CHAPTER FIVE

STRESSES ON IOWA'S WILDLIFE AND ITS HABITATS

Virtually all stresses that have or still affect Iowa's wildlife can be attributed to human influences on the animals themselves or on the Iowa landscape.

Direct Stresses on Wildlife

Over-harvesting for food or other economic value depleted the original big game herds, furbearers and some other species (e.g. the extirpation of elk, buffalo, white-tailed deer and beaver and the extinction of the passenger pigeon).

Indiscriminate killing eliminated predators that were perceived as a threat to humans, livestock, crops or property (e.g. wolves, bears, mountain lions, and bobcats). Avian predators were persecuted because they reduced the numbers of game animals (e.g. quail, turkey and rabbits) available for human use. Snakes, even non-poisonous ones, were killed because of irrational human fear. Other species (spotted skunks, beaver, mink, fox and weasels) were trapped because of the damage they caused to buildings or land, or because they killed small domestic livestock like chickens and ducks.

Accidental killings include animal collisions with vehicles or man-made structures such as towers or buildings. They also result from agricultural operations such as mowing, pesticide, manure, fertilizer or anhydrous ammonia application.

Since the formation of the Iowa State Conservation Commission (now IDNR) in 1935 Iowa law has regulated the taking of all wildlife. Wildlife science has developed models for game harvest that perpetuate game species and since then over harvest has not been a continuing problem. Raptors have been protected by Federal statute since 1918. By Iowa law landowners are permitted to protect their property from furbearers that are causing damage, but this has had no apparent impact on furbearer populations; generally only the most abundant animals are targeted. Although Iowa has one of the highest densities of improved roads in the nation and road-kills are observed frequently, they also seem to affect the most numerous species. No cases of SGCN being unduly threatened by roads are known to exist.

The *introduction of exotic species* can impact native wildlife through direct conflict, competition for needed resources, or by introducing new diseases. The (English) house sparrow reached Iowa in 1869. By 1907 it was considered the most abundant bird in Iowa, successfully competing with native species for food

and nesting sites. A more recent introduction, the Eurasian tree sparrow has had detrimental impacts on cavity-nesting native birds in states surrounding Iowa. Conversely, exotic species that can find a vacant niche to occupy can have beneficial affects e.g. the ringnecked pheasant and gray partridge. Pheasants have occasionally been blamed for the final demise of the prairie chicken in Iowa, but the elimination of the prairie as a functioning ecosystem was the most probable cause.

Aquatic ecosystems in Iowa have been severely impacted by introduced exotic species. Various carp species have so altered aquatic habitats in wetlands and shallow lakes so they cannot sustain most native fish or mussels. Zebra mussels introduced initially in the Great Lakes and then into the Mississippi River drainage have monopolized available mussel habitat and have colonized living individuals resulting in their death. Eurasian water millfoil and purple loostrife in aquatic systems and garlic mustard in terrestrial locations are squeezing out native plants valuable to native wildlife. Introduced white and striped bass, on the other hand, provide thousands of hours of recreational fishing annually.

Stresses on Wildlife Habitats

Terrestrial habitats. The Steering Committee and Working Groups identified 18 stresses that are affecting Iowa's terrestrial wildlife and its habitats. The greatest impact of human activities on most of Iowa's wildlife has been the conversion of natural plant communities to agricultural lands, resulting in the *absence of wildlife habitat* for many native species over extensive portions of the state. Wetland *drainage* has nearly eliminated natural wetlands from most of the state (Chapter 2 and Chapter 4).

Other seemingly beneficial activities such as *dam building* for flood or erosion control or to provide water-based recreation can produce a similar result. The Mississippi River underwent extensive lock-and-dam building in the early 20th century to improve navigation. Iowa has 4 large flood control reservoirs on interior rivers, and 200 constructed multi-purpose lakes. More than 87,000 farm ponds have been constructed to stabilize watersheds, most in southern Iowa. Trade-offs are inevitable when these projects are undertaken. Where habitat mitigation is not practiced a net loss of habitat can result. Mitigation frequently benefits species that were not originally present. Recent projects have planted wildlife habitat on uplands in the watershed to reduce siltation rates. One assemblage of wildlife frequently replaces another, however, which could be detrimental to SGCN. The loss of bobwhite quail habitat in southern Iowa caused by watershed stabilization projects is a recent example.

The habitat value of Iowa's cropland has decreased over time. Most native grass pastures have been *converted to cool season grasses* to provide early spring forage for livestock. The change in preferred hay crops to earlier-maturing alfalfa and the early cutting of hay has decreased the habitat value of hay ground for ground nesting birds. The *increase in rowcrop acreage* at the expense of hay and pasture in the late 20th century has reduced populations of a number of grassland-dependent species like jackrabbits and bobolinks (Chapter 2). New corn and soybean harvest technology that leaves little if any waste grain and standing cover on cropfields reduces rowcrop values to wildlife.

Excessive grazing by livestock in woodlands and native prairie can eliminate preferred forage plants, cause physical damage to trees and shrubs and alter growing conditions through soil compaction. The species composition of native plants can be altered - only those tolerant of grazing or with some innate defense against livestock remain. Invasive species often fill the void. The dominance of prickly ash and multiflora rose in overgrazed Iowa woodlands and pastures are common examples. Manure runoff can lead to increased nutrient and silt loads in nearby aquatic systems. Physical damage from livestock can include the destruction of riparian vegetation and a break down of the stream bank leading to increased erosion.

Timber harvest has both positive and negative impacts on wildlife. Clear cutting may remove beneficial den trees and mature mast producing trees but may benefit plant and animals that require earlier successional stages. The physical removal of trees alters light penetration through the canopy and switches the competitive balance toward shade intolerant species. Understory and mid-story vegetation increases and a new assemblage of wildlife communities can develop, sometimes at the expense of SGCN. At the present most of Iowa's forestlands are entering mid-to-late growth stages and the lack of harvest to imitate natural disturbance is tipping the ecological balance toward wildlife adapted to late successional stages.

Herbicides, insecticides and fertilizers, although used primarily on agricultural lands, can alter adjacent natural habitats when wind drift or runoff carries chemicals from their primary targeted lands into adjacent or downstream habitats. Herbicides eliminate habitat. Modern insecticides, although not persistent in the environment, can kill wildlife directly exposed to them and reduce or eliminate insects utilized as food by a variety of wildlife. Fertilizers carried in runoff waters can alter the chemical and physical parameters of aquatic systems by accelerating algae and plant growth and lead to excessive eutrophication.

Conversion of habitats for residential use and non-farm industrial use, including the reverse migration of humans from cities and towns to the country, is proceeding at a rapid pace. Homes and all infrastructure modifications including additional roads, wires, and pipelines further disrupt natural communities.

Increased amounts of impermeable surfaces lead to hydrologic modifications. Increased domestic cat and dog populations can prey excessively on native wildlife.

Wetland drainage through tiling or ditching and stream channelization has reduced the amount of available wetlands in this state and can alter water retention duration, fluctuations and flow rates. *Land conversion to row crop* agriculture has increased flow rates in streams and rivers. *Man-made impoundments* can change the rate of flow and bottom substrate composition of flowing bodies of water with a resulting change in associated plants and animals.

Habitat fragmentation results when a large tract of habitat is reduced to a number of smaller, often isolated, tracts as portions of the habitat block are converted to other uses. Smaller tracts may not be suitable for use by some species that require large expanses of habitat. The increased amount of edge in fragmented habitats exposes a higher percentage of these blocks to sunlight along the edges, which can alter the plant and animal community. Many predators are known to search most actively along edges for prey, which has impacted survival and nest success of birds.

Loss of connectivity is frequently a result of fragmentation of habitats. When travel corridors are lost between fragmented habitat blocks, populations of some wildlife may become isolated genetically, may not be able to colonize new habitats, or may not be able to survive if the habitat block becomes unsuitable. Relatively non-mobile species are most at risk from this problem - even seemingly innocuous activities like *road construction* can block movement of less mobile animals like reptiles and amphibians.

Fire can have both positive and negative impacts. *The suppression of fire* in natural habitats following settlement has altered plant and animal species composition. Many native prairie and savanna habitats have converted to woodland. Frequent fires in forest communities retard plant succession and result in dominance by fire-tolerant, mast-producing oaks.

Improper use of fire can be harmful to wildlife if entire blocks of fragmented habitat are burned at one time. Less-mobile species such as some butterflies can lose all habitats in fragmented sites when the entire area is burned. All of the young, eggs or other life stages of a species may be destroyed by the fire with no reservoir of other individuals left to re-colonize the burned portion of the site.

Excessively high wildlife populations or populations concentrated in fragmented habitats can be susceptible to the spread of *disease* from other wildlife and domestic livestock. Improper timber harvest can expose the remaining trees to *pathogens and insect damage*.

Excessive recreational use, by foot traffic, horseback or off-road vehicles can destroy habitats by trampling or destroying vegetation. Excessive use on trails, particularly on fragile forest and loess soils, can lead to excessive erosion. Sensitive species can be driven from critical habitats by too-frequent interactions with humans.

Climate change, although hard to measure in the short term, has the potential to radically alter natural plant and animal communities. Scientists have predicted that global warming and increased precipitation will change most of Iowa's uncultivated lands to forest by the end of the 21st century (The Wildlife Society 2004).

Aquatic habitats. Seventeen stresses were identified that are affecting aquatic wildlife and habitats. Many of these stresses are related to or directly result from the alteration of terrestrial habitats.

Permanent drainage of shallow lakes and marshes, loss of riparian habitat and *the loss of shoreline vegetation* are all forms of terrestrial habitat loss. The conversion of native vegetation, grasslands and forest to rowcrops increases the base flow in streams. Less vegetative cover on the landscape results in less evapotranspiration and more water becomes available as runoff. This additional runoff has increased the number of creeks in many areas that were historically wet meadows and sloughs.

Loss of vegetative cover, excessive grazing, *excessive recreational use, channelization of streams,* and *shoreline alterations* can lead to *accelerated siltation* from agricultural fields and construction sites and from stream-bank sloughing. S*treambed degradation* and the *loss of submergent and emergent plants* frequently follow.

Heavy siltation and streambank disturbance from livestock facilitates the *transport of pesticides and fertilizers* into aquatic systems from agricultural fields and urban centers resulting in a*ccelerated eutrophication*. A heavy silt load can alter the turbidity and temperature regime of a body of water. As the silt settles it can cover existing bottom substrates and alter the entire natural community.

Constructed dams on flowing rivers and streams decrease flow rates, increase siltation above the dam and alter aquatic habitats. Artificial water level manipulation on impounded waters can upset normal cycles of reproduction and survival and alter vertebrate and invertebrate communities

All of these alterations to native habitats, aquatic plant communities and wildlife increase the opportunities for *invasive exotic species* to supplant native wildlife and for *disease* and other *pathogens* to take advantage of stressed and weakened wildlife populations.

Not all human influences on aquatic habitats are negative. *Properly constructed lakes and wetlands* can add aquatic habitats and help to improve water quality at and below the site of the created habitat. Land management practices within a watershed can greatly affect the hydrologic parameters of that system.

Stress Analysis

A formal process was used to identify the most important problems facing Iowa's wildlife today. Three stress levels - *Low, Moderate or High* - were used to evaluate the relative importance of each factor (Table 5-1). The Steering Committee and Working Groups defined 19 stresses currently affecting terrestrial wildlife and their habitats (Table 5-2) and 17 aquatic stresses (Table 5-3).

Separate stress evaluations were made for each taxonomic class (Chapter 3, Table 3-1), each habitat class (Chapter 4, Table 4-1 and Table 4-5) and each landform region (Chapter 2, Map 2-1). IDNR fisheries and wildlife biologists, the Steering Committee and Working Group members that had the appropriate expertise and experience performed the stress evaluations.

Table 5-1. Definitions of Stress Levels.

Stress Level	Definition
Low	If no action is taken, these stresses may degrade certain populations or habitats but at a level that will still permit sustainability of current populations or habitats.
Moderate	If no action is taken, these stresses will continue to degrade populations or habitats until a future time when populations or habitats are no longer sustainable. Corrective actions need to be studied and implemented in the near future.
High	If no action is taken, these stresses will cause a widespread degradation of populations and habitats resulting in an increased risk of statewide extirpation of species and loss of sustainable habitats. Corrective actions should be immediate and widespread, wherever the species or habitats occur.

Evaluators assigned a ranking of Low, Moderate or High to each stress affecting each taxonomic class and habitat class in each landform. The number of individuals completing an individual evaluation ranged from 1 to 31.

Once individual evaluations were completed, stress levels were assigned numerical values (Low = 1, Moderate = 2, High = 3). Numerical values were averaged over all persons completing each evaluation. Results of evaluations for each habitat and taxonomic class in each landform are presented in Appendix 16 (terrestrial) and Appendix 17 (aquatic).

Statewide summaries were calculated for each habitat class and taxonomic group. Because few evaluators completed some evaluations, average values for stresses are presented simply as Low, Moderate or High without statistical analysis. Stresses with mean scores of 1.0 - 1.6 were reclassified as Low, 1.7 - 2.2 as Moderate, and 2.3 - 3.0 as High.

Stresses on Terrestrial Wildlife and Habitats

Terrestrial Habitats

A statewide ranking of the relative importance of terrestrial stresses on each terrestrial habitat class was obtained by averaging stress rankings over all landform regions (Table 5-4). These statewide averages may be moderated if high and low values in different landforms offset each other or if some stresses are common only in specific habitats. For example, detrimental grazing is a *High* stress in the Loess Hills landform that has a substantial portion of the state's remaining grasslands, but a *Low* stress in the NW Iowa Plain that is nearly all row crops. Drainage is obviously a stress only on wetland and wet forest habitats.

In spite of these potential moderating influences, several factors ranked as *High* stresses in all landforms. **Absence of habitat, fragmentation, the loss of connectivity and detrimental grazing ranked as *High* stresses statewide and on nearly every habitat class (Table 5-4).** Several of the factors listed as *Moderate* stresses statewide were still *High* stresses in some habitat classes. Forests and savannas are threatened by conversion for residential use (reverse migration from urban areas and the attractiveness of wooded home sites). Forests are also threatened by the affects of oak wilt and other potential diseases. The few remaining wetlands are still threatened by drainage and the invasion of exotic plant species (e.g. purple loosestrife, Eurasian water milfoil). Drained wetlands and grasslands are the easiest habitats to convert to row crops. Conversion to row crops ranked as only a *Moderate* stress in wooded habitats because most woodlands and savanna are found on land too steep to plow. Fire suppression and the eventual conversion to

Table 5-2. Terrestrial stresses affecting Iowa's wildlife and its habitats.

Stress	Definition
Conversion to row crops	The conversion of natural habitats to agricultural row crops
Conversion to non-native grasses	The replacement of natural habitats with non-native grasses.
Conversion for residential use	Self-explanatory
Conv. for non-farm industrial use	Self-explanatory.
Excessive recreational use	Recreational uses such as snowmobile, ATV or horseback riding in natural areas may destroy habitat or limit wildlife use.
Detrimental grazing	The over-grazing or grazing too early or late resulting in habitat loss including loss of residual cover for SGCN.
Fire suppression	The removal of fire as a natural succession retarding process results in the conversion of grasslands to woody shrubs and trees.
Excessive Fire use	Fire may beneficially retard encroachment of woody vegetation in grasslands or stimulate growth of understory species in woodlands. Excessive or untimely use can kill individual animals, destroy habitats or alter habitats at critical life stages for SGCN.
Road construction	Can result in habitat loss, fragmentation and the opening of blocs of habitat to detrimental intrusions.
Timber harvest	Timber harvest is not bad *per se*, but the method and timing of harvest must consider the habitat needs of SGCN.
Invasive non-native species.	The proliferation of non-native species not naturally found in a certain habitat or geographical area can replace declining native species.
Pesticide/herbicide use	Can have direct impact on animals or may change habitats by altering normal successional stages in ecosystems.
Drainage	Man-made drainage of surface waters (can also alter the water table and groundwater flows).
Flooding caused by dams	Inundation of terrestrial habitats caused by man made dams. May also alter the natural seasonal occurrence of floods
Disease/pathogens/insect damage	Outbreaks of organisms that harm listed species or their habitats.
Fragmentation	The breaking up of large tracts of a certain habitat type into smaller blocks.
Loss of connectivity	Introducing breaks in linear habitats that had previously connected habitat blocks of various sizes to similar habitats
Climate change	Broad scale changes in precipitation and/or temperature fluctuations or extremes in temperatures or precipitation in a geographical area.
Absence of Habitat	The total lack of habitat needed for survival by listed species.

Table 5-3. Aquatic stresses affecting Iowa's wildlife and its habitats.

Stress	Definition
Siltation	The deposition of silt and sand sediments in aquatic ecosystems.
Chemical pollution	The introduction of harmful chemicals into aquatic ecosystems.
Accelerated eutrophication.	The excessive additions of nutrients into aquatic systems.
Channelization	The straightening of stream channels leading to decreased stream lengths, increased flow rates, and increased frequency of flooding.
. **Constructed dams**	Structures on flowing rivers and streams that impound water, resulting in altered aquatic habitats, decreased flow rates and increased siltation above the dam.
Permanent drainage	The permanent removal of surface water from natural lakes and wetlands.
Artificial water level manipulation	Human induced water level changes that may result in high or low water levels that may harm aquatic habitats and species.
Shoreline alteration	Human changes to shorelines that may result in increased or decreased bank erosion, shoreline structure and length of shoreline or stream segment.
Invasive/non-native species.	The proliferation of non-native species not naturally found in a certain habitat or geographical area.
Disease/pathogens	Harmful diseases or pathogens that affect the fish or mussel species directly or the biotic environment that they require for survival.
Excessive recreational use	Detrimental over use of the species or their environment for recreational purposes.
Climate change	Broad scale changes in precipitation and/or temperature fluctuations or extremes in a geographical area
Loss of riparian habitat	The removal of vegetation adjacent to bodies of water which may lead to increased flooding, siltation, and water temperatures.
Loss of shoreline vegetation	The removal of vegetation in or immediately adjacent to the waters edge or bank.
Loss of submerged/emergent plants	The loss of rooted plants in the water that may result in altered aquatic habitats.
Shoreline/bank erosion	Siltation originating from the bank or shoreline of a body of water.
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

Table 5-4. Stresses on Terrestrial Habitats (averaged over all taxonomic groups and all landforms).

Stress level: Blank = Low, Moderate, High
Terms: For = Forest; Warm = Warm Season; Herb = Herbaceous; Ag = Agricultural

	Wooded				Grasslands		Wetlands			
Stress	**FOREST**	**WET FOR**	**WOOD LAND**	**SHRUB**	**WARM HERB**	**SAVANNA**	**WET SHRUB**	**HERB WETLAND**	**AG LAND**	**MEAN**
Absence of Habitat	H	M	H	H	H	H	H	H		H
Fragmentation	H	H	H	H	H	H	M	H		H
Loss of connectivity	H	H	H	H	H	H	H	H		H
Detrimental grazing	H	H	H	M	H	H	M	M	M	H
Conversion to row crops.	M	M	M	M	H	M	M	H	M	M
Invasive non-native species	M	M	M	M	M	M	M	H		M
Fire suppression	M		M	M	H	H	M			M
Conversion for residential use	H		M	M	M	H				M
Conversion to non-native grasses				M	M	M		M	M	M
Disease/pathogens/insect damage	H		M			M			M	M
Pesticide/herbicide use					M		M	M	M	M
Excessive recreational use	M		M		M	M				M
Drainage		M					M	H	M	M
Conv. for non-farm industrial use	M		M							
Timber harvest	M	M	M			M				
Climate change		M					M			
Road construction										
Flooding caused by dams										
Fire use										

wooded habitats are impacting grasslands unless active land management is practiced.

The stress evaluations by habitat class within each landform showed similar patterns (Appendix 16-1). The same factors tended to rank as *High* stresses in a habitat class regardless of the landform in which the habitat was located.

Terrestrial Wildlife

Many of the same stress factors that were important to habitat classes significantly impact all the taxonomic classes considered in the ICWCP. **Negative habitat influences (absence of habitat, fragmentation, loss of connectivity, drainage, conversion to row crops), human land use activities (detrimental grazing and pesticide and herbicide use) and the influence of invasive non-native organisms ranked as *High* stresses to all taxonomic classes (Table 5-5).** There are some differences between the most important stress factors impacting each taxonomic class and between habitat classes for each taxon (Table 5-6 through Table 5-10). General factors such as the degree of habitat specificity exhibited by a taxonomic class (generalist - specialist), the mobility of individuals (birds - land snails) and the fragility of some taxa (mammals - butterflies) can explain some of these differences. Overall, the strong similarities between taxonomic classes seem more striking than the minor differences that can be observed. A discussion of the most important specific stresses for each taxonomic class follows.

Loss of Habitat (all causes). The numbers of grassland and wetland birds that once nested in Iowa must have been thousands of times greater than the populations that exist now. Grassland obligate species like prairie chickens, sharp-tailed grouse, short-eared owls, and bobolinks are prime examples. In many places in the state, the only wildlife habitat of any kind that remains is found in road ditches where only generalist species like redwing blackbirds and meadowlarks find suitable habitat.

At least 69 mammal species were known to reside in the state in the early 1800's. By 1900, 14 species had been extirpated and an additional 15 species are now considered either uncommon or rare. Species dependent upon either forest or prairie suffered most, while forest-edge species generally have thrived and even increased (e.g. white-tailed deer and raccoon).

Wetland drainage has eliminated aquatic habitat needed by many reptiles and amphibians, especially the drainage of ephemeral and other shallow wetlands devoid of predatory fish and bullfrogs. Surveys conducted since the 1970's show a decline in the distribution and abundance of most of Iowa's reptiles and amphibians when compared to similar surveys conducted in the 1940's (J.L. Christiansen, Drake University, personal communication). Only a few species, such as the bullfrog (*Rana catesbeiana*), have become more widespread. These declines have occurred not only in populations of habitat specialists, but to habitat generalists as well (e.g. the tiger salamander (*Ambystoma tigrinum*).

Numerous species of amphibians and reptiles require different habitats during different stages of their development or at certain times of the year. Amphibians all require water for reproduction and have aquatic larvae, but many become terrestrial as adults. Many of the reptiles, such as massasauga rattlesnakes (*Sistrurus catenatus*) and Blanding's turtles (*Emydoidea blandingii*), utilize both wetland and upland habitats throughout the year. The loss of any one of the habitat components can lead to the decline or elimination of that species.

Loss and fragmentation of habitats are the major reasons for population declines and reduced distributions of many butterfly species. This is especially true for those species that require prairie and wetland habitats. Fragmented habitats with separation distances too great for all but occasional movement between them has led to local extirpation of species with very little chance for natural re-colonization.

Habitat requirements of Pleistocene snails are very specific, and loss of their habitat is virtually irreversible. All of these land snails utilize algific slopes, maderate cliffs, and limestone or dolomite cliffs and outcroppings in the Paleozoic Plateau landform. *(Algific talus slopes are features derived from karst formed by frost action and ice wedging in limestone and dolomite bedrock when the system developed during the Wisconsinan glaciation. They formed from the freezing of water that infiltrated into the cracks formed along large joint blocks. Expanding ice physically pushed apart the adjoining blocks to form fissures and sinks. Maderate cliffs are algific talus slopes without substantial talus at the base.)* Pleistocene snails were probably never widespread, so any activity that changes the temperature and/or moisture regime for these animals or fragments their limited habitat is highly detrimental to small, isolated snail populations.

Some researchers believe that a minimum of 250 acres of forested land is necessary to maintain most forest-interior bird species (e.g. warblers, flycatchers, and thrushes). Northern harriers and short-eared owls are examples of area-sensitive grassland nesting birds. Large blocks of habitat provide a larger habitat interior and offer greater protection from predators, from nest parasitic birds like the brown-headed cowbird (*Molothrus ater*), and a greater buffer against human disturbance. Some species like dickcissels and meadowlarks can nest successfully in smaller grassland blocks, especially when grassland corridors connect these blocks of habitat.

Human activity. Excessive grazing in wooded habitats, savanna and grassland pastures reduces valuable ground cover needed by ground-nesting or low-nesting species like ovenbirds and redstarts. It also eliminates food and cover for the burrows and runs of many small mammals. Heavy grazing benefits only generalist butterfly species that occur in disturbed habitats and is probably the greatest stress to land snails on algific talus slopes. Livestock can trample individual animals, destabilize the talus, cause erosion of the thin soil cover, and kill trees resulting in an unprotected and warmer, unsuitable habitat.

Table 5-5. Stresses on Terrestrial Wildlife (averaged over all habitat classes).

Stress level: Blank = Low, Moderate, High
Taxonomic Class Mean: Average across all 5 taxonomic classes.
Habitat Class Mean: From Table 5-4

Stress	BIRDS	MAMMALS	REPTILES & AMPHIBIANS	LAND SNAILS	BUTTERFLIES	TAXONOMIC CLASS MEAN	HABITAT CLASS MEAN
Detrimental grazing	H	H		H	H	H	H
Invasive non-native species.	H	H		H	H	H	M
Fragmentation	H	H	H	H	H	H	H
Loss of connectivity	H	H	H	H	H	H	H
Absence of Habitat	H	H	H	H	H	H	H
Conversion to row crops	H	H	H	M	H	H	M
Drainage	M	H	H	M	H	H	
Pesticide/herbicide use	H	M	H	M	H	H	M
Excessive recreational use	M	H		H	M	M	M
Road construction			H	H	M	M	
Conversion to non-native grasses	M	M		M	H	M	M
Fire suppression	M	M	H		M	M	M
Fire use		M	M		M	M	
Climate change	M			H	M	M	M
Conversion for residential use	M	M	H	M	M	M	
Disease/pathogens/insect damage	M				M		M
Flooding caused by dams		M			M		
Conv. for non-farm industrial use		M					
Timber harvest				M			
Damage to sinkholes - Siltation				H			
Damage to sinkholes - Contaminants				H			

Table 5-6. Statewide Stresses on Birds

Stress level: Blank = Low, Moderate, High
Terms: For = Forest; Warm = Warm Season; Herb = Herbaceous; Ag = Agricultural

	WOODED				GRASSLANDS		WETLANDS			
Stress	FOREST	WET FOREST	WOOD LAND	SHRUB	WARM HERB	SAVANNA	WET SHRUB	HERB WETLAND	AG LAND	MEAN
Invasive non-native species.	H	H	H	H	H	H	H	H	H	H
Loss of connectivity	H	H	H	H	H	H	H	H	H	H
Fragmentation	H	H	H	H	H	H	H	H	M	H
Absence of Habitat	M	H	H	H	H	H	H	H		H
Detrimental grazing	M	H	H	H	H	H	M	M	H	H
Conversion to row crops	M	M	M	H	H	H	H	H	H	H
Pesticide/herbicide use		M	M	H	H	H	H	H	H	H
Conversion to non-native grasses			M	H	H	H	M	H	H	M
Climate change	H	H	M	M	M	M	M	M		M
Conversion for residential use	H		H	M	H	H			M	M
Excessive recreational use	H	M	H	M	M	M		M		M
Fire suppression			H	H	H	H				M
Disease/pathogens/insect damage	M	M	M			M			M	M
Drainage		H	M				H	H		M
Road construction	M		M	M	M	M				
Timber harvest	H	M	H			H				
Flooding caused by dams		M					M	M		
Conv. for non-farm industrial use			M	M	M	M				
Fire use			M	H		M				

Table 5-7. Statewide Stresses on Mammals

Stress level: Blank = Low, Moderate, High
Terms: For = Forest; Warm = Warm Season; Herb = Herbaceous; Ag = Agricultural

	WOODED				GRASSLANDS		WETLANDS			
Stress	**FOREST**	**WET FOREST**	**WOOD LAND**	**SHRUB**	**WARM HERB**	**SAVANNA**	**WET SHRUB**	**HERB WETLAND**	**AG LAND**	**MEAN**
Invasive non-native species.	H	H	H	H	H	H	H	H	H	H
Detrimental grazing	H	H	H	H	H	H	H	H	H	H
Loss of connectivity	H	H	H	H	H	H	H	H		H
Fragmentation	H	H	H	H	H	H	H	H		H
Absence of Habitat	H	H	H	H	H	H	H	H		H
Excessive recreational use	H	H	H	H	M	H	H	M	M	H
Drainage	H	H	M	M	H	M	H	H	H	H
Conversion to row crops	M	M	M	M	H	H	M	H	H	H
Conversion for residential use	H		H	H	H	H			H	M
Conversion to non-native grasses		M	M	H	H	H		H	H	M
Fire suppression	M		M	H	H	H				M
Pesticide/herbicide use			H	M	H	M		M	H	M
Conv. for non-farm industrial use	M		M	M	M	H			M	M
Fire use				M	H	H		M		M
Flooding caused by dams		M			M		M	M	M	M
Timber harvest	H	M	H							
Road construction										
Disease/pathogens/insect damage	,									
Climate change										

Table 5-8. Statewide Stresses on Reptiles and Amphibians

Stress level: Blank = Low, Moderate, High
Terms: For = Forest; Warm = Warm Season; Herb = Herbaceous; Ag = Agricultural

	WOODED				GRASSLANDS		WETLANDS			
Stress	**FOREST**	**WET FOREST**	**WOOD LAND**	**SHRUB**	**WARM HERB**	**SAVANNA**	**WET SHRUB**	**HERB WETLAND**	**AG LAND**	**MEAN**
Conversion to row crops	H	H	H		H	H	H	H		H
Fire suppression					H	H		H		H
Road construction	H	H	H		H	H	H	H	H	H
Pesticide/herbicide use	H	H	H		H	H	H	H	H	H
Drainage		H					H	H	H	H
Fragmentation	H	H	H		H	H	H	H	H	H
Absence of Habitat	H	H	H		H	H	H	H	H	H
Conversion for residential use	H	H	H		H	H		H	M	H
Loss of connectivity	H	H	H		H	M	H	H	M	H
Fire use					M	M	M	M	M	M
Conversion to non-native grasses										
Conv. for non-farm industrial use										
Detrimental grazing										
Timber harvest										
Flooding caused by dams										
Disease/pathogens/insect damage										
Climate change										
Excessive recreational use										
Invasive non-native species.										

Table 5-9. Stresses on Land Snails (found only in the Paleozoic Plateau)

Stress level: - = Not applicable; Blank = Low; Moderate; High
Terms: For = Forest; Warm = Warm Season; Herb = Herbaceous; Ag = Agricultural

	WOODED				GRASSLANDS		WETLANDS			
Stress	FOREST	WET FOREST	WOOD LAND	SHRUB	WARM HERB	SAVANNA	WET SHRUB	HERB WETLAND	AG LAND	MEAN
Excessive recreational use	H	.	H	.	.	.	.	.	H	H
Detrimental grazing	H	.	H	.	.	.	.	.	H	H
Fragmentation	H	.	H	.	.	.	.	.	H	H
Loss of connectivity	H	.	H	.	.	.	.	.	H	H
Climate change	H	.	H	.	.	.	.	.	H	H
Damage to sinkholes through siltation	H	.	H	.	.	.	.	.	H	H
Invasive non-native species.	H	.	H	.	.	.	.	.	H	H
Absence of Habitat	H	.	H	.	.	.	.	.	H	H
Road construction	M	.	M	.	.	.	.	.	H	H
Damage to sinkholes through contaminants.	M	.	M	.	.	.	.	.	H	H
Conversion for residential use		.	M	.	.	.	.	.	H	M
Drainage	M	.	H	.	.	.	.	.		M
Timber harvest		.	M	.	.	.	.	.	M	M
Pesticide/herbicide use		.		.	.	.	.	.	H	M
Conversion to row crops		.		.	.	.	.	.	H	M
Conversion to non-native grasses		.		.	.	.	.	.	H	M
Flooding caused by dams		.		.	.	.	.	.	M	
Fire suppression		.		.	.	.	.	.		
Disease/pathogens/insect damage		.		.	.	.	.	.	M	
Conv. for non-farm industrial use		.		.	.	.	.	.		
Fire use		.		.	.	.	.	.		

Table 5-10. Statewide Stresses on Butterflies

Stress level: Blank = Low, Moderate, High
Terms: For = Forest; Warm = Warm Season; Herb = Herbaceous; Ag = Agricultural

	WOODED				GRASSLANDS		WETLANDS			
Stress	FOREST	WET FOREST	WOOD LAND	SHRUB	WARM HERB	SAVANNA	WET SHRUB	HERB WETLAND	AG LAND	MEAN
Detrimental grazing	H	H	H	H	H	H	H	H	H	H
Invasive non-native species.	H	H	H	H	H	H	H	H	H	H
Fragmentation	H	H	H	H	H	H	H	H		H
Loss of connectivity	H	H	H	H	H	H	H	H		H
Conversion to row crops	H	H	H	H	H	H	H	H	H	H
Conversion to non-native grasses	H	M	H	H	H	H	M	H	H	H
Absence of Habitat	M	H	M	M	H	H	H	H		H
Drainage	M	H	M	H	H	M	H	H	M	H
Pesticide/herbicide use	M	M	M	H	H	H	M	H	H	H
Excessive recreational use	H	M	H	M	M	H	M	M	M	M
Fire suppression	M	M	M	M	H	H	M	M	M	M
Fire use	M		M	H	H	H	M	M	M	M
Climate change	M	M	M	M	M	M	M	M	M	M
Road construction	M	M	M	M	M	M	M	M	M	M
Conversion for residential use	M		M	M	M	M			M	M
Disease/pathogens/insect damage	M	M	M		M	M			M	M
Flooding caused by dams		M					H	H		M
Conv. for non-farm industrial use			M	M	M	M			M	
Timber harvest	M		M							

Fire suppression and reduced cutting for firewood and wood products are changing the nature of Iowa's forests. Habitats for birds that inhabit mature forests (warblers and thrushes) appear to be increasing at the expense of species requiring earlier successional stages (woodcock and ruffed grouse). Fire suppression also impacts grasslands that are rapidly invaded by shrubs when grazing and fire are eliminated.

Management activities for prairie and wetland habitats may stress some butterfly species if fire is used more frequently than every three or four years and if more than 25%-30 % of a site is burned in the same year.

Excessive recreational use is also a *High* stress to these snails. Human activities around the entrances to ice caves and other limited habitats utilized by these snails can kill individuals and alter vegetation and ground litter such that the habitat is no longer suitable.

The major stresses to the unique habitats of land snails are primarily physical changes that disrupt the movement of water and air through the cracks and rock fractures. Two stresses unique to land snail habitat were added to this stress analysis table to account for this factor - Damage to sinkholes through siltation and through the introduction of contaminants. Filling of upland sinks with soil or other materials destroys the ability of the system to provide the buffered microclimate required by snail species restricted to algific talus slopes and madereate cliffs. Physical destruction of the slope or cliff may be due to road construction or quarry activities. The removal of talus material for fill can also destroy a site.

Road construction is a *High* stress for amphibians and reptiles because it interrupts travel corridors needed during seasonal and breeding migrations, dispersal, and movements due to environmental changes. Roads are also a source of direct mortality to slow-moving species like snakes and turtles

.

Pesticide and herbicide use can remove required food and habitat for amphibians and reptiles. Wetlands with approximately a 75% vegetative cover provide optimum shelter, aquatic foods, foraging habitat and egg attachment sites for many amphibians. Herbicides that reduce aquatic vegetation are detrimental to aquatic habitat use by this group. Reptiles and amphibians have been shown to be sensitive to pesticide and industrial chemical pollution.

Outside influences. The impacts of non-native species on birds include both plants and animals, with invasive plants having the greatest impact. Garlic mustard (*Alliaria petiolata*), leafy spurge (*Euphorbia esula*), and purple loosetrife (*Lythrum salicaria*) replace desirable existing native plants and can change the bird community structure. Invasive animals like house sparrows (*Passer domesticus*) or European starlings (*Sturnus vulgaris*) may exclude native birds from nest sites or other necessary habitats

Land snails are the only taxonomic class for which climate change is listed as a *High* stress. Because these snails are relicts of the Ice Age, global warming in the long term can shrink or eliminate available habitat.

Stresses on Aquatic Wildlife and Habitats

A ranking of the relative importance of aquatic stresses was obtained by averaging stress rankings over all habitat classes. Separate evaluations were made for fish and mussels and for damselflies and dragonflies because of their obviously very different use of the same habitat classes (submerged versus airborne). Statewide stress rankings were affected by substantial differences in rankings between habitat classes. For example, shoreline erosion, shoreline alterations and loss of shoreline vegetation do not usually impact ponded waters, but they were High stresses on flowing waters. Loss of submergent plants and permanent drainage were *High* stresses only on shallow natural lakes and oxbows.

Fish and Mussels

The *High* stresses impacting fish and mussels in all aquatic habitat classes are loss of riparian habitat, siltation, accelerated eutrophication, and the introduction of invasive non-native species (Table 5-11). In flowing and impounded habitats channelization, shoreline alteration, loss of shoreline vegetation and stream bank erosion also ranked *High* in most habitat classes**.** Permanent drainage was rated a *High* stress for natural impoundments in backwaters and oxbows.

All of the *High* stresses on fish and mussels can be attributed to human influences on land use and to invasive species. The conversion of native plant communities to agricultural use, confined livestock husbandry operations and runoff from urban and suburban construction sites and storm sewers have altered many aquatic ecosystems. Silt (*Iowa's most important water quality problem)*, nutrients and pesticides that run off the land into Iowa's waters all contribute. The potential impacts of row crop agriculture on water quality are pervasive in all landform regions and watersheds (Map 5-1).

While land tillage, construction activities and livestock grazing adjacent to aquatic habitats can result in heavy silt loads in local situations, most silt is the result of channel and gully erosion. Silt can impact aquatic habitats by transporting pesticides and nutrients into the water, increasing turbidity, covering substrates, and decreasing water depth. Nutrients carried in runoff increase the productivity of aquatic systems causing algae blooms and excessive plant growth that alter other chemical and physical hydrologic parameters. Tiling, ditching, and stream channelization have reduced water retention on the land causing increased in-stream flow rates and large fluctuations in stream flow.

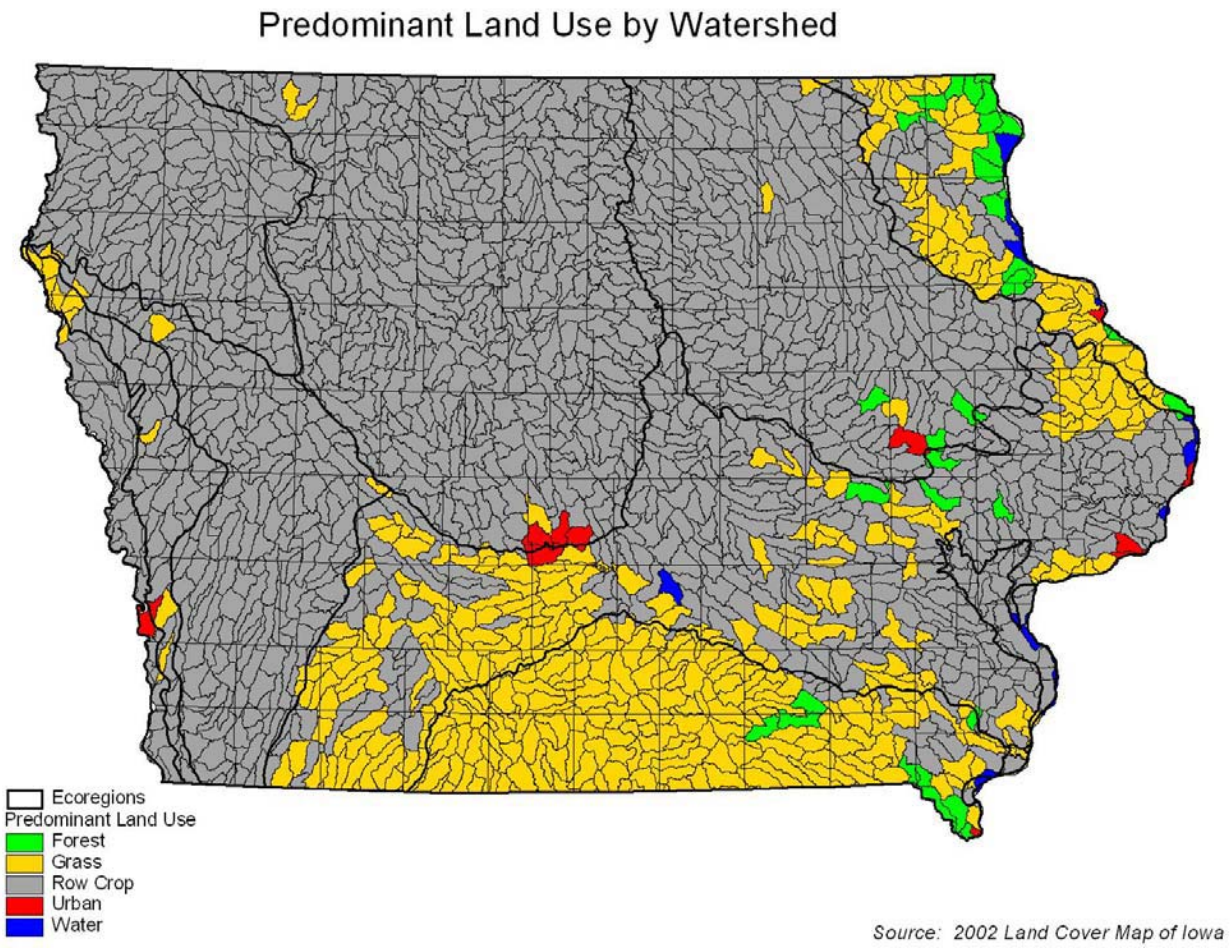
Most of these stresses are caused by altered hydrology throughout the State of Iowa. Tiling, loss of wetlands, stream channelization, and other factors have increased the volume and velocity of water in streams and rivers. This has lead to increased bank erosion, loss of aquatic vegetation, and loss of slow-moving water habitats necessary for some SGCN. Dams, weirs, and other barriers have restricted water flow and species movement, but may also improve some aquatic habitats and water quality and slow the

Table 5-11. Statewide Stresses on Fish and Mussels

Stress level: Blank = Low, Moderate, High
Terms: Impound = Impoundment; Wtr = Water; Nat = Natural; Con = Constructed

	FLOWING			IMPOUNDED			PONDED			
Stress	RIVER	STREAM	CREEK	IMPOUND	BACK WTR	OXBOW	NAT LAKE	CON LAKE	POND	MEAN
Siltation	H	H	H	H	H	H	H	H	H	H
Accelerated eutrophication	M	M	M	H	H	H	H	H	H	H
Invasive/non-native species.	H	H	M	H	H	H	H	H	M	H
Loss of riparian habitat	H	H	H	H	H	H	H	M		H
Shoreline/bank erosion	H	H	H	H	M	M	M	M		M
Loss of shoreline vegetation	H	H	H	M	H	M	H	M		M
Shoreline alteration	H	H	M	H	M	H	M			M
Channelization	M	H	H	M	H	H				M
Loss of submerged/emergent plants	M	M	M	H	H	M	M			M
Permanent drainage	M	M	H	M	H	H				M
Streambed degradation	H	H	H	M	M	M				M
Chemical pollution	M	M	M	M	M					M
Constructed dams	M	M	M	M			M			M
Artificial water level manipulation	M	M	M	M	M	H				M
Disease/pathogens										
Excessive recreational use							M			
Climate change										

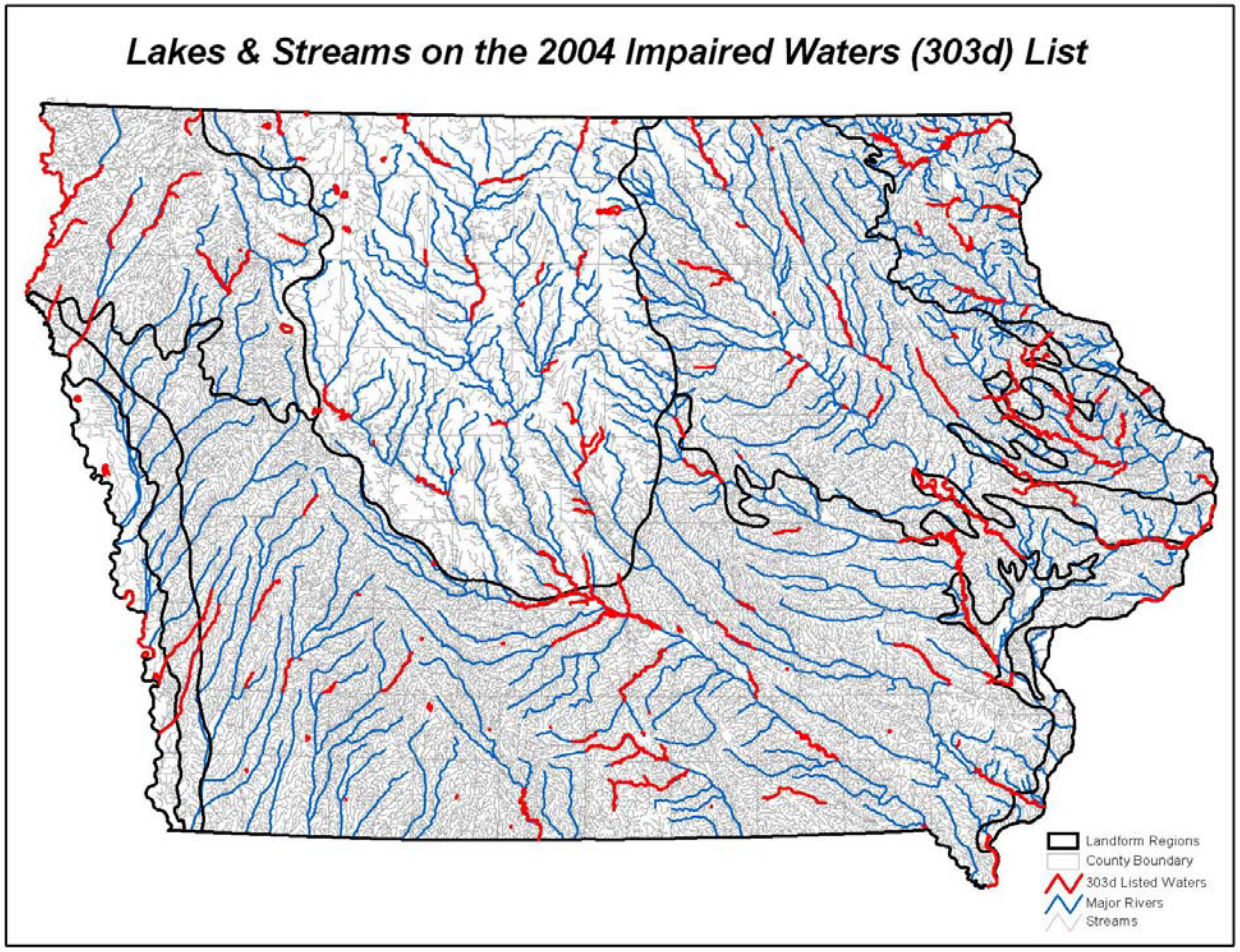
Map 5-1. Predominant Land Use by Watershed



movement of invasive species. Shallow lakes are an example of an aquatic habitat that has generally received little attention from resource managers and now exhibits multiple problems. They are in a perpetual state of turbid water, are devoid of emergent and submergent vegetation, have low wildlife diversity, and provide little recreational opportunity.

Map 5-2 shows those aquatic systems that are considered i*mpaired waters* by the IDNR. Impaired waters are surface waters that only partially support or do not support their designated use and do not meet all state water quality standards. A list of impaired waters is submitted to the U.S. Environmental Protection Agency every other year in compliance with Section 303 (d) of the Clean Water Act. Water quality analysis is based on chemical, physical and biological data and considers both point and non-point sources of pollution. While not all factors used in determining impaired listing are critical in evaluating fish and wildlife habitat quality, and not all aquatic systems have been sampled, the map of impaired waters does give an indication of the extent and statewide distribution of problems in Iowa's aquatic habitats. It is obvious that impaired lakes, rivers and

Map 5-1. Iowa's Impaired Waters



streams occur in every landform. Within each region, however, impaired lake and stream segments can be used as one source of information in helping to prioritize the implementation of conservation actions needed to reduce listed stresses on aquatic systems.

Invasive species stress native populations through direct contact, through competition for needed resources, or by altering the physical habitat. Iowa has several aquatic invasive species that impact our fish and mussel SGCN. Multiple species of carp have altered aquatic habitats to a point where those habitats cannot sustain most native species. Zebra mussels in the Mississippi River compete with native mussels and other filter feeders for food, cover substrates, and colonize on native mussels resulting in their death. Aquatic invasive species were recognized as such a significant stress to Iowa's natural resources the state developed the "Plan for the Management of Aquatic Nuisance Species in Iowa" in 1999.

Dragonflies and Damselflies

Siltation, loss of submergent and emergent plants, streambed degradation, chemical pollution, and invasive non-native species were listed as *High* stresses on dragonflies and damselflies in al aquatic habitats (Table 5-12). Shoreline and bank erosion and artificial water level manipulation were rated *High* in flowing waters. Shoreline alteration, loss of shoreline vegetation, accelerated eutrophication and excessive recreational use also ranked *High* in impounded and ponded waters.

Siltation and destabilized streambeds ranked at the highest stress level in every habitat type. Dragonflies and damselflies require a stable streambed for egg attachment and larval feeding activities.

Permanent drainage removes the aquatic habitats needed by dragonflies and damselflies at some stage of their life cycles. It is consistently scored at the highest stress level for ponds in every region of the state (Appendix 17 - 1).

Herbicides and insecticides in aquatic systems can kill aquatic plants that dragonflies and damselflies require for survival or for feeding or egg laying.

Invasive species is scored as a *High* stress in every habitat category. Invasive plants can alter the species composition and structure of native submerged and emergent aquatic plants. Carp can disturb bottom substrates, add to water turbidity and remove vegetation needed by dragonflies and damselflies.

Dragonflies and damselflies rely on aquatic habitats completely at some stages of their life cycles, and are usually closely associated with water throughout their lives. Nearly one third of the species of dragonflies and damselflies found in Iowa are considered imperiled or critically imperiled (Table 3-11). Most of the imperiled species occur in flowing water habitats or wetlands. Many species were extirpated or have become less common due to stream degradation. The construction of farm ponds, gravel pits and small lakes, and the elimination of most wetlands in this state dramatically changed still-water fauna populations and distributions. Improvement of water quality in streams and rivers is critical in preventing the further loss of species occurring in these habitats. Because of their terrestrial association, the protection of riparian habitats is as important to this group of animals as is the protection of aquatic habitats.

Table 5-12. Statewide Stresses on Dragonflies and Damselflies

Stress level: - = Not applicable, Blank = Low, Moderate, High
Terms: Impound = Impoundment; Wtr = Water; Nat = Natural; Con = Constructed

	FLOWING			IMPOUNDED		PONDED		
Stress	**RIVER**	**STREAM**	**CREEK**	**IMPOUND**	**BACKWTR**	**LAKE**	**POND**	**MEAN**
Siltation	H	H	H	H	H	H	H	H
Permanent drainage	-	-	-	-	-	-	H	H
Loss of submerged/emergent plants	H	H	H	H	H	H	H	H
Streambed degradation	H	H	H	H	H	H	H	H
Chemical pollution	H	H	H	H	H	H	H	H
Invasive/non-native species.	H	H	H	H	H	H	H	H
Artificial water level manipulation	H	-	-	-	-	-	M	M
Shoreline/bank erosion	H	H	H	M		M		M
Channelization	M	M	M	-	-	-	-	M
Loss of shoreline vegetation	M	M	M		H	H	H	M
Accelerated eutrophication.	-	M	M	M	H	M	H	M
Shoreline alteration	M	-	-	-	-	H	-	M
Excessive recreational use	M			H		H		M
Loss of riparian habitat	M	M	M					
Constructed dams	-	-	-	-	-	-	-	
Disease/pathogens								
Climate change								

IOWA'S FISH AND WILDLIFE AND THEIR HABITATS

Summary and Conclusions

It has been said that Iowa's landscape has changed more since European settlement than that of any other state. Most of 23 million acres of prairie, 7 million acres of woodlands and 5 million acres of wetlands were converted to farmland in less than a century. Today 75% of Iowa is farmed with 60% in row crops. Just 43% of the original forest acreage, 21% of the grassland acreage, 4% of the original wetlands and 18% of the surface waters remain. Most are severely degraded. Forests are, or recently have been, excessively grazed. Only 0.1% of native grasses are left (the rest are introduced cool season grasses) and wetlands and surface waters have been degraded by excessive siltation and the introduction of exotic species.

Iowa's fish and wildlife communities have undergone a similar change. The big game herds, prairie chickens, passenger pigeons, wild turkeys, the millions of nesting and migrating waterfowl and shorebirds, and the large predators that fed on them were mostly gone by 1900. Wildlife communities that could survive on small farms or introduced species like the ringnecked pheasant that found a vacant habitat niche were all that was left. Advancing agricultural technology in the 20th Century continued to reduce wildlife habitat as farms grew larger and were subjected to an ever-increasing clean-farming mentality.

Conservation programs have returned several extirpated species to the state over the last half century, but most are robust and adaptable and can survive in Iowa's highly altered habitats e.g. deer, wild turkeys, and giant Canada geese. Several visible and charismatic nongame species like river otters, peregrine falcons, and trumpeter swans have also been reintroduced to encourage increased funding for IDNR's Wildlife Diversity Program. But little is known about the distribution and abundance of most of Iowa's nongame wildlife. Populations of most are tremendously reduced from their historic levels by habitat loss and degradation.

One-third of all of Iowa's wildlife species is listed in need of immediate conservation to reverse declining trends. These Species of Greatest Conservation Need are found in all taxonomic classes of animals considered by the ICWCP (birds, mammals, reptiles, amphibians, land snails, butterflies, fish, mussels, dragonflies and damselflies) and in all terrestrial and aquatic habitats. Fish and birds have the greatest number of species listed as SGCN, but aquatic and semi-aquatic wildlife have the highest percentages of their species listed.

Riverine habitats have the greatest number of SGCN and woodlands have the most in terrestrial habitats, probably because these are the most abundant native habitats still remaining. So few native grasslands and wetlands remain that their SGCN are highly imperiled also. Priorities set for addressing the habitat needs of SGCN should recognize that imperiled species are found in all remaining habitats and that all need conservation actions.

The greatest stresses impacting Iowa's wildlife today all stem from human decisions about land use. The removal of most permanent vegetation from the landscape and the degradation of remaining habitats through improper or excessive use have had numerous inter-related consequences:

- A lack of adequate habitat for terrestrial wildlife
- Reduced habitat quality that limits their use by SGCN
- Isolation of populations of less-mobile species
- Altered hydrology that removes water from the land too quickly
- Streambed degradation
- Stream and shoreline alteration
- Accelerated erosion of unprotected soils
- Excessive siltation of flowing and impounded waters
- Excessive nutrient input leading to accelerated eutrophication
- Loss of submergent and emergent vegetation
- Reduced habitat quality and quantity for aquatic and semi-aquatic organisms and for human use as well
- Ecosystems that are being invaded by aggressive exotic species that are displacing native wildlife.

Reversing or mitigating the impacts of these immense changes to Iowa's natural landscape presents an immense challenge to conservationists. Reversing declining trends in populations of SGCN will require a partnership between wildlife professionals and citizens who understand what is needed, who are committed to effecting change and who have the skills to seek improved funding for wildlife conservation.

Part 2 of the ICWCP will specify visions, goals and conservation actions that promise a bright future for the state's wildlife.

Henceforth, the title will be changed to the *Iowa Wildlife Action Plan (IWAP)*. This new name conforms to similar name changes for the comprehensive plans of many other states and territories, and it reflects the fact the Iowa intends to make this a living, working document, resulting in many benefits to both wildlife and habitat. (Some appendices and references will continue using ICWCP, to maintain the historical context of Plan development.)

THE IOWA WILDLIFE ACTION PLAN

SECURING A FUTURE FOR FISH AND WILDLIFE

CHAPTER SIX

A VISION FOR IOWA'S WILDLIFE IN THE YEAR 2030

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, grey 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, longear 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 ringnecked 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. Numbers of bobwhite quail and jackrabbits have plummeted, pheasants are in a half-century decline and songbirds of our forests and grasslands are declining rapidly. Nearly a third of Iowa's lakes, rivers and streams are considered imperiled waters.

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 of temporary conservation practices on private land.

But after a half-century of conservation, one-third of all of Iowa's fish and wildlife are 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 2 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 highest and best 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 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 6 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.

These *vision elements* and *conservation actions* are not specifically designed to be implemented by IDNR. 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. Extensive coordination will 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.

Conservation Actions:

- Develop a balanced program of wildlife conservation by increasing the emphasis on species of greatest conservation need.
- Develop scientifically reliable knowledge on the distribution, abundance and ecological needs of all wildlife species.
- Focus on protection, restoration, reconstruction and enhancement of native plant communities and wildlife habitats.
- Restore viable wildlife populations to suitable habitats through informed relocation and reintroduction programs.
- Protect ecosystem stability by developing invasive species management plans that provide early detection strategies to control exotic invasive species.
- Develop methods to identify and reduce economic and social conflicts between wildlife and citizens.

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.

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 Actions:

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

- Permanently protect, restore, reconstruct and enhance large 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.
  - Develop a series of core habitat blocks in the range of 3,000 - 5,000 acres of permanently protected and managed habitat.
  - Evaluate existing permanently protected areas for potential expansion.
  - Work with legislators to implement *smart growth* efforts in these designated core areas.

- Ensure that long-term Federal land conservation programs meet the needs of landowners and wildlife on privately owned lands and waters.
  - Use existing tools and create new tools to permanently protect private lands and waters and expand outreach efforts.
  - Encourage Federal land conservation programs that allow existing native habitats to be enrolled.
  - Work to mandate Federal and state wildlife agency involvement in the prioritization, design, and implementation of the Federal programs.
  - 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.
  - Integrate this Plan with existing Federal programs.
  - Expand existing Federal and State programs that focus on water quality of streams and rivers but allow flexibility for local issues to be addressed.

- Provide technical guidance and supplemental cost share programs to private landowners to maximize the benefits to wildlife from Federal land conservation programs.
  - 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.
  - Expand IDNR's Private Lands Program efforts to meet the needs of SGCN outlined in this Plan.
  - Provide for improved coordination of all Federal, state, county and non-governmental organizations private lands programs to efficiently deliver technical assistance to landowners.
  - 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.
  - Educate all natural resource agencies staff about the Plan.
  - Create a central site for all resources of the Plan and make available to natural resource agencies and landowners.

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

Explanation:

Currently only 2% of Iowa's wildlife habitats are permanently protected – 600,000 acres by state, county, or Federal ownership and 57,000 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 by 24,000 acres annually. 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.

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 Actions:

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

- 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.
  - Provide coordination and implement activities that involve all in-state land management agencies (state, county and Federal) cross state lines and include the Missouri and Mississippi River systems.
  - Coordinate all Federal, state, county and NGO's private lands programs to efficiently provide management plans to landowners.
  - Implement a statewide private lands management coordination committee.
  - Educate natural resource management staff on management needs of species of greatest conservation need.
  - Develop a standard template for all public and private land management plans.
  - Acquire tools and gather reference materials and make them easily accessible to all natural resource managers and landowners.
  - 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.
  - 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.
  - Evaluate the shallow lakes of the Prairie Pothole region to develop and implement management plans that will benefit the species of greatest conservation need.
  - Develop and implement a statewide strategy to eradicate invasive species.

- Coordinate habitat management policies and messages among all layers of government to promote goals of the Plan.

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

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

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.

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.

Goal:

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

Conservation Actions:

- Develop 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.
  - — Gather information through the upcoming Statewide Comprehensive Outdoor Recreation Plan (SCORP) survey
- Expand training programs in wildlife-associated recreation skills to increase citizen participation and improve public health.
  - — Work with the IDNR outdoor skills committee and associated partners to complete the development of outdoor skills modules,
  - — Create a network of lending sites for recreation equipment to teach programs,
  - — Provide training for interested teachers, youth leaders, and other educators through formal and non-formal venues.
- 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 and to minimize conflicts between users.

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.

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 between land use, wildlife diversity and abundance, the quality of life for all citizens, and the positive effects wildlife has on Iowa's economy.

Conservation Actions:

- 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, Department of health, physicians, wellness coordinators, bank place market tours).

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

- Determine appropriate target audiences based on the overarching goals of this Plan.
  - Determine audience wants and needs through needs assessments
  - Develop appropriate informational materials and distribution venues
  - (Planned surveys include the 2005 needs assessment for SCORP).

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

- 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.

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.

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.

Goal:

- 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 Actions:

- 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.

- 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.

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

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, 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.

CHAPTER SEVEN

RESEARCH, SURVEY, INVENTORY AND MONITORING

General Discussion

Identifying research and survey efforts needed to restore and enhance SGCN and their habitats is one of the required elements in the IWAP. Plans for monitoring SGCN, habitats, the effectiveness of proposed conservation actions and for adapting these actions to new information or changing conditions is also required. These elements are presented in this chapter.

Although discussed elsewhere in this document, this paragraph clarifies that Iowa understands the importance of monitoring and adaptive management. 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.

As discussed in this and other chapters, Iowa has identified, and will identify in the future, stresses to wildlife and actions that can be taken to alleviate those stresses. Performance measures for the actions have been outlined, and additional measures may be selected in the future as other stresses become apparent. Often, these measures are less obvious than the response of wildlife, but may be more oriented toward the opinions of the public or the success of education programs. However, all measures will be of utmost importance to the success of the IWAP. Following the adaptive management paradigm, should these measures indicate that an action is not working (whether the measure is the public perception of the importance of wildlife or the number of reproductively active small mouth salamander populations), then other actions will be evaluated until an appropriate response is found.

The lack of species-specific information on the abundance and distribution of SGCN was one of the greatest challenges faced in developing this Plan. In some cases species were added to the list simply because information was outdated or unavailable. In spite of the problems identifying fine scale habitats and qualitative differences, the amount and distribution of potential wildlife habitat is comparatively well known.

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.

Appendix 21 contains a partial list of individual wildlife monitoring, survey and inventory projects conducted in Iowa over the past 45 years. A summary is provided in Table 7-1. Many other research studies too numerous to list have provided information on the presence of individual species or groups of species.

Table 7-1. Summary of Wildlife Monitoring, Surveys and Inventories Conducted in Iowa: 1960-2005.

	Long Term Monitoring			Short Term Surveys & Inventories		
	Populations		Harvest	Populations		
Taxonomic Class	**Game**	**Nongame**	**Game**	**Game**	**Nongame**	**Total**
Birds	9	14	3 [1]	0	2	28
Mammals	1	2	2	2	24	31
Reptiles & Amphibians	0	2	0	0	7	9
Land Snails	0	0	0	0	1	1
Butterflies	0	0	0	0	?	0
Fish	1	4	1	13 [2]	2	21
Mussels	0	2	0	0	4	6
Damselflies & Dragonflies	0	0	0	0	2	2
Total	11	24	6	5	52	98

[1] Plus one harvest survey that includes 2 mammals and 5 birds
[2] Both game and nongame fish are surveyed.

Virtually all monitoring programs have focused on game species, T & E species, common bird surveys (e.g., Breeding Bird Survey), and evaluations of wildlife restorations. (Recall that game animals make up only 15% of the species considered in this Plan). Birds, mammals, and fish have been studied far more than the other taxonomic classes, but most mammal work has been short term inventories.

Because of the funding available, IDNR researchers have historically worked most on game animals and fish, although that is changing (Appendix 21). Without the career–long dedication of Dr. James Dinsmore (ISU-nongame birds), Dr. John Bowles (Central College-small mammals), Dr. James Christiansen (Drake University-reptiles and amphibians) (all now retired) and their students relatively little would be known about these taxa. Recent work on butterflies and odonates is discussed in Chapter 3.

In spite of this recent change in emphasis, little information is available on the distribution and status of amphibians, small and meso-mammals, snails, butterflies, odonates, freshwater mussels, reptiles, non-game fish and many nongame birds. Iowa GAP is the most recent project to attempt to determine the statewide distribution of terrestrial wildlife. Iowa GAP produced distribution maps for 288 vertebrate species based on habitat modeling. These are habitat distribution maps, however, and are not based on current survey or inventory work. Many of the surveys listed in Appendix 21 were used by Iowa GAP to determine habitat preferences. Given the highly fragmented nature of Iowa's remnant wildlife habitat, the inability of current GIS technology to identify habitats at a fine scale or to identify qualitative habitat differences, these maps serve best as a starting point for future research rather than the providing the answers sought by the Steering Committee and Working Groups in preparing this Plan.

It should be recognized that in order to meet IWAP submission deadlines, as prescribed by Congress and the National Advisory Acceptance Team, there was insufficient time to fully develop and test the necessary monitoring programs and protocols. Therefore, the *beta* procedures described herein must be considered subject to change or revision as a monitoring system is adapted to Iowa's unique requirements.

What Needs to Happen?

The State of Iowa is in need of surveys and monitoring programs that focus on the biodiversity of the state.

New Survey Needs

The Steering Committee and the Monitoring Working Group sub-committee agreed that the first priority for monitoring and research is to inventory Iowa's permanently protected wildlife habitats and a sample of habitat on private lands within the state. Virtually all wildlife specialists involved in developing this Plan expressed the need for expanded inventories, surveys, and monitoring of SGCN to guide habitat and population conservation actions. The Working Groups developed specific survey needs to fill immediate knowledge gaps (Table 7-2). These can serve as a priority list of potential survey projects until more extensive monitoring can begin.

Long Term Monitoring

Tracking accomplishments of the IWAP so that political and financial support can be maintained over the 25-year implementation period is a first-order priority of the Plan. Discrete accomplishments such as funding attained, education programs initiated and presented, site-specific recreational opportunities developed, citizen participation, habitats protected, information learned from survey and research studies, etc. must be tracked and made constantly available for scrutiny by all stakeholders. A database will be developed by IDNR's Wildlife Diversity Program and made available through the Internet for stakeholder review and use.

Future performance measure development: It should be understood that the stresses and actions described in this plan will most likely change over time. Although future stresses and responses cannot be predicted at this time, information gained from the current monitoring of both wildlife populations and conservation actions can serve as a fount of knowledge for future issues. When new stresses or actions arise, they will be addressed in a manner that is in accordance with this plan and the approach and steps outlined herein.

But 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 to track the status of Iowa's wildlife resources. Tables 14.1 through 14.9 in Appendix 14 list each primary habitat associated with each SGCN.

Iowa's Species of Greatest Conservation Need almost always are linked to critical habitats, which frequently are localized, degraded, highly fragmented or disconnected from similar habitats and under increasing pressure from numerous human-related threats. Figures 7.4, 7.5 and 7.6 (see the end of this chapter) offer readily recognizable examples of some terrestrial and aquatic habitats, associated SGCN, habitat stresses, suggested actions to address those stresses, possible inventory and monitoring needs and a list of suggested partners to undertake necessary tasks.

Who Needs to be Involved?

If funding becomes available, a standardized, statewide wildlife survey will be implemented to provide a basic inventory of wildlife species and to serve as the initial data collection in a long term monitoring design. This program would incorporate permanent sampling sites situated on public (federal, state, and county owned) as well as private lands. Private land sampling should focus on short term protected conservation lands (CRP, WRP, FWP, TNC, INHF etc.) The IDNR should have primary responsibility for coordinating this statewide survey and monitoring program, with assistance as needed from other partners (USFWS, Iowa County Conservation Boards, ICFWRU, NGO's, etc.) This design will be based loosely on the US Forest Service's "Multiple Species Inventory and Monitoring Guide".

We intend to establish the permanent sampling locations on public and private lands. By stratifying the plot locations based upon habitat classifications, we will be able to monitor multiple SGCN associated with each habitat type. Ideally, we envision a system under which other cooperators are involved in the monitoring, perhaps on their lands. For example, the IDNR could provide training on the methods and species identification as well as providing assistance with the establishment of the permanent sampling plot (GIS, ground-truthing, etc.). The cooperators (USFWS, ICCBs, NGO's), then would ensure that the protocols were carried out by their employees or well-trained volunteers. This may mean that various NGO's, state or federal parks, and private landowner programs would need to purchase some equipment (Trail master

cameras, Sherman traps, minnow traps, etc.) in addition to the time used by their staff and/or volunteers.

How Will Monitoring of SGCN and Their Habitats be Accomplished?

Iowa's WAP has defined 19 habitats and 296 SGCN. The majority of these SGCN were designated as such due to the lack of information concerning their distribution and status. Therefore, Iowa has decided to follow the template established by the US Forest Service for their Multiple Species Inventory and Monitoring Program (Manley et al. 2004). In following this design, Iowa will be randomly choosing permanent sampling locations stratified by the 19 habitat classes. Within each location, field techniques will be used to document the occurrence of all taxonomic groups of animals on the SGCN list. We expect this to be a more cost efficient approach for inventory and monitoring as compared to designing and sampling locations for individual species for 3 reasons. The first reason is that, by randomly choosing areas (instead of going to known locations), we hope to increase the number of known locations for many species. The second reason is that, also due to the randomization of site selection, we should be able to use the trends in the proportion of area occupied as a surrogate for the trend in population size (MacKenzie et al. 2003 *and* 2005). A third benefit to following the multiple species design is that we will be acquiring information on all species encountered, not just a handful of indicator species. In addition to the data collected on the animal species, habitat data will also be collected at each site. This habitat data will be in addition to that assembled by the IDNR Geographic Information Systems Section (see Objective 1). All animal and habitat protocols are currently in different stages of peer review.

Table 7-2. Short Term Survey Needs for SGCN

SGCN	Project	Lead Agency	Cost	
Fish				
Mississippi River	Inventory of Channel border Fish	IDNR	$150,000	
	Grass pickerel inventory & re-establishment in deltas	IDNR	$60,000	
Missouri River	New survey of River Channel	IDNR, FWS	$180,000	
Turkey River	Crystal darter inventory and habitat preference	IDNR	$50,000	
Rivers General	Asian Carp River & Stream Surveys - Track Movements	IDNR	$80,000	
Streams General	Surveys for SGCN - Fish passage and habitat	IDNR	$250,000	
	Identify extent of cold water streams	IDNR	$80,000	**Fish**
	Increase range of brook trout, slimy sculpin and mottled sculpin	IDNR	$60,000	**$910,000**
Mussels	Statewide mussel survey at 10-year intervals	IDNR	$10,000	
	Document mussel beds in Mississippi River	IDNR,FWS	$50,000	**Mussels**
	Time frame and causes of mussel mortality in Des Moines River	IDNR	$40,000	**$100,000**
Amphibians & Reptiles	Survey for T & E species	IDNR	$10,000	**Amphibians**
	Repeat survey of southern Loess Hills	IDNR	$100,000	**& Reptiles**
	Mudpuppies in Mississippi and Upper Iowa Rivers	IDNR	$100,000	**$210,000**
Birds	Repeat Breeding Bird Atlas to Look for Trends	IDNR, FWS	$250,000	
	Inventory and Monitoring on Important Bird Areas	IDNR Audubon	$150,000	**Birds**
	Inventory and Monitoring on BCAs	IDNR, Audubon	$200,000	**$600,000**
Mammals	Statewide survey for bats	IDNR		**$100,000**
Dragonfly and Damselfly	Statewide survey	IDNR		**$150,000**
Crayfish	Statewide Survey	IDNR		**$150,000**
	Total Short Term Survey Needs			**$2,220,000**

Objective 1: Current Inventory of Wildlife in Iowa.

This objective is primarily concerned with estimating the statewide spatial distribution of species. Species occurrence and distribution would be 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.

The design of the inventory and monitoring protocol will provide the ability to estimate the spatial distribution and status of many species. The overall protocol will determine how widespread or isolated a species is within the state and relate distribution to the condition of habitats. Permanent sampling sites would be established within the 19 habitats identified by this Plan and many appropriate sampling protocols have been incorporated to document the occurrence of as many species as possible. This design is based loosely on the US Forest Service's Multiple *Species Inventory and Monitoring Guide* (Manley et al. *draft paper, 2005 anticipated)* [1]. 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. 2004).

We have adapted the USFS Guide to include protocols for additional taxa on Iowa's SGCN list. Within each permanent terrestrial sampling plot, several techniques will be utilized to collect data on a wide variety of wildlife (Figure 7.1). For example, Sherman traps and Tomahawk traps will be used to catch small and meso-mammals. Point counts will be used to quantify birds. Cover boards and time constrained searches will be used to search for herpetofauna and land snails, and line transects will be walked to search for butterflies, dragonflies, and damselflies. In addition, any water bodies that fall within the sampling area will be examined using seining, or if appropriate, electrofishing for fish and timed visual or excavation surveys for mussels. We will also be convening workshops with aquatic experts to develop additional protocols for monitoring aquatic habitats.

Inventorying and monitoring fish and mussel species in aquatic habitats may need separate sampling locations and will incorporate both passive and active capture techniques. Ideally each water body located on public land would be monitored, at least in the area adjacent to public lands. Larger water bodies would be searched for fish using electrofishing, minnow traps, and netting/seining (Murphy and Willis 1996). Visual timed searches of the substrate surface will be combined with a double-sample excavation protocol for a subset of plots to determine mussel occurrence and density following Strayer and Smith (2003) and Smith et al. (2001). In addition to the information acquired on wildlife, the design will also incorporate field data collection on the plant species composition and habitat classifications within the sample sites where the wildlife protocols are implemented. This will allow us to collect information at the microhabitat scale to draw more specific correlations between species occurrence and habitat characteristics/environmental variables.

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[1]http://www.fs.fed.us/psw/programs/snrc/whatsnew/msim/msim_tech_guide_review_draft_april04.pdf last accessed 4/07/05

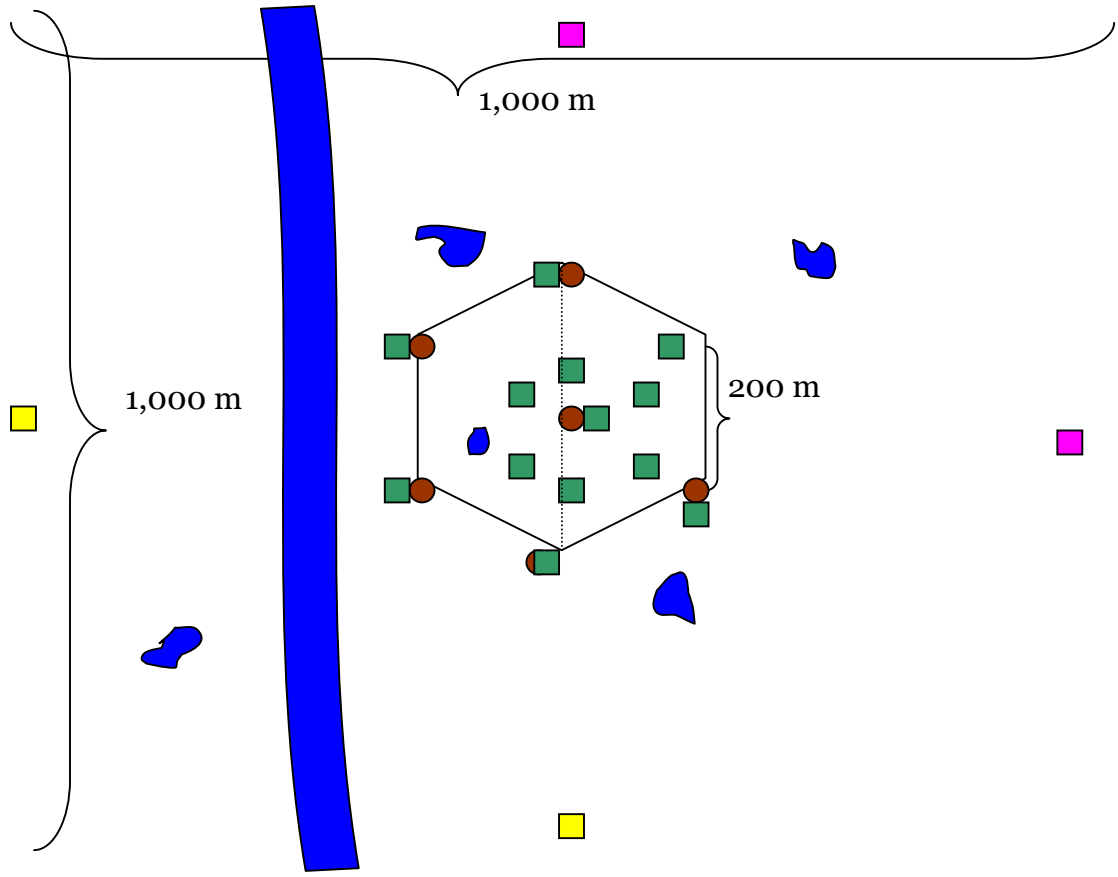


Figure 7.1. Diagram of permanent sampling location. Bird point counts (brown circles) will be conducted at each point of the hexagon, including the middle point. Small mammal traps will be set along the edge transects as well as the middle transect. These transects will also be walked for butterflies. Coverboards for herpetofauna and snails are illustrated with green squares. Wetlands (in blue) will be searched using time constrained visual encounter surveys for amphibians, dragonflies, and damselflies. Waterbodies will also be electroshocked (where applicable) for fish and quadrats will be used to search for mussels. Pink squares represent trailmaster camera locations, and yellow squares represent track plate locations. A track plate and camera will also be deployed at the center point of the hexagon.

Inventorying Habitat

The above described habitat data collection will be done in addition to information currently collected by the IDNR Geographic Information Systems Section which periodically evaluates Landsat Satellite Imagery to compile landcover classification data (year 2002 is the last complete data set) similar to that recommended by Schoonmaker and Luscombe (2005). This allows the IDNR 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 expect to be able to discover potential problems with the GIS system and will be able to address these as they arise.

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 surrogate 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 would be established due to the higher cost per sampling unit, but would examine a smaller group of species more in-depth.

Objective 2: Monitoring Species and Their Habitats.

Once the initial inventory and survey has been completed, the same sites will be re-visited using the same protocols (unless we discover that these need to be revised). This set of second visits will convert the inventory into the monitoring program. Depending on funding, we anticipate that the sample sites will be visited repeatedly every 2-5 years, with a subset of sites from each habitat being sampled every year to ensure continuity. As with the inventory program, the monitoring program will have protocols to examine the plant species composition and the habitats within each sampling site.

The number of sites to be visited per year has yet to be determined and will be 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 will depend 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. 2004).

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. We anticipate that knowing both changes in habitat and changes in species occurrence will allow 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.

Field technicians will be under the direction of the IDNR or cooperators, as either paid technicians, summer interns through universities, or well-trained volunteers. Data analysis will be conducted by the IDNR. All field technicians will undergo training that will include species identification and handling techniques, habitat classification techniques, and other training specific to the data being acquired.

Data Management and Archiving

Currently the state of Iowa has no central location for data deposition. In the past, this information has either been deposited at individual universities and small colleges or left to the knowledge of the individual who collected the data. Many schools in Iowa are no longer hiring natural history professors and the positions traditionally held by those retiring individuals are being re-filled by physiologists or geneticists that happen to work on a given taxonomic group. To insure continuity, a central natural history database should be established that would include information on the fauna and flora of the state, as well as water quality data. Such a database would allow IDNR staff and researchers from universities and other agencies access to previously acquired information quickly and easily. The database would include information on animal species occurrence with GPS coordinates, numbers, size, and condition in an easy to search format. It could be maintained by a new permanent position created within the IDNR or it could be contracted out to an individual or company with oversight from the IDNR.

However, Iowa is also committed to using the US Geological Survey/NBII Natural Resource Monitoring Partnership monitoring locator database (http://biology.usgs.gov/status_trends/nrmp/MonitoringPartnership.htm) (last accessed 2/3/2006). The goals of this partnership are to improve the accessibility of monitoring efforts to resource managers to aid in decision making for multiple purposes at multiple scales. The main components of this database are a library for protocols in use across the US and also a GIS application to aid in locating on-going and historical monitoring projects. While this database will not house the actual data associated with a monitoring project, it will allow an interested part y to contact the monitoring project leader to share information.

Reporting, Periodic Review, and Evaluation

The monitoring protocol will undergo a peer review process prior to implementation. Once implemented, the protocols will undergo an internal review every 1 to 2 years and if problems are noticed, advice will be sought from outside sources (e.g. university faculty and non-government organization scientists). In addition to the IDNR review, information from the monitoring program will be presented at the cooperator's meetings. Results from the monitoring program will be reported in regular progress reports, beginning with an "Inventory Assessment" once the initial round of the program has been completed and the data has been analyzed.

At this time any problems encountered with the data collection protocol will be addressed and specific directions for research recommendations will be suggested. The first report, and those that follow, will be made available to the public through the IDNR website. It may be possible to test the validity of using indicator species by examining the results of certain species individually from data collected through the monitoring program. Therefore, periodic internal and external peer review would become even more critical. An additional benefit that will result from periodic review will be the opportunity to evaluate current objectives and establish new objectives and goals of the program.

We do expect that some species may be completely missed by the inventory and monitoring programs but believe that the information gained on a large number of species outweighs this short-coming. Once we know exactly which species are not being adequately monitored, it would be prudent to advertise for proposals to do true research projects with these animals. Scientists would compete for a pre-determined amount of money associated with the research budget of the Plan. Figure 7.2 illustrates how we envision the decision making process concerning SGCN research and action needs to progress.

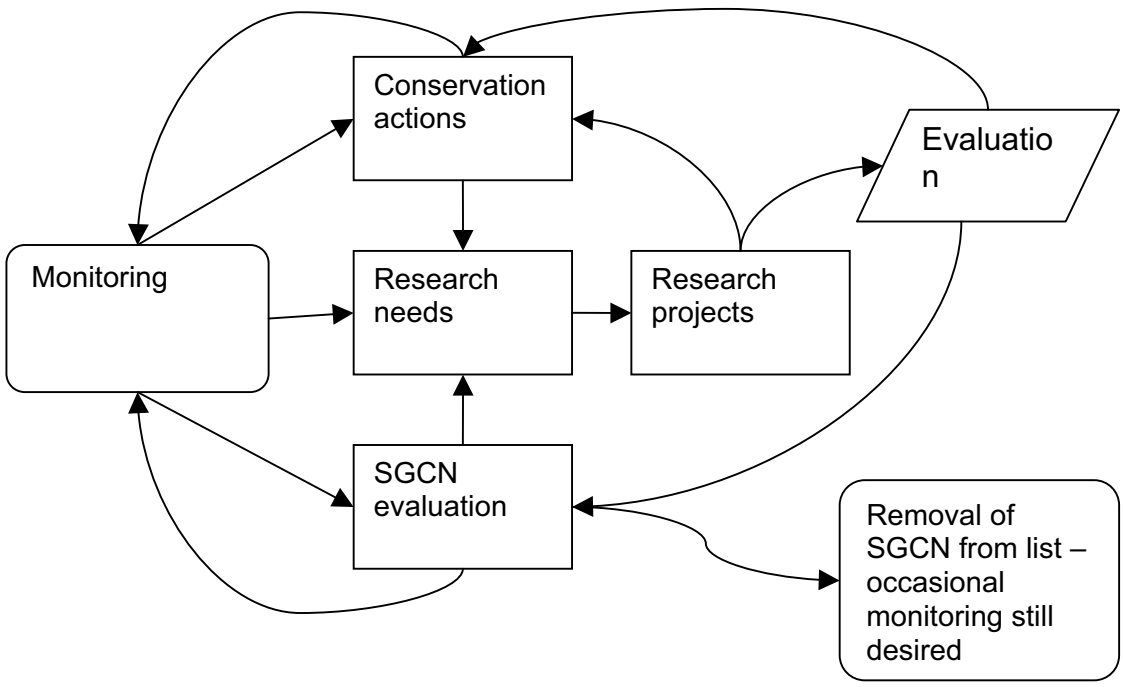


Figure 7.2. Decision making process concerning SGCN.

Additional Benefits

While stressing that at this time, the critical objective of this program is to determine statewide distribution and population statuses for as many species of concern as possible, there are additional potential objectives of the inventory and monitoring plans which may be able to be addressed through the monitoring data collection. These included the following (Objectives 3-5):

Objective 3: Strengthening Vertebrate GAP Models.

The Gap Analysis Program predicted species occurrences based upon given habitat classification and locations throughout the state of Iowa. At the present time, the GAP models are only available for birds, mammals, amphibians, and reptiles. Aquatic GAP models for fish are presently being developed but will not be completed before this plan is finalized. Aquatic GAP models will be incorporated in future planning efforts. 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. 2004)) to create predicted areas of occurrence for birds, mammals, amphibians, and reptiles.

To strengthen the models, the study site habitats could be classified into landcover areas within the predicted ranges would be further stratified using the GAP ancillary data characteristics. Ideally, we will have data collected as part of the monitoring program for each species for which GAP models were created. Information from the monitoring program will include geographic locations, species occurrence probabilities, and habitat classifications, which can then be compared against the original GAP models to determine accuracy. Alternatively, this data could be used to change the model predictions if a GAP round 2 was initiated.

Objective 4: Impact and Stress Assessment.

The third element in the Plan includes the 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 stresses chosen by the state biologists and other experts.

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 stress, 2) areas where steps have been taken to ease/prevent the stress, and 3) areas where the stress is allowed to go forward un-impeded. It may be possible that this can be accomplished within the framework of the long-term monitoring program.

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 stress or the management programs.

Monitoring the Effectiveness of Individual Conservation Actions

The IWAP lists a total of 28 actions to address the 6 visions of Iowa. A handful of these can be measured through scientific research, others will need to be measured through sociological research and public opinion. For example, the management actions (e.g. restore native plant communities and wildlife habitats; reintroduction programs for wildlife species; invasive species management) can be monitored through before and after, control and impact studies (see objective 5). To a somewhat less scientific extent we can also evaluate the progress made in protecting large areas of habitat (under the Creating Healthy Ecosystems vision) by inventorying new land acquisitions and habitat acres and also by monitoring the SGCN on private lands enrolled in conservation easement programs.

However, other actions, (e.g. market-based research to determine wildlife recreation interests; developing consistent messages about the value of wildlife and their habitats) may represent less-tangible goals as far as determining the effectiveness of the actions for wildlife populations. In regard to these actions, we must somehow monitor public opinion and decide what level of public support constitutes effectiveness.

Objective 5: Evaluation of Management Protocols and Restoration Programs (*ADAPTIVE MANAGEMENT*).

Regardless of what management protocol is followed, i.e. 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 may be critical to evaluate the results of management decisions on specified groups of species. This already is underway for selected public wildlife areas, with projects to evaluate the effects of patch-burn grazing at a major grassland landscape for prairie-chickens and other SGCN in southern Iowa, and to evaluate avian SGCN use of restored or recreated prairie and other grassland types in northern Iowa's prairie pothole region.

Most likely the same protocols and procedures would be used for this objective as for Objective 4. However, as these impacts would result from planned management programs, this could be addressed by manipulative experiments or more formal applications of adaptive resource management protocols. Ideally, data would be collected for several years pre- and post-implementation. Again, if species occurrence (or possibly abundance) was the parameter of interest, it may be possible to address this objective within the monitoring program, however, if more specific question 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 has been analyzed, then decisions as to 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 SGCN, then the action could be implemented elsewhere. Should it be determined that the action did not help the SGCN, then that action would most likely not be implemented on other lands. Ideally, we will be able to evaluate several similar actions at one time to determine the best, most cost-effective, action for the SGCN. However, we realize that what might benefit one species may be harmful to another and anticipate that several discussions involving exactly what species we are trying to enhance will be needed to truly evaluate the effect of the action being adapted. This is sometimes described as the "trial and error" method. While not the most effective means of adapting management to the needs of wildlife, it often is the most practical when funding is limited.

Research Priorities – Conservation Actions

Statewide distribution and status information is a priority for all SGCN. Additional areas for research will undoubtedly be identified as the results of the inventory and monitoring program become available. IDNR and other knowledgeable wildlife researchers have already identified other priority projects (Tables 7-3, 7-4 and 7-5). Progress on addressing this list needs to begin even as the survey and monitoring projects are conducted. These projects should be rigorously designed from a statistical standpoint to evaluate the effect of given actions (or inactions). The ideal design would include pre-and post- treatment data collection on wildlife in affected sites as well as control sites. These projects will be prioritized and a subset will be funded each year funds are available.

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 actions by meeting with all collaborators at least every other year beginning in 2007 with a formal conference including scientific presentations of on-going or recently completed research and

monitoring projects in addition to round-table discussions to address new information and changing conditions. Issues which warrant immediate attention (e.g. a 100-year flood occurring, resulting in the need for urgent research into a SGCN dependent upon floodplains for nesting purposes) can be decided at that time or at any time by the Implementation Team (see Chapter 9).

In addition to the bi-yearly meetings, 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, stresses that have been resolved or have intensified, the public's acceptance of the IWAP and its achievements. Figure 7.3 illustrates this process.

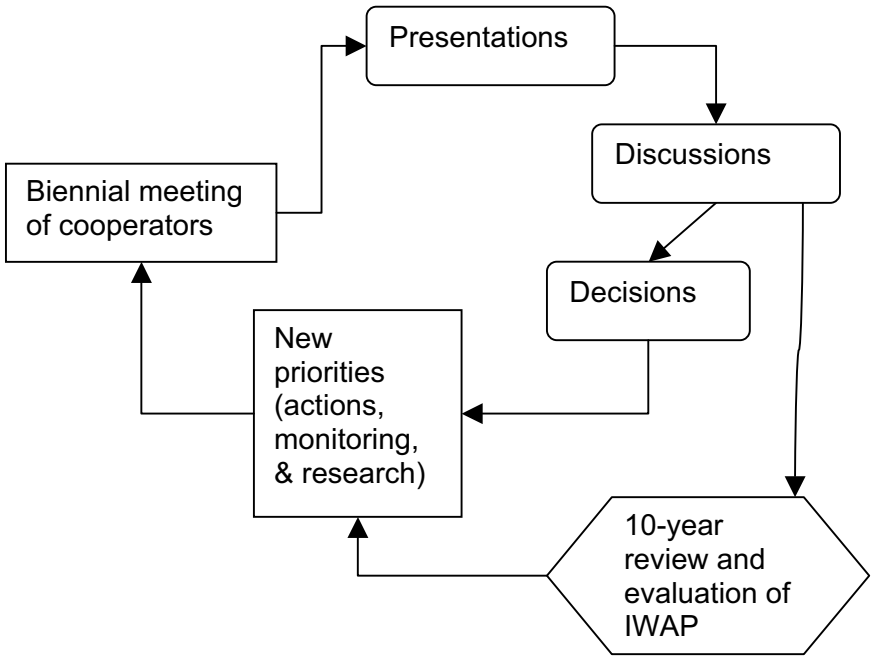


Figure 7-3. Process of evaluation on monitoring, actions, and research for IWAP.

Research and Monitoring Costs

Estimated costs for the research, survey and monitoring programs recommended in this chapter are summarized in Table 7-6. Costs are estimates based on similar studies undertaken in Iowa or surrounding states. Priorities are difficult to establish until the amount and timing of funding available to address

research needs becomes known. Costs for some short term survey projects Table (7-2) could be absorbed by the long term monitoring program if that becomes a reality. Some of the individual research studies could be combined to maximize efficiency and reduce overall costs if sufficient funds are available for expanded work. Costs listed in the tables for research and short term surveys are assumed to end when studies are complete.

Table 7-3. Land Management Research Needs

Project	Description	Lead Agency	Estimated Cost
Restoration And New Habitat Projects	-Identifying faunal differences between native and restored sites (prairie, wetland, savanna) -Feasibility of introducing missing species -Sources for amphibian and insect colonizers in restored sites - Effectiveness of nitrate removal .in restored wetlands -Coldwater stream fish species restoration Warmwater stream aquatic species restoration	IDNR-Universities	$1,000,000
Effect Of Prescribed Fire	- Exclusion of fire suppression on native grasslands and forests - Effect of fire on butterflies	IDNR - Universities	$200,000
Effect Of Public Land Crop And Grazing Rotation	- Pre- and post- management study to address impacts on SGCN - Effect of mowing/grazing on butterflies.	IDNR - Universities	$160,000
Timber Harvest	- Impacts of timber harvest to create early successional habitat and maintain prairies and savannas (Pre- and post-management studies - neotropical migrants and ruffed grouse, etc.) -Are Iowa forests sources or sinks for interior forest nesting birds like the cerulean warbler? - Determining a sustainable deer density that balances public demand with impacts on forest birds and other taxa.	IDNR - Universities	$250,000
Goat Prairie Management	-Impacts of tree and shrub encroachment on goat prairies and sensitive species (e.g. timber rattlesnakes) - Value of microsites to the status of butterflies and other wildlife.	IDNR - Universities	$50,000
CRP	Do the CRP seedings and other management techniques really affect wildlife? (Grass vs. grass/forbs mix, discing, etc.)	IDNR - NRCS	$50,000
Wind Turbines	-Wind turbines - Effects on nesting success of breeding birds? -How can wind turbines be modified so they will not cause bat mortality?	IDNR - Universities	$80,000
Land Acquisition	-How large must core tracts be to conserve species with minimum viable population sizes? - Pre and post effects of land management techniques.	IDNR – CCBs - USFWS	$150,000
Farming practices	Impacts of different farming practices (e.g. organic vs. chemical fertilizer) on songbird and herptile populations	IDNR - Universities	$40,000
Canary grass removal practices	Effects of water level management versus herbicide, and manual removal of canary grass on wildlife.	IDNR	$20,000
	Total Land Management Research Cost		**$2,000,000**

Table 7-4. Wildlife Species Research Needs

Project	Description	Lead Agency	Estimated Cost
Carp	Impacts of carp on SGCN in shallow lakes- Management techniques for controlling carp in shallow lakes	IDNR	$275,000
Eel ladders	Develop eel passage structures for Mississippi River locks and dams	IDNR - Universities	$200,000
Prairie chickens	-Impacts of trees on predations on leks (How many? How far?) - Minimum-area habitat size required for a self-sustaining population	IDNR - Universities	$200,000
West Nile Virus	-Occurrence, frequency and impacts on birds	IDNR - IDALS	$150,000
Snakes	- Can created hibernacula help reverse snake population declines?	IDNR - Universities	$50,000
Birds of prey	-Habitat and prey preferences of migratory birds of prey -Measure the impacts on game species	IDNR - Universities	$!00,000
Fish	-Reproductive needs of paddlefish and grass pickerel	IDNR	$50,000
Ruffed grouse	-Habitat suitability and habitat use in NE Iowa - Use of aspen & other early successional habitat.	IDNR - Universities	$300,000
Reptiles & Amphibians	-Habitat status and use by all Iowa Herps (Priority on state and Federal T & E species) - Impacts of public land management on Herps.	IDNR - Universities	$175,000
Ornate box turtle	Population assessment in the Loess Hills	IDNR - Universities	$50,000
Plains pocket mouse	Population analysis and habitat use in the central and southern Loess Hills	IDNR - Universities	$50,000
Prairie butterflies	-Habitat components and obligate host plants for selected declining species	IDNR - Universities	$100,000
Rare fish	-Habitat and water quality requirements of rare fish on the Lower Cedar River	IDNR - Universities	$50,000
	Total Populations Research Cost		**$775,000**

Table 7-5. Area-Specific Research Projects

Project	Description	Lead Agency	Estimated Cost
Headwater streams	-Community composition and impacts of agricultural runoff	IDNR - Universities	$175,000
Missouri River	-Long term monitoring plan similar to that on the Mississippi River.	IDNR - FWS	$1,000,000
Identify critical habitat components	-Landscape factors affecting SGCN (structural features, landscape configurations, amount of habitat) -breeding and migratory birds	IDNR - Universities	$800,000
GIS and landscape modeling	Continue development Grassland Bird Conservation Area Model to identify geographic focus areas for habitat protection, restoration, and management	IDNR - PIF	$25,000
Investigate interactions among birds, other animals and flora	What is the relative importance of disease, predation, nest parasitism, introduced species, land use, and abiotic factors such as climate change?	IDNR - Universities	$800,000
Sinkholes feeding ATS slopes	ATS slopes with rare and endangered species need to have the sinkholes mapped for protection. Data should be collected at these areas to abate potential pollution or blockage.	IDNR	$50,000
	Total Area-Specific Research Cost		**$2,850,000**

Table 7-6. Estimated research and monitoring costs.

Project	Description	Cost[1]	Occurs
Surveys and Monitoring			
Short Term Surveys	Table 7-2	$2,220,000	Project Duration
Long Term Monitoring		$2,000,000	Annually
Research			
Land Management	Table 7-3	$2,000,000	Project Duration
Species Management	Table 7-4	$775,000	Project Duration
Area-Specific	Table 7-5	$2,850,000	Project Duration
Total		**$7,845,000**	Project Duration
		$10,000,000	5-Year Monitoring

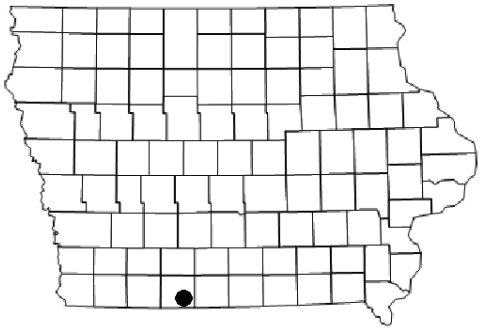
[1] Costs are based on 2005 dollars. Costs are estimates by the Plan author and Steering Committee. Costs may be revised depending on the amount and timing of funding for IWAP.

The biggest unknown is the cost for the long term monitoring effort. Preliminary estimates based on field tests (funded under Iowa State Wildlife Grant Study T-4-P-1) are that each sampling site will cost about $4,000 for the multiple species sampling that will occur. A minimal goal would be to complete the initial round of survey and inventory work in 5 years. This would produce the first-ever statewide view of the status and distribution of all wildlife species. At that time the potential of the project to become a long term monitoring program will be evaluated and adjustments implemented if any are needed. To make this a reality would cost $2,000,000 annually for field surveys, or $10 million for the initial 5 years. Experience and data gained from the initial years of the project may increase or decrease this cost.

Fig. 7.4. Examples of Iowa Habitats and SGCN

Habitat: **Warm Season Herbaceous Vegetation**

Location: Grand River Grasslands, in southwestern Iowa



Roger Hill photo

Description: A region of southwestern Iowa in which the landscape is dominated by grasslands (~70%), primarily tame grass pastures, tame grass Conservation Reserve Program (CRP) lands, with scattered remnants of tallgrass prairie and oak savanna.

Example Associated SGCN: ** = Key species (also pictured above)

- Northern harrier (*Circus cyaneus*)
- Greater prairie-chicken (*Tympanuchus cupidio*)**
- Short-eared owl (*Asio flammeus*)
- Henslow's sparrow (*Ammodramus henslowii*)
- Franklin's ground squirrel (*Seprmophilus franklinii*)
- Prairie vole (*Microtus ochrogaster*)
- Spotted skunk (*Spilogale putorius*)
- Regal fritillary (*Speyeria idalia*)
- Byssus skipper (*Problema byssus*)
- Smooth greensnake (*Opheodrys vernalis*)
- Northern prairie skink (*Eumeces septentriolnalis*)

Example Habitat Stresses:

- Detrimental grazing
- Conversion to row crops
- Fragmentation and loss of connectivity
- Conversion to non-native grasses
- Fire suppression (leading to woody invasion).

Fig. 7.4 cont. Examples of Iowa Habitats and SGCN

Example Actions to Address Stresses:

- Landowner education; cooperative "grassbanking"; patch-burn grazing (response measure then would be the amount of education programs, public opinion, the amount of grassland, and the effectiveness of patch-burn grazing systems)
- Work with landowners to re-enroll or extend CRP contracts (response measure would then be the number of landowners who re-enroll)
- Permanent protection of key connecting tracts (response: amount and location of protected tracts)
- Work with landowners to restore native flora and suppress non-natives (response: number of landowners participating AND the effectiveness of these programs by measuring wildlife response)
- Conduct periodic prescribed burns on public and private land (response: effectiveness of these burns)

Example Inventory, Survey, Monitoring and Research Needs

- Conduct multi-taxa baseline faunal inventories
- Track changes in grassland cover and fragmentation with remote sensing/GIS
- Research the effects of patch burn grazing on SGCN
- Identify and monitor all prairie-chicken lek sites and determine number required for population growth and stability

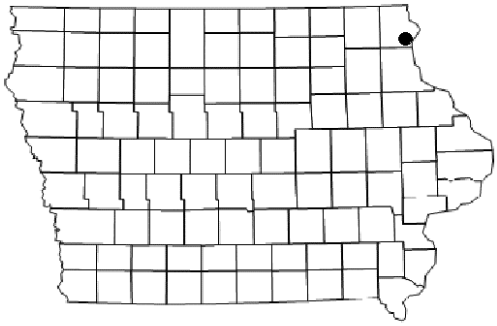
Possible Partnerships to Address Issues and Needs

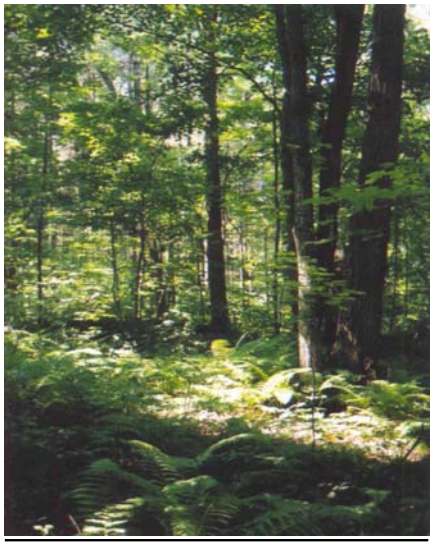
- Iowa Department of Natural Resources
- US Fish and Wildlife Service
- US Geological Survey
- USDA Natural Resources and Conservation Service
- Missouri Department of Conservation
- Ringgold County Conservation Board
- The Nature Conservancy in Iowa
- The Iowa Natural Heritage Foundation
- Iowa State University
- Private landowners

Fig. 7.5. Examples of Iowa Habitats and SGCN

Habitat: **Forest**

Location: Yellow River forest, in northeastern Iowa





Doug Harr photo

Description: A region of northeastern Iowa in which significant portions of the landscape are dominated by a 60% canopy of tree species with interlocking crowns. This area is also interspersed with patches of open grassland pastures, small remnant prairies on steep hillsides, successional shrublands and row crop agriculture. Mississippi River tributary streams bisecting the area, such as the Yellow River, also host riparian forests.

Example Associated SGCN: ** = Key species

- Red-shouldered hawk (*Buteo lineatus*)
- Wood thrush (*Hylocichla mustelina*)
- Cerulean Warbler (*Dendroica cerulea*)**
- Southern flying Squirrel (*Glaucomys volans*)
- River otter (*Lutra Canadensis*)
- Timber rattlesnake (*Crotalis horridus*)
- Iowa Pleistocene snail (*Discus macclintokii*)
- Edward's hairstreak (*Satyrium liarops*)
- Slimy sculpin (*Cottus cognatus*)

Fig. 7.5 cont. Examples of Iowa Habitats and SGCN

Example Habitat Stresses:

- Fragmentation and loss of connectivity
- Conversion for residential use
- Timber harvest
- Fire suppression (on hill prairies)

Example Actions to Address Stresses:

- Landowner education (response measure: number of education opportunities and public opinion)
- Plant native trees and shrubs to fill gaps, decrease edge and restore corridors (response: amount of area restored and wildlife response)
- Limit clear cuts to less than five acres; leave seed trees and snags (response: number of cuts > 5 acres)
- Maintain mature bottomland timber stands (response: amount of land in mature stands)
- Work with county and local governments to create environmental zoning (response: number of environmental zoning successes compared to failures)
- Remove (cut/burn) invading red cedars from hill, or "goat", prairies (response: amount of area cleared)

Example Inventory, Survey Monitoring and Research Needs

- Conduct multi-taxa baseline faunal inventories
- Track changes in forest canopy cover and hill prairies with remote sensing/GIS
- Identify and monitor refugia for less mobile SGCN
- Research the value of microsites to butterflies and other invertebrates

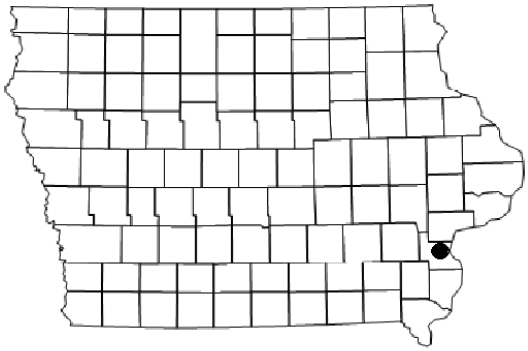
Possible Partners to Address Issues and Needs

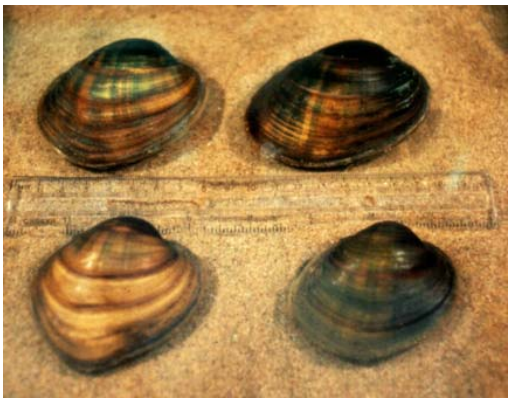
- Iowa Department of Natural Resources
- US Fish and Wildlife Service
- US Geological Survey
- National Park Service
- The Iowa Natural Heritage Foundation
- Blufflands Alliance
- Minnesota Department of Natural Resources
- Iowa Audubon Important Bird Areas Program
- Iowa State University
- Luther College
- Private landowners

Fig. 7.6. Examples of Iowa Habitats and SGCN

Habitat: **River**

Location: Confluence of the Lower Cedar and Iowa Rivers with the Mississippi River, in southeastern Iowa





USFWS photo

Description: Large, permanent, slow-moving rivers draining major portions of Iowa, characterized by expansive floodplains with attendant backwaters, oxbows and associated saturated uplands, floodplain forests and sandy areas

Example Associated SGCN: ** = Key species (also pictured above)

- King rail (*Rallus elegans*)
- Prothonotary Warbler (*Protonotaria citrea*)
- Least shrew (*Cryptotis parva*)
- Yellow mud turtle (*Kinosternon flavescens*)
- Eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*)
- Grass pickerel (*Esox americanus*)
- Higgins' eye pearlymussel (*Lampsilis higginsi*)**
- Royal river cruiser [dragonfly] (*Macromia taeniolata*)

Example Habitat Stresses:

- Siltation
- Invasive/non-native species
- Loss of riparian habitat
- Loss of submergent/emergent plants

Fig. 7.6 cont. Examples of Iowa Habitats and SGCN

Example Actions to Address Stresses:

- Work with private landowners to control runoff through soil conservation practices (response measure: number of landowners participating vs number that do not)
- Reduce agricultural and development activities in floodplain (response: number of detrimental activities prevented vs those completed)
- Permanently protect "greenbelts" along riparian corridors (response: amount of area protected)
- Immediate removal/destruction of invasive species as encountered (response: amount of invasive species removed vs remaining)
- Public education regarding all aspects of stresses upon rivers (response: number of education opportunities and public opinion)
- Reintroduce Higgins' eye pearly mussel glochidia into Mississippi River tributary rivers (response: number of viable, self-sustaining Higgins' eye pearly mussel populations)

Example Inventory, Survey, Monitoring and Research Needs

- Conduct multi-taxa baseline faunal inventories
- Monitor expansion/contraction of invasive species
- Determine habitat quality requirements of rare fish in the Lower Iowa and Cedar Rivers
- Research the reproductive needs of grass pickerel

Possible Partners to Address Issues and Needs

- Iowa Department of Natural Resources
- US Fish and Wildlife Service
- US Army Corps of Engineers
- US Geological Survey
- USDA Natural Resources Conservation Service
- Louisa and Muscatine County Conservation Boards
- The Nature Conservancy in Iowa
- The Iowa Natural Heritage Foundation
- Iowa State University
- Private landowners

Existing Applicable Resources

- Upper Mississippi River Evaluation and Monitoring Program
- Upper Mississippi-Great Lakes Joint Venture (Iowa revised implementation plan)