and animal populations of concern
7. Law & Policy	**Actions to develop, change, and influence formal legislation, regulations, and voluntary standards**
7.1 Legislation	Making, implementing, changing, influencing, or providing input into formal government sector legislation at all levels: international, national, state/provincial, municipal, tribal
7.2 Policies & Regulations	Making, implementing, changing, influencing, or providing input into policies and regulations affecting the implementation of laws and codes at all levels: international, national, state/provincial, municipal, tribal private
7.3 Private Sector Standards & Codes	Setting, implementing, changing, influencing, or providing input into voluntary standards & professional codes that govern private sector practice
7.4 Compliance & Enforcement Capacity	Monitoring and enforcing compliance with laws, policies & regulations, and standards & codes at all levels
8. Research & Monitoring	**Basic and applied research to support conservation work**
8.1 Basic Research & Status Monitoring	Basic research related to conservation
8.2 Effectiveness Monitoring / Adaptive Management	Assessment of and learning about the effectiveness of strategies
9. Education & Training	**Enhancing knowledge and skills of specific individuals**
9.1 Formal Education	Enhancing knowledge and skills of students in a formal degree program
9.2 Training & Capacity Development	Enhancing knowledge, skills and information exchange for practitioners, stakeholders, and other relevant individuals in structured settings outside of degree programs
10. Institutional Development	**Creating the institutions needed to support conservation work**

Conservation Actions	Definition
10.1 Organizational Management & Administration	Doing the work needed to establish and operate conservation organizations and agencies
10.2 Institutional & Civil Society Development	Creating or providing non-financial support & capacity building for non-profits, government agencies, communities, and for-profits
10.3 Alliance & Partnership Development	Forming and facilitating partnerships, alliances, and networks of organizations
10.4 Financing Conservation	Raising and providing funds for conservation work

*IUCN Protected Areas Categories System: IUCN protected area management categories classify protected areas according to their management objectives. For more information, visit: http://www.iucn.org/about/work/programmes/gpap_home/gpap_quality/gpap_pacategories/

Category Ia: Strict Nature Reserve
Category Ib: Wilderness Area
Category II: National Park
Category III: Natural Monument or Feature
Category IV: Habitat/Species Management Area
Category V: Protected Landscape/Seascape
Category VI: Protected area with sustainable use of natural resources

Appendix 24. Additional Resources

Natural Resource Management & Scientific Agencies in Iowa

Agency Name	Website
US Army Corps of Engineers – Lakes Gateway page for Iowa	http://corpslakes.usace.army.mil/visitors/states.cfm?state=IA
Conservation Districts of Iowa	http://cdiowa.org/
Iowa's County Conservation System	http://www.mycountyparks.com/Info/IACCB.aspx
US Fish and Wildlife Service	http://www.fws.gov
US Forest Service	http://www.fs.fed.us/
US Geological Survey	http://www.usgs.gov/
Iowa Fish and Wildlife Cooperative Research Unit	http://www.cfwru.iastate.edu/
Iowa Department of Natural Resources	http://www.iowadnr.gov
National Park Service National Natural Landmark Program page for Iowa	http://www.nature.nps.gov/nnl/state.cfm?State=IA
US Department of Agriculture – Natural Resources Conservation Service's Iowa homepage	http://www.nrcs.usda.gov/wps/portal/nrcs/site/ia/home/

Partnerships and Coalitions

Partnership Name	Website
Association of Fish and Wildlife Agencies	http://www.fishwildlife.org/
Iowa is within the spatial scope of one regional association of fish and wildlife agencies:	
Midwest Association of Fish and Wildlife Agencies	http://www.mafwa.org/
Iowa Conservation Alliance	http://iowaconservationalliance.com/
Iowa Monarch Conservation Coalition	http://monarch.ent.iastate.edu/
Monarch Joint Venture	http://www.monarchjointventure.org/
National Bobwhite Conservation Initiative	http://bringbackbobwhites.org/
National Climate Change and Wildlife Science Center	https://nccwsc.usgs.gov/
Iowa is within the spatial scope of two Climate Science Centers:	
1. North Central Climate Science Center	http://revampclimate.colostate.edu/
2. Northeast Climate Science Center	https://necsc.umass.edu/
National Fish Habitat Partnership	http://www.fishhabitat.org/
Iowa is within the spatial scope of three fish habitat partnerships:	
1. Driftless Area Restoration Effort	http://www.tu.org/tu-projects/driftless-area-restoration-effort
2. Midwest Glacial Lakes Partnership	http://midwestglaciallakes.org/
3. Fishers and Farmers Partnership for the Upper Mississippi River Basin	http://fishersandfarmers.org/
Migratory Bird and All-Bird Joint Ventures	http://www.fws.gov/birds/management/bird-conservation-partnership-and-initiatives/migratory-bird-joint-ventures.php

Partnership Name	Website
Iowa is within the spatial scope of two Joint Ventures:	
1. Upper Mississippi River & Great Lakes Region Joint Venture	http://uppermissgreatlakesjv.org/
2. Prairie Pothole Joint Venture	http://ppjv.org/
Landscape Conservation Cooperatives (LCCs)	http://lccnetwork.org/
Iowa is within the spatial scope of three LCCs:	
1. Upper Midwest and Great Lakes LCC	http://greatlakeslcc.org/
2. Eastern Tallgrass Prairie and Big Rivers LCC	http://www.tallgrassprairielcc.org/
3. Plains and Prairie Potholes LCC	http://www.plainsandprairiepotholeslcc.org/
NatureServe (network of state natural heritage programs and other independent organizations)	http://www.natureserve.org
North American Bird Conservation Initiative	http://www.nabci-us.org
Partners in Amphibian and Reptile Conservation	http://parcplace.org/
Midwest Partners in Amphibian and Reptile Conservation	http://mwparc.org/
Partners in Flight US	http://www.partnersinflight.org
Avian Knowledge Network	http://www.avianknowledge.net/
Iowa is within the spatial scope of the Midwest Node of the Avian Knowledge Network	
Midwest Coordinated Bird Monitoring Partnership and Midwest Avian Data Center	http://midwestbirdmonitoring.ning.com/ http://data.pointblue.org/partners/mwadc/
Plant.Grow.Fly	http://www.blankparkzoo.com/en/conservation/plant_grow_fly/
Teaming With Wildlife Coalition	http://www.teaming.com/
Iowa Teaming With Wildlife Coalition	http://www.teaming.com/state/iowa
Wildlife Management Institute	http://wildlifemanagementinstitute.org/

Non-governmental Fish and Wildlife Conservation and Scientific Organizations in Iowa

Organization Name	Website
American Ornithologists' Union Check-List of North American Birds	http://www.aou.org/checklist/north/
National Audubon Society Important Bird Areas	http://www.audubon.org/bird/iba
Iowa Audubon Society Important Bird Areas	http://www.iowaaudubon.org/IBA/
Iowa Audubon	http://www.iowaaudubon.org
Iowa Academy of Science	http://www.scienceiniowa.org/
American Fisheries Society	http://fisheries.org/
Iowa Chapter of the American Fisheries Society	http://iowa.fisheries.org/
Iowa Association of Naturalists	http://www.iowanaturalists.org/
Iowa Association of Wildlife Rehabilitators	
Blank Park Zoo	http://www.blankparkzoo.com/
Iowa Conservation Education Coalition	http://www.iowaee.org/
Ducks Unlimited	http://www.ducks.org/

Organization Name	Website
Hawkeye Fly Fishing Association	http://www.hawkeyeflyfishing.com/
Iowa Division of the Izaak Walton League of America	http://iowaikes.org/
Iowa Native Plant Society	http://iowanativeplants.org/index.php
Iowa Natural Heritage Foundation	http://www.inhf.org/
Iowa Odonata Survey	www.iowaodes.org
Iowa Prairie Network	http://www.iowaprairienetwork.org/
Iowa Wildlife Center	
Loess Hills Alliance	http://loesshillsalliance.com/
Loess Hills Preservation Society	http://loesshps.org/
Macbride Raptor Project	http://recserv.uiowa.edu/mrp
National Wildlife Federation	www.nwf.org
Iowa Wildlife Federation (Iowa Affiliate of the National Wildlife Federation)	http://iawildlife.org/
National Wild Turkey Federation - Iowa	http://www.nwtf.org/about/state/iowa
NatureServe	http://www.natureserve.org/
Odonata Central, also hosts Dragonfly Society of the America's webpage	http://www.odonatacentral.org
Pheasants Forever - Iowa	http://www.iowapf.net/
Quail Forever	http://quailforever.org/
Reiman Gardens at Iowa State University	http://www.reimangardens.com/
Iowa Butterfly Survey Network (hosted by Reiman Gardens)	http://www.reimangardens.com/collections/insects/iowa-butterfly-survey-network/
Ruffed Grouse Society	http://www.ruffedgrousesociety.org/
Safari Club International - Iowa	http://iowasci.com/
Saving Our Avian Resources	http://www.soarraptors.org/
Sierra Club - Iowa	http://www.sierraclub.org/iowa
Society for the Study of Amphibians and Reptiles	https://ssarherps.org/
Southern Iowa Oak Savanna Alliance	http://www.siosa.org/
The Nature Conservancy - Iowa	http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/iowa/index.htm?intc=nature.tnav.where.list
Trout Unlimited – Iowa Chapter	http://www.iadriftless.org/
The Wildlife Society	http://wildlife.org/
Iowa Chapter of The Wildlife Society	http://iowatws.org/
Whiterock Conservancy	http://whiterockconservancy.org/

Websites

The following websites provide information about Iowa species (occurrence records, life history information, checklists, taxonomic order and nomenclature, etc.)

Organization Name	Website
General	
Iowa Academy of Science	http://www.scienceiniowa.org/
NatureServe Explorer	http://explorer.natureserve.org/
Amphibians and Reptiles	
Society for the Study of Amphibians and Reptiles	https://ssarherps.org/
Herpnet – Iowa and Minnesota	(As of printing time, this site is changing its web address)
Birds	
American Ornithologists' Union Check-List of North American Birds	http://www.aou.org/checklist/north/
Iowa Ornithologists' Union	http://iowabirds.org/
Butterflies & Moths	
North American Butterfly Association's Checklist of North American Butterflies Occurring North of Mexico	http://www.naba.org/pubs/enames2.html
Iowa Butterfly Survey Network (hosted by Reiman Gardens)	http://www.reimangardens.com/collections/insects/iowa-butterfly-survey-network/
Poweshiek Skipper Project	http://www.poweshiekskipper.org/biodiversity/biodiversityhome.html
Insects of Iowa	http://www.insectsofiowa.org/
Crayfish	
BioNet	https://programs.iowadnr.gov/bionet/
Dragonflies and Damselflies	
Iowa Odonata Survey	www.iowaodes.org
Odonata Central, also hosts Dragonfly Society of the America's webpage	http://www.odonatacentral.org
BioNet	https://programs.iowadnr.gov/bionet/
Insects of Iowa	http://www.insectsofiowa.org/
Fish	
BioNet	https://programs.iowadnr.gov/bionet/
Fish Atlas (Aquatic GAP)	http://maps.gis.iastate.edu/iris/fishatlas/
Mammals	
Smithsonian Institution's Mammals of the World Online Database	http://vertebrates.si.edu/msw/mswcfapp/msw/index.cfm
Mussels	
BioNet	https://programs.iowadnr.gov/bionet/
Terrestrial Snails	
Poweshiek Skipper Project	http://www.poweshiekskipper.org/biodiversity/biodiversityhome.html
Field Museum of Natural History's Mollusk Collection	http://www.fieldmuseum.org/node/5011

Plans and Strategies

The following strategic plans, which were developed by wildlife conservation agencies, organizations or partnerships are relevant to the implementation of various aspects of the Iowa Wildlife Action Plan.

Organization/Plan Name	Website
Iowa Plans	
Iowa's Forest Action Plan	http://www.iowadnr.gov/Environment/Forestry/ForestryLinksPublications/IowaForestActionPlan.aspx
State Conservation and Outdoor Recreation Plan	http://www.iowadnr.gov/InsideDNR/GrantsOtherFunding/StateConservationRecPlan.aspx
Iowa Water Trails Plan	http://www.iowadnr.gov/Recreation/CanoeingKayaking/WaterTrailDevelopmentTools/StatewidePlan.aspx
Iowa's Wetland Action Plan	http://www.iowadnr.gov/Environment/WaterQuality/WaterMonitoring/Wetlands.aspx
Comprehensive Conservation Plans for National Wildlife Refuges in Iowa	http://www.fws.gov/midwest/planning/PlansByState/iowa.html
Regional Plans	
Bird Joint Venture Plans	
Prairie Pothole Joint Venture (PPJV) Implementation Plan	http://ppjv.org/resources/implementation-plan
Upper Mississippi River and Great Lakes Region (UMRJV) Implementation Plan	http://uppermissgreatlakesjv.org/Plans.htm (Habitat Conservation Strategies for Landbirds, Shorebirds, Waterfowl and Waterbirds within this JV are also available at this site)
The Nature Conservancy Ecoregional Assessments	http://www.conservationgateway.org/ConservationPlanning/SettingPriorities/EcoregionalReports/Pages/EastData.aspx
1. Central Tallgrass Prairie	Ecoregional Assessments and reports for each of the three ecoregions in Iowa can be downloaded from the Conservation Gateway's Ecoregional Assessment Status Tool (EAST)
2. Northern Tallgrass Prairie	
3. Prairie Forest Border	
Partners in Flight Physiographic Area Plans	http://www.partnersinflight.org/bcps/pifplans.htm
1. Dissected Till Plains - Physiographic Region #32	http://www.partnersinflight.org/bcps/pl_32sum.htm
2. Northern Tallgrass Prairie, Physiographic Region #40	http://www.partnersinflight.org/bcps/pl_40sum.htm
3. Upper Great Lakes Plain, Physiographic Region #16	http://www.partnersinflight.org/bcps/pl_16sum.htm
National/Continental Plans	
North American Waterfowl Management Plan	http://www.fws.gov/birds/management/bird-management-plans/north-american-waterfowl-management-plan.php
United States Shorebird Conservation Plan	http://www.shorebirdplan.org/
United States Waterbird Conservation Plan	http://www.waterbirdconservation.org/nawcp.html
North American Landbird Conservation Plan	http://www.partnersinflight.org/cont_plan/
North American Monarch Conservation Plan	http://www.cec.org/Page.asp?PageID=122&ContentID=2783
National for Fish, Wildlife and Plants Climate Change Adaptation Strategy	http://www.wildlifeadaptationstrategy.gov/