CHAPTER FOUR: HABITATS OF SGCN

Terrestrial Habitat Classes

The Steering Committee selected nine terrestrial vegetation classes defined by Iowa GAP as the basis for evaluating terrestrial wildlife habitats. Vegetation classes were identified from 1990 satellite imagery, entered into Iowa GAP's GIS database and were mapped. The nine habitat classes with their related alliances and the dominant vegetation found in each alliance are listed in Appendix 13. A descriptive summary of the terrestrial habitat classes is listed in Table 4-1. The distribution of terrestrial habitats is shown in Map 4-1 through Map 4-9.

Table 4-1. Description of Terrestrial Habitat Classes Used in the IWAP.

HABITAT CATEGORY	DESCRIPTION
WOODED HABITATS	
Forest	>60% canopy of tree species with crowns interlocking
Wet - Forest/Woodland	Temporarily or seasonally flooded forest or woodland
Woodland	Open stands of tree species with 25-60% canopy cover
Shrubland	Shrubs >0.5 m tall forming >25% cover with <25% tree cover
WETLAND HABITATS	
Wet Shrubland	Temporarily, seasonally, and semi-permanently flooded wetlands or saturated deciduous shrubland
Herbaceous Wetlands	Temporarily, seasonally, semi-permanently, permanently flooded or saturated herbaceous wetlands
GRASS0LAND HABITATS	
Warm Season Herbaceous Vegetation	<25% canopy cover made up of trees or shrub species. Herbs form at least 25% of canopy cover
Savanna	Temperate grassland with sparse coniferous or cold-deciduous tree layer
AGRICULTURAL LANDS	Lands normally worked to produce a crop or grazed by livestock
Cool Season Grassland	Cool season grassland (smooth brome, forage crops, and pasture)
Cropland	Worked land normally on an annual basis in corn, soybeans, sorghum, fallow fields or other crops.

In another analysis, the IDNR used 2002 satellite imagery to identify 16 land cover categories that provide updated land cover estimates (presented in Table 4-2). The land cover types developed in this analysis do not coincide with the Iowa GAP vegetation classes, but several are intuitively similar or are clearly sub-classes. The acreages of land cover types in Table 4-2 are thought to be more reliable than those developed by Iowa GAP and are used in the IWAP unless otherwise noted.

Table 4-2. GIS Land Cover Types From 2002 Satellite Imagery.

Land Cover Type	Acres	Percent of Iowa
Agricultural		
Corn	11,592,000	32.2%
Soybeans	9,612,000	26.7%
Other Row crops	144,000	0.4%
Hay	1,152,000	3.2%
Pasture	2,664,000	7.4%
Conservation Reserve	1,584,000	4.4%
All Agricultural	**26,748,000**	**74.3%**
Forest		
Deciduous forest	2,700,000	7.5%
Coniferous forest	72,000	0.2%
Wetland forest	72,000	0.2%
All Forest	**2,844,000**	**7.9%**
Developed		
Roads	516,000	1.6%
Residential	324,000	0.9%
Commercial	216,000	0.6%
Other	36,000	0.1%
All Developed	**1,092,000**	**3.2%**
Ungrazed Grassland	4,932,000	13.7%
Wetlands	180,000	0.5%
Surface water	324,000	0.9%

Seventy-four percent of Iowa was considered farmland in 2002 (Table 4--2). Nearly sixty percent is in row crop, primarily corn and soybeans, with the remainder of the farmland in hay, pasture, and CRP fields. Developed lands and ungrazed grasslands are the other non-native land use categories. Ungrazed grasslands could not be specifically categorized, but probably are a combination of temporarily idle pastures, odd field corners, wet areas along streams, and road ditches.

Distribution of wildlife habitats. Wildlife habitats are not uniformly distributed throughout the state (Table 4-3). Agriculture clearly dominates all landforms. The largest proportion of all wildlife habitats is found in the Southern Iowa Drift Plain, the least in the NW Iowa Plain and in the Missouri and Mississippi Alluvial Plains. The Southern Iowa Drift Plain contains more of each major habitat category - wooded, grassland and wetland habitat - than would be expected if habitats were distributed proportional to the areas of the landforms. The Paleozoic Plateau has more woodland and wetland than would be expected and the Loess

Hills more grassland, but the other landforms generally have fewer acres in wildlife habitat than expected based solely on their area.

Table 4-3. The Amount of Iowa's Wildlife Habitat Found in Each Landform

			Percent of each habitat class in each landform				
Landform [1]	**Acres**	**% of State**	**Wooded**	**Grass land**	**Wetland**	**All Habitat**	**Ag Land**
S Iowa Drift Plain	15,726,045	44%	57%	61%	51%	57%	41%
Iowan Surface	5,981,595	17%	10%	12%	16%	12%	18%
Des Moines Lobe	7,586,367	21%	9%	11%	13%	11%	23%
Paleozoic Plateau	1,632,298	5%	14%	4%	12%	10%	3%
Loess Hills	867,035	2%	3%	5%	2%	3%	2%
NW Iowa Plains	2,967,431	8%	2%	3%	4%	3%	9%
Mississippi Alluvial Plain	524,465	1%	3%	1%	1%	2%	1%
Missouri Alluvial Plain	717,025	2%	2%	2%	2%	2%	2%
Statewide	36,002,261	100%	100%	100%	100%	100%	100%

[1] Refer to map 2-1 for the description of landforms.

The Paleozoic Plateau has the greatest concentration of wildlife habitat within its boundaries (more than a third of its acreage), mostly in woodlands (Table 4-4). The three landforms in northcentral and northwest Iowa are among the most intensively farmed regions in the world and have relatively little wildlife habitat. In these landforms only the major river systems, restored and natural lakes and restored wetland/grassland complexes on publicly owned land provide substantial amounts of habitat (Map 2-3).

Table 4-4. Landcover Within Each Landform

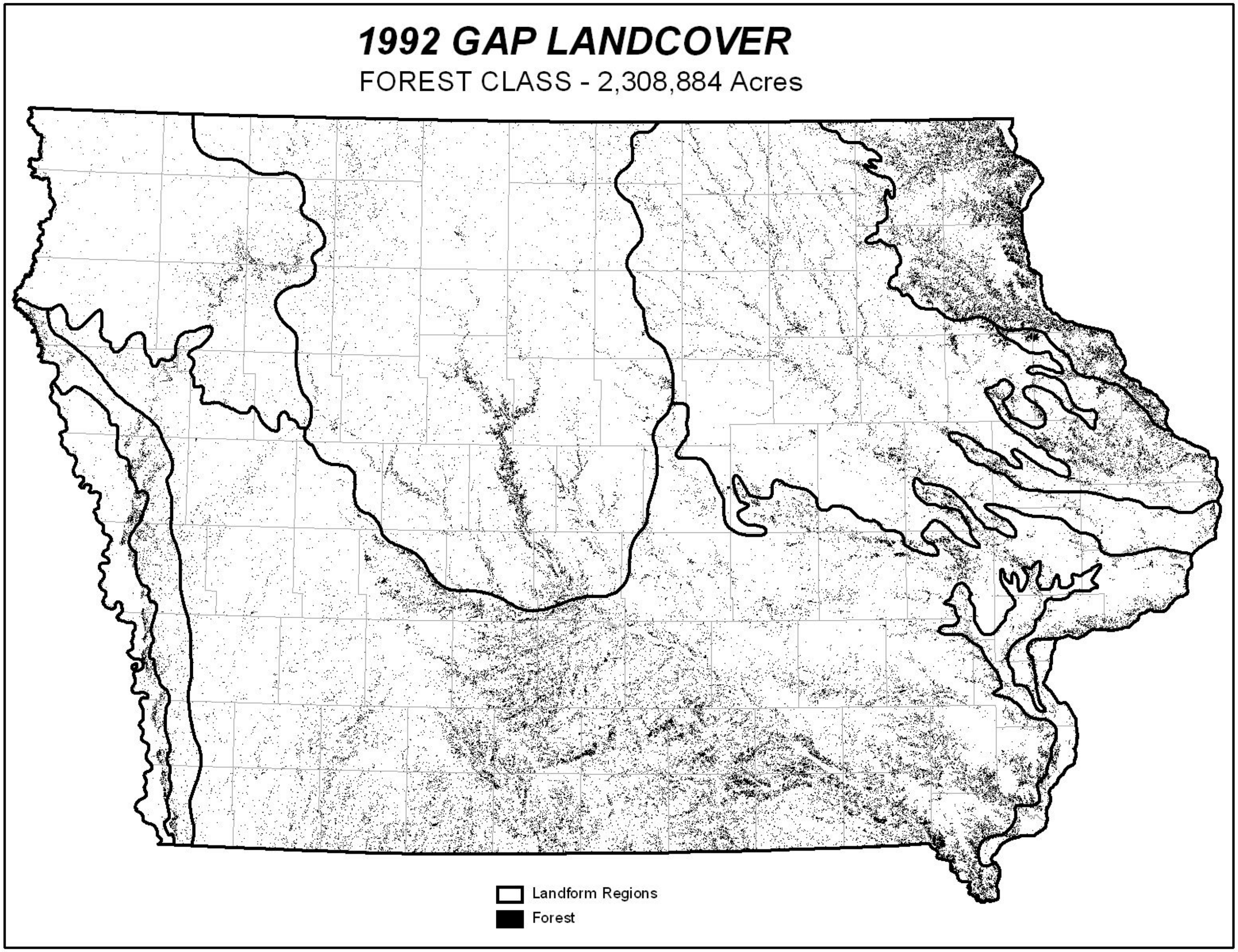
	Percent of Landform Region						
Landform [1]	**Wooded**	**Grass land**	**Wetland**	**All Habitat**	**Ag Land**	**Developed**	**All Land**
Paleozoic Plateau	25%	4%	7%	36%	61%	4%	100.0%
Mississippi Alluvial Plain	16%	5%	2%	22%	66%	12%	100.0%
Loess Hills	9%	11%	3%	22%	75%	3%	100.0%
S Iowa Drift Plain	11%	7%	3%	21%	76%	3%	100.0%
Missouri Alluvial Plain	9%	4%	3%	16%	79%	5%	100.0%
Iowan Surface	5%	4%	3%	12%	86%	2%	100.0%
Des Moines Lobe	4%	3%	2%	8%	89%	3%	100.0%
NW Iowa Plains	2%	2%	1%	5%	93%	2%	100.0%
Total							

[1] Refer to map 2-1 for the description of landforms.

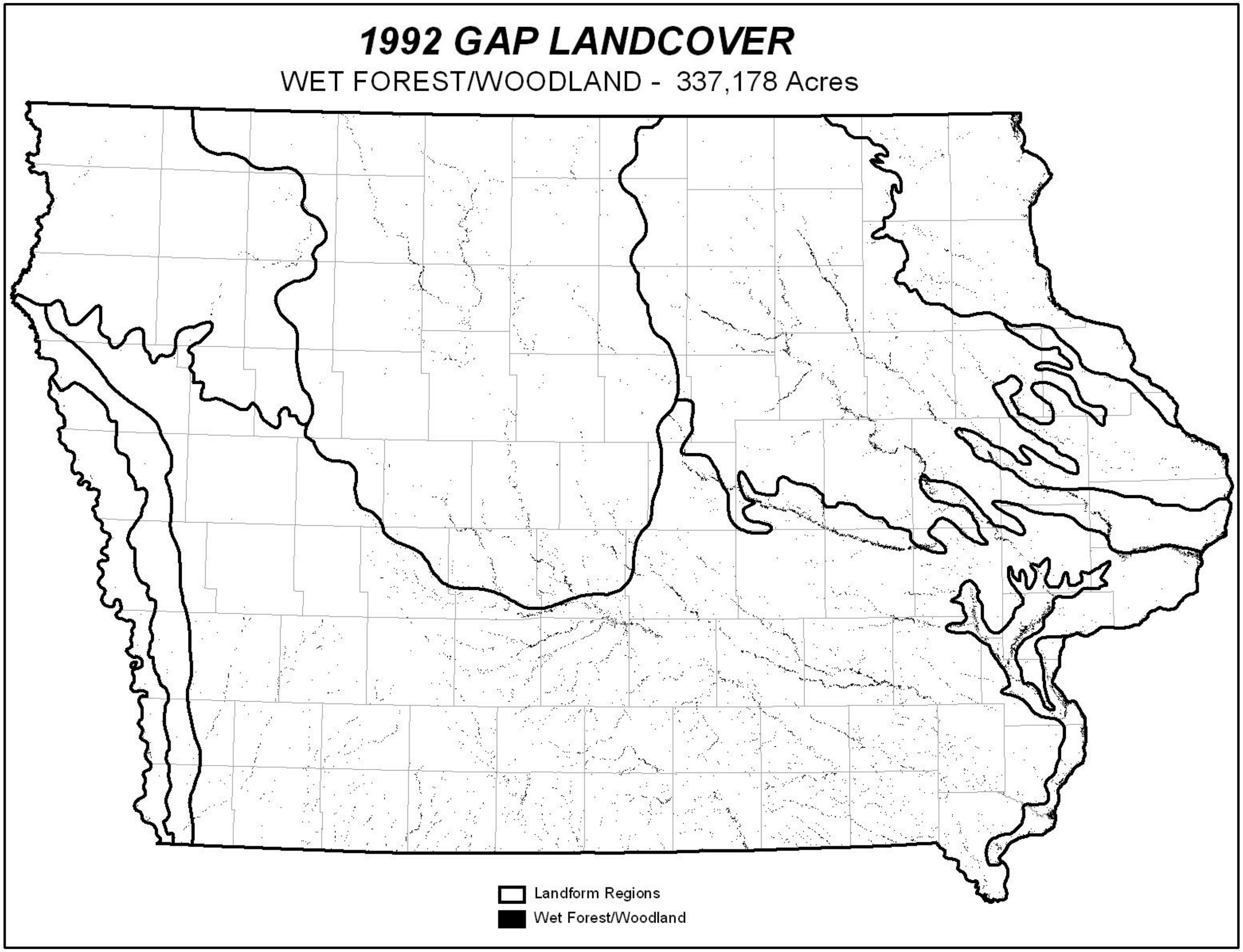
Habitat Maps. Caution should be used when interpreting the habitat distribution maps (Map 4-1 - Map 4-8). Iowa GAP encountered significant problems trying to distinguish between closely related vegetative alliances with similar infrared reflectances. Warm season grasses were difficult to reliably separate from cool season grasses and pasture. Map 4-7 clearly overestimates the amount of warm season grasses in Iowa. Some fields, particularly CRP fields, have plots of warm season grasses in an otherwise cool season landscape. Forested vegetation alliances, nearly all deciduous, could not be consistently identified by canopy reflectance. Identifying each alliance would require substantial ground-truthing to resolve. The major habitat categories listed in Table 4-1 (wooded, wetland, grassland and agricultural land), however, could be distinguished reliably. Habitats are discussed at finer levels in this Plan only where acceptable accuracy was attained. Other sources of information (National Wetlands Inventory, USDA Forest Service, etc.) were used to supplement the GAP data when it was available.

The maps do give a visual impression of the distribution of wildlife habitats, and they do highlight two problems that are discussed later in the Plan. Most habitat blocks are small and highly fragmented compared to Iowa's original landscape. A century of sub-dividing the land for agricultural purposes has left few large blocks in any vegetative cover except for row crops. The current average size of a wooded habitat is just 40 acres. This has implications for area-sensitive species that require large blocks of habitat to survive or reproduce successfully. It may also make it difficult for less mobile species to pioneer new habitats or to find replacement habitat if their habitat patch is destroyed or altered unacceptably.

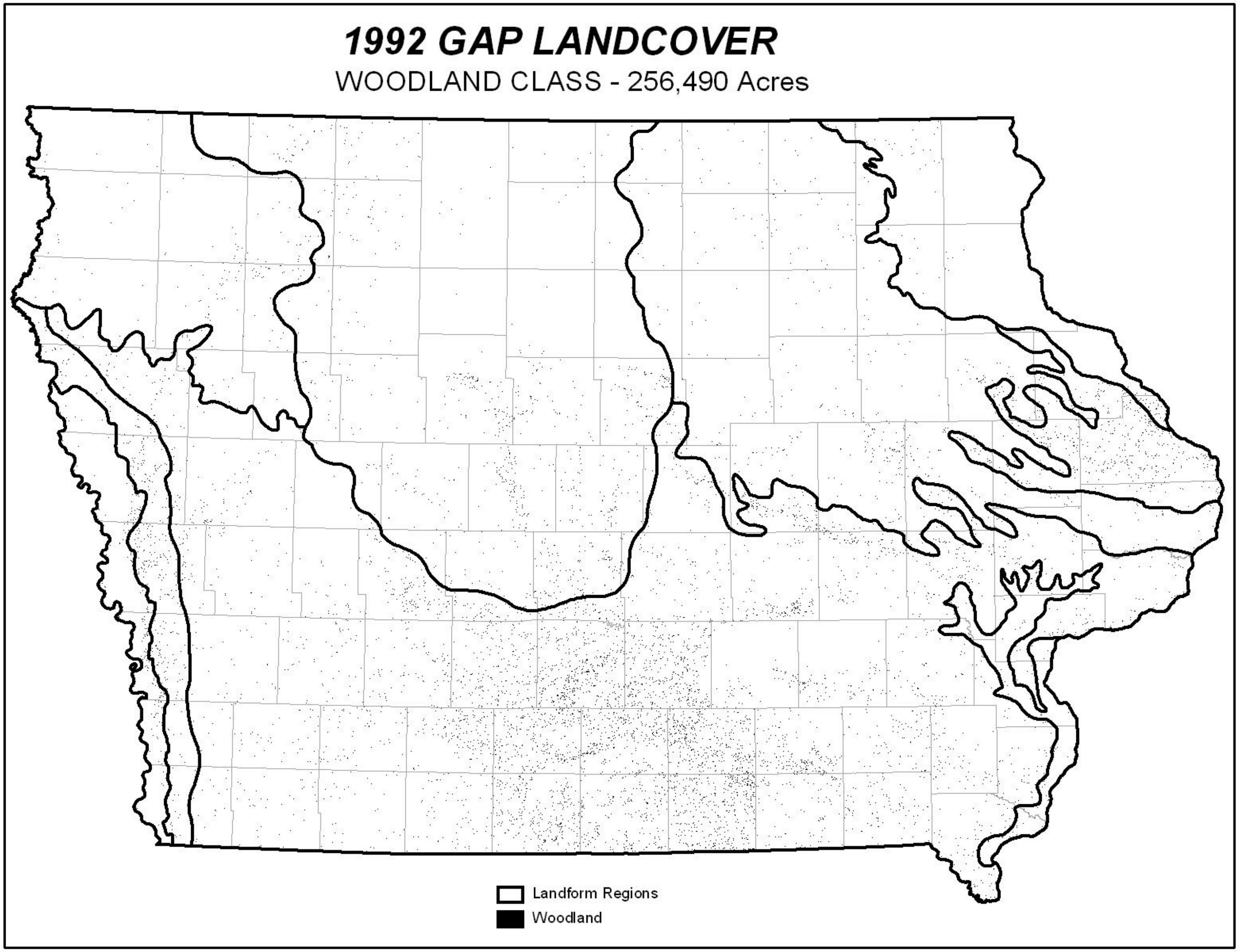
Map 4-1. Forest Land Cover



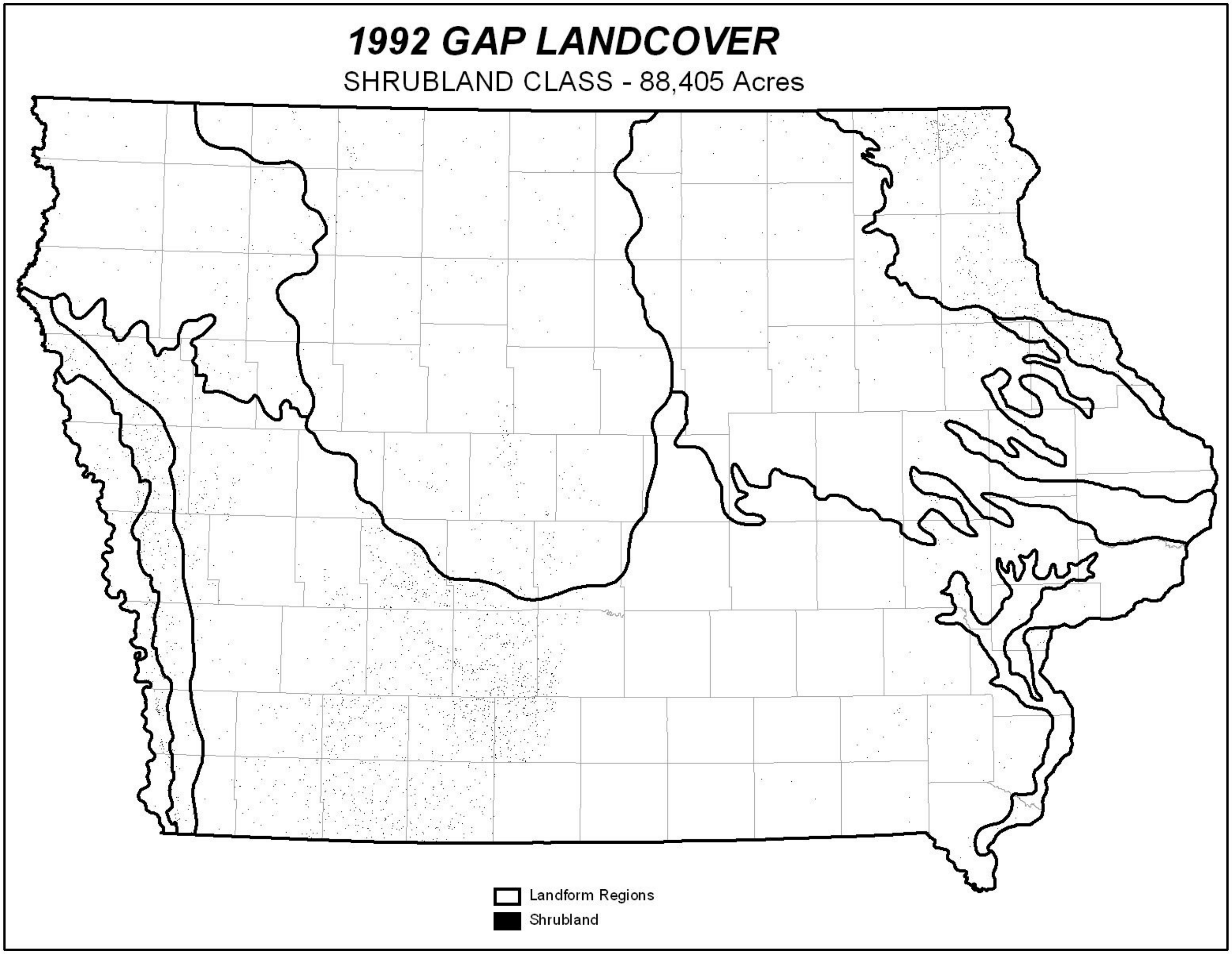
Map 4-2. Wet Forest/Woodland Land Cover



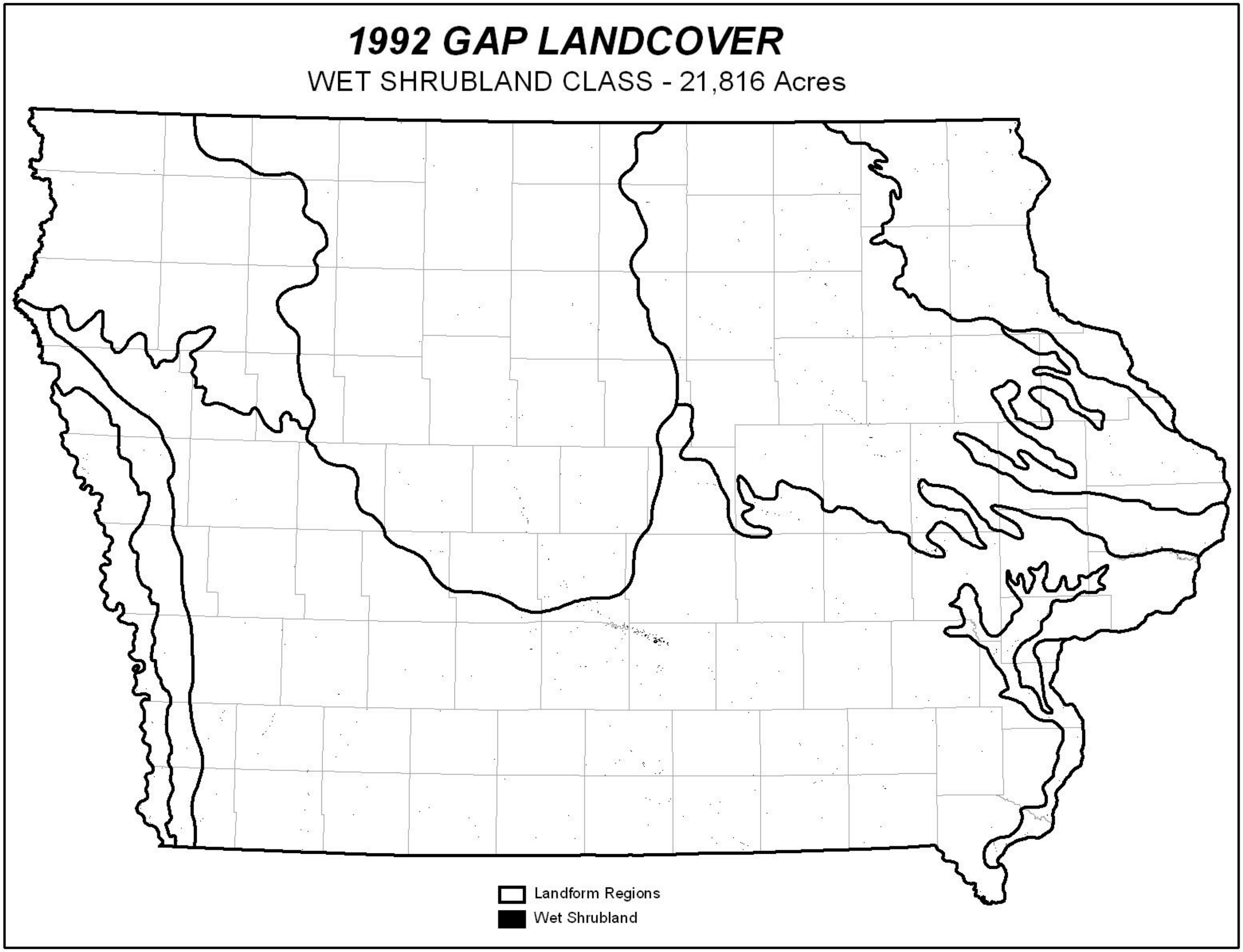
Map 4-3. Woodland Land Cover



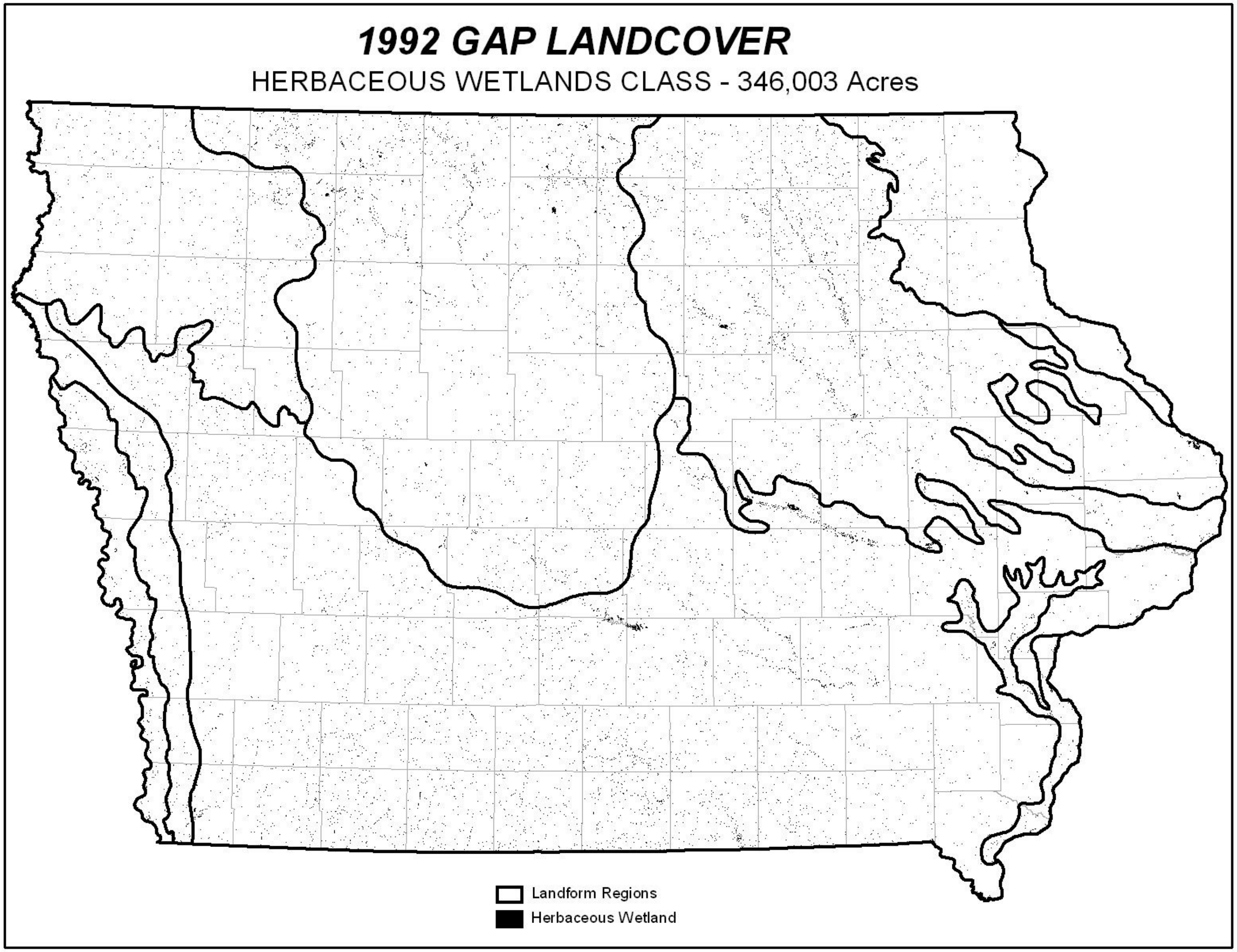
Map 4-4. Shrubland Land Cover



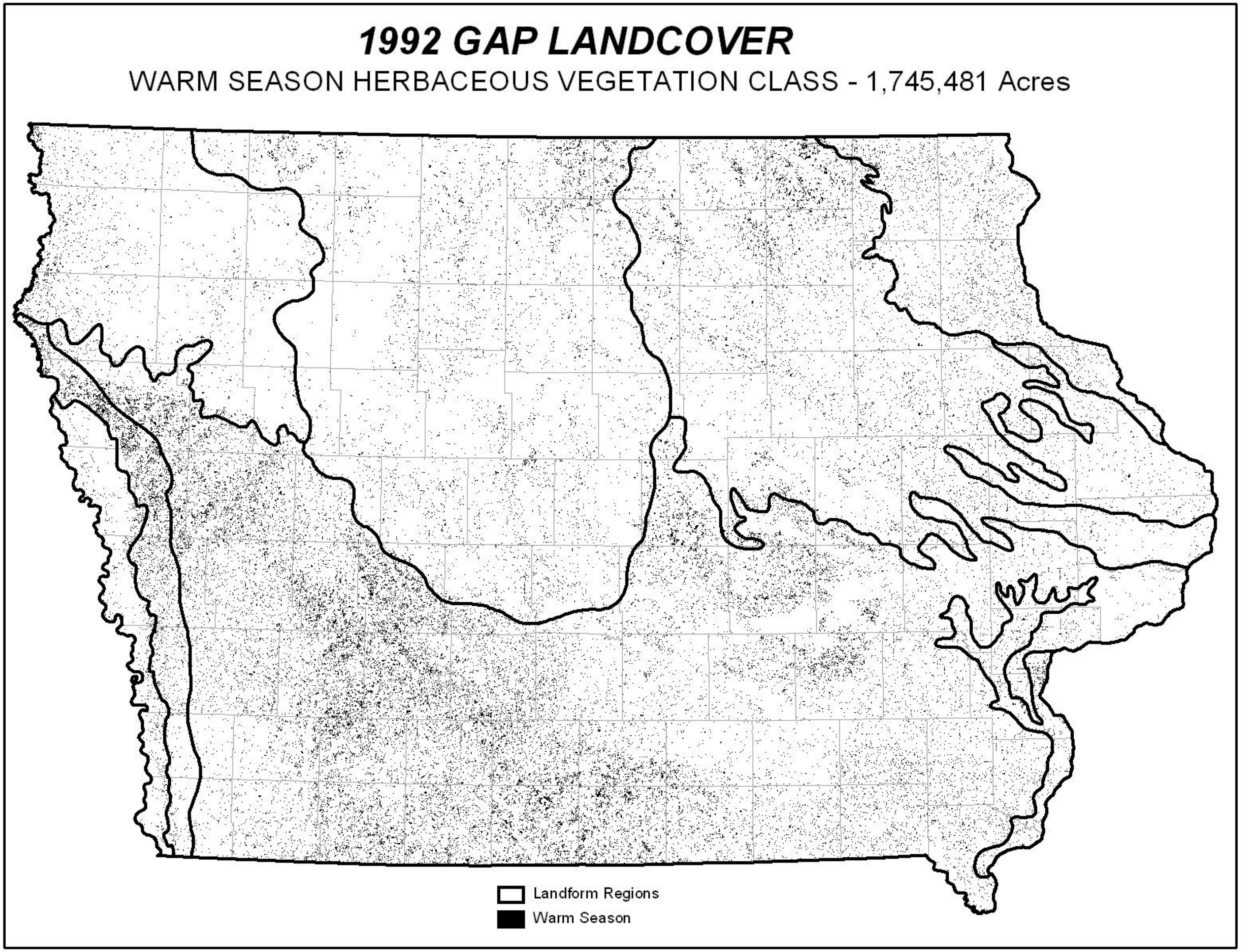
Map 4-5. Wet Shrubland Land Cover



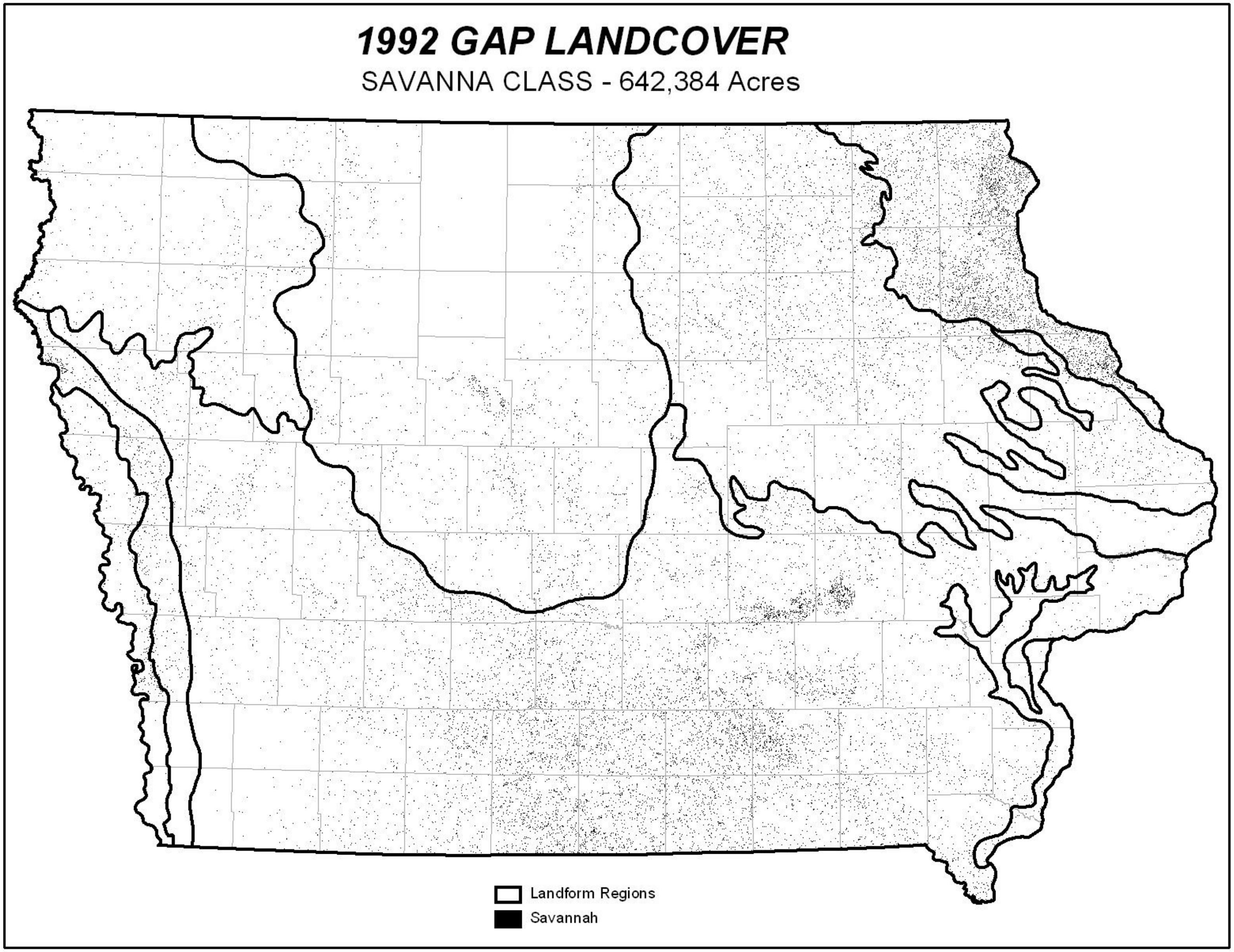
Map 4-6 Herbaceous Wetland Land Cover



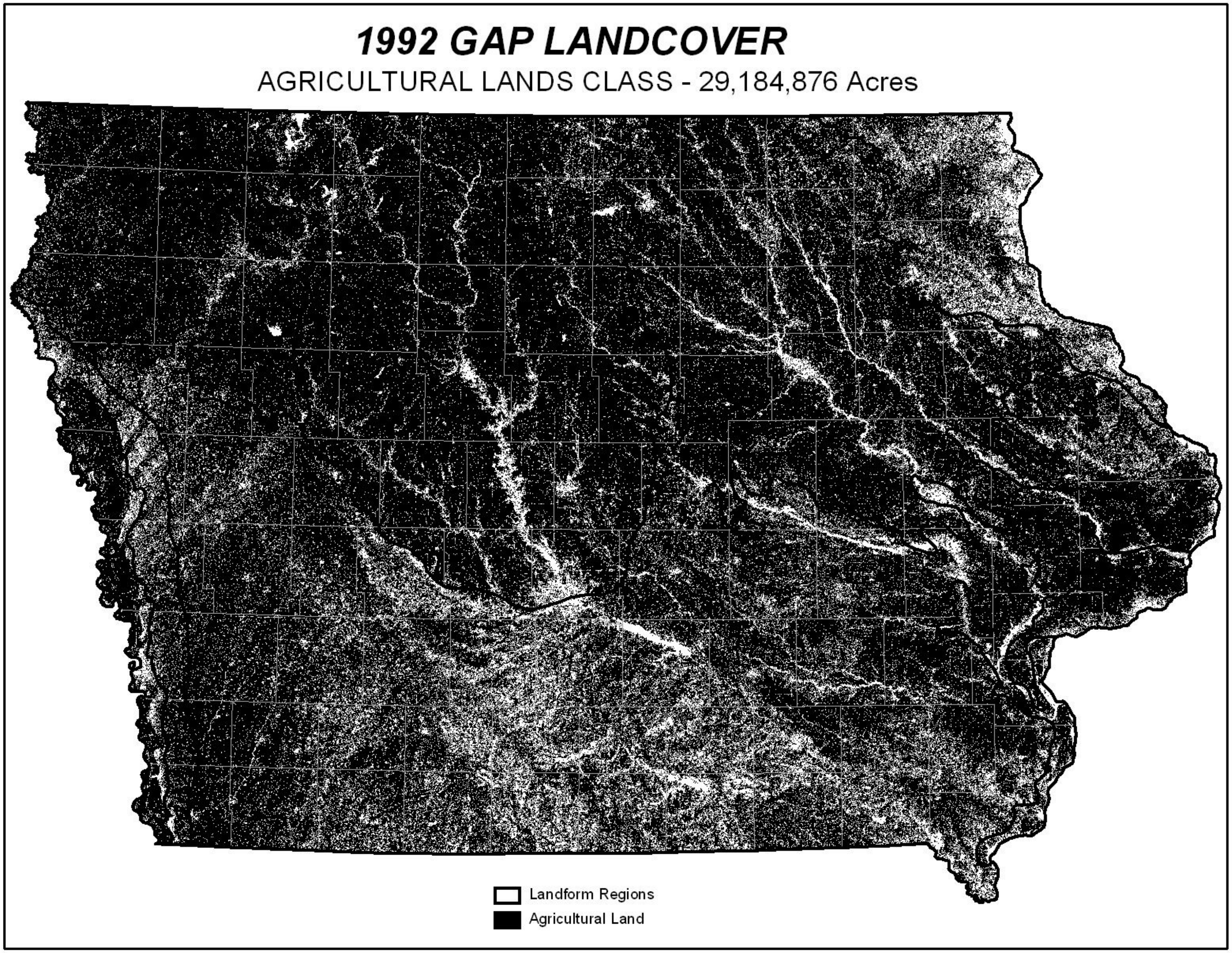
Map 4-7 Warm Season Herbaceous Land Cover



Map 4-8. Savanna Land Cover



Map 4-9. Agricultural Land Cover.



Aquatic Habitat Classes

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

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

Aquatic Habitat	Description
River	Large flowing bodies of water, normally with permanent flow and draining over 100 square miles.
Stream	Smaller flowing bodies of water, normally permanent, that serve as tributaries to rivers and drain less than 100 square miles.
Creek	Even smaller flowing stretches, often intermittent and ephemeral, that flow into streams
On-stream Impoundment	Slowly flowing bodies of water formed from artificial damming of a river, creek or stream, generally less than 500 acres in size and having a watershed to lake ratio >200:1.
Backwater	Slow flowing bodies of water associated with larger river systems. Back-channel low-lying areas filled with water during high flow events but may be completely isolated from the river during low flow and may exhibit no flow during these periods. They are especially prevalent on the Mississippi River.
Oxbow	A sub-class of backwaters, they are water bodies formed in old river channels that are now cut off from the main channel and flow of a river
Lake	Large bodies of water exhibiting little or no flow with emergent vegetation over less than 25% of the surface area. They may be either natural or constructed.
Shallow lake	Open freshwater systems where maximum depth is less than 10 feet. Normally in a permanent open water state due to the altered hydrology of watersheds and unmanaged outlet structures that maintain artificially high water levels. May be fringed by a border of emergent vegetation in water depths less than 6 feet. When clear, they are dominated by emergent and submergent vegetation.
Pond	Smaller standing bodies of water, often exhibiting large swings in dissolved oxygen and water temperatures and generally less than 10 acres in size

Natural lakes are most common in the NW Iowa Plains and the Des Moines lobe (Table 4-5). Thirty-one major natural lakes with a combined surface area of almost 29,000 acres and 17 marsh-like shallow lakes with over 3,000 acres of combined surface area are still present in Iowa in spite of the extensive drainage of the past 150 years.

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

Constructed lakes include recreational lakes, municipal water supplies, river impoundments and surface mine lakes. These are generally small - less than one-fourth are over 100 acres. More than 200 man-made dams on rivers, streams and creeks impound from 15 acres to 19,000 acres. Four Corps of Engineers flood control reservoirs on the Des Moines river (Saylorville and Red Rock reservoirs), the Iowa river (Coralville Reservoir) and the Chariton river (Rathbun Reservoir) are the largest.

There are more than 87,000 ponds statewide. Most are in the Southern Iowa Drift Plain south of Iowa Highway 92. Ponds are generally less than 10 acres. An estimated 53% of Iowa's surface water area is in private ownership, and that vast majority of that acreage is in farm ponds.

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

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

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

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

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

Map 4-10. Major Lakes and River Systems of Iowa (Source: Iowa DNR)

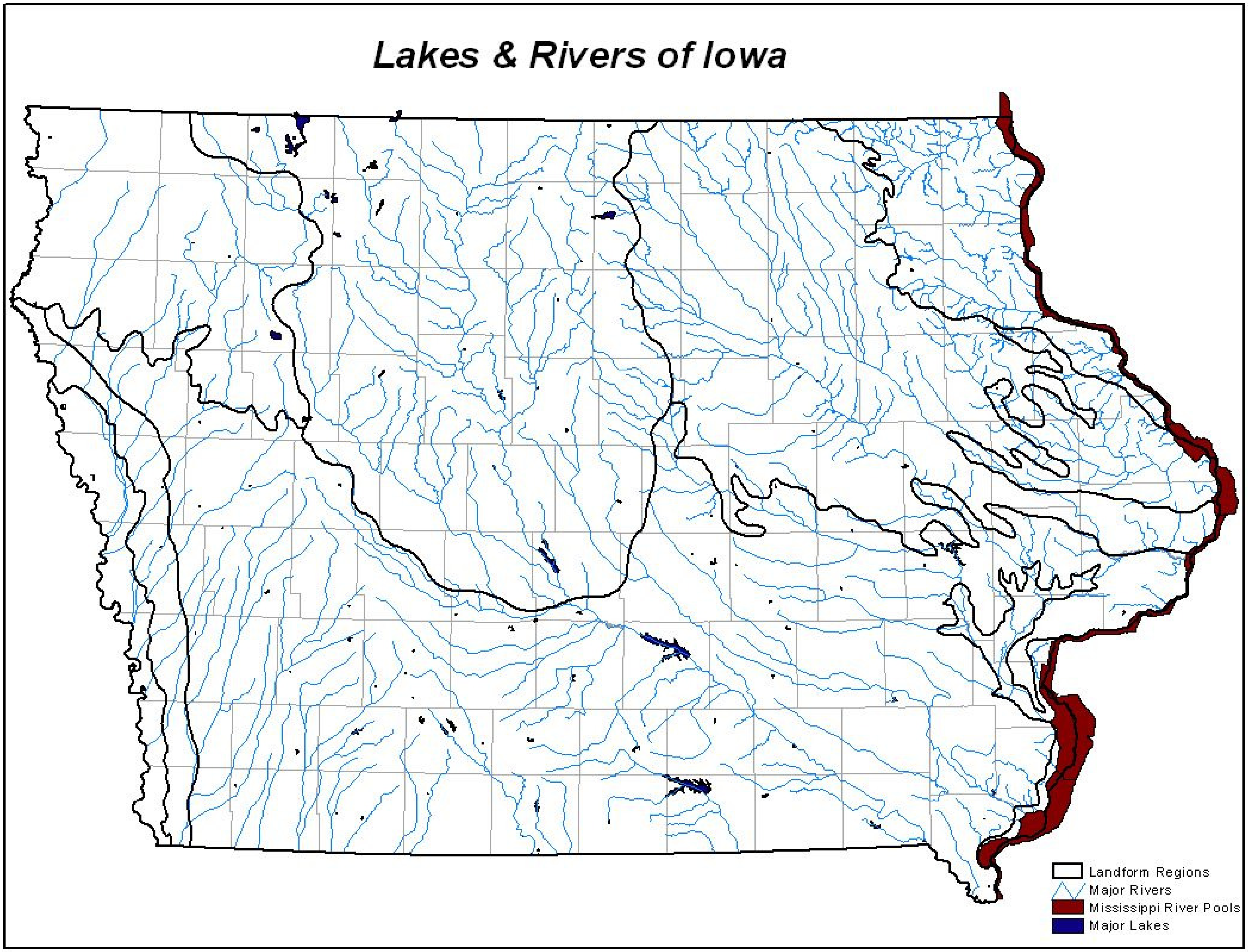


Table 4-5. Lake types by landform.

Landform	Shallow Natural Lake	Deep Natural Lake	Constructed Lake	Oxbow	Back-water	Pond	Reservoir	Impoundment	Surface Mines
Des Moines Lobe	23-8,996	14-21,217	10-2,045			32-72	1-5,400	9-2	39-600
Iowan Surface			9-770	14-94	1-5	27-84		28-616	32-599
Loess Hills			5-98			7-25			4-4
Miss. Alluvial Plain				3-22	5-3,275	6-9			
Mo. Alluvial Plain			6-218	8-3,089		3-5			6-96
NW Iowa Plains		1-3,097	5-147			7-24			22-184
Paleozoic Plateau			3-245		7-200	7-16		3-3	2-12
S. IA. Drift Plain		1-134	113-14,336	7-67	23-901	135-384	3-26,680	9-470	20-605
TOTALS	23-8,996	16-24,448	151-17,859	32-3,272	36-4,381	224-619	4-32,080	49-1,091	125-2,100

More detailed maps of Iowa lakes and rivers by region are shown in Appendix 18 as Maps 18-1 to 18-8. Rivers and streams were taken from the Environmental Protection Agency's National Hydrologic Dataset and the lake information from the Iowa Public Lakes Dataset (J. Kopaska, IDNR Fisheries Bureau). The Public Lakes Dataset lake types differ somewhat from the aquatic class definitions listed above, but the maps provide a valuable picture of the extent and distribution of these aquatic systems in Iowa. Table 4-5 provides a summary of the lake data shown on these maps.

Habitat Preferences of SGCN

The Working Groups assigned each SGCN to a habitat class or classes. Aspects of each species' biology and behavior complicated this process. Some are generalists and can occupy a variety of habitats; others have very narrow habitat tolerances. Some species require different habitats at different stages in their life cycles, at different seasons of the year or at different times of the day. Working Groups identified those habitats that were considered to be the most critical or limiting to the species distribution and abundance in Iowa. Habitat preferences are taken from the existing literature and do not necessarily include all of the terrestrial and aquatic habitat classes listed in this Plan. Habitat preferences for individual SGCN are found in Appendix 14.

SGCN with common habitat preferences were then grouped into the 9 terrestrial and 8 aquatic habitat classes. Species with more than one critical habitat were listed in each class so more than the 297 SGCN appear in comparisons between habitats. Groupings of SGCN by habitat class give a very general overview useful only for identifying habitat protection or restoration priorities at the landscape level. Detailed habitat management plans for SGCN must consider their entire individual habitat needs. Individual SGCN grouped into habitat classes are listed in Appendix 15.

SGCN were found in all of the terrestrial and aquatic habitats in Iowa (Table 4-6). Flowing water aquatic habitats had the greatest number of SGCN of any habitat class, followed by herbaceous wetlands. The number of aquatic SGCN nearly equals the number of terrestrial species, yet surface water covers just 1% of Iowa. (If wetlands were included with aquatic habitats instead of terrestrial, aquatic habitats would have the most SGCN.) Aquatic and semi-aquatic species had the highest percentage of their species listed as SGCN (Table 3-11).

Herbaceous wetlands had the greatest number of SGCN of any terrestrial habitat class. Wooded habitats contained the greatest number when classes were combined into more easily identified categories. Grasslands, wetlands and agricultural lands followed in declining order.

Table 4-6. Summary of Habitat Preferences of SGCN by Habitat Class (updated in 2012).

	Taxonomic Class								
Habitat Class	Birds	Mammals	Reptiles & Amphibians	Butterflies	Land Snails	Dragonflies & Damselflies	Fish	Mussels	Total
Terrestrial Habitat Classes	**166**	**43**	**76**	**58**	**8**	**8**	**0**	**0**	**359**
Wooded	**73**	**22**	**23**	**22**	**8**	**1**	**0**	**0**	**149**
Forests	25	11	3	6	8	0	0	0	53
Wet Forests/Woodlands	18	4	7	0	0	1	0	0	31
Woodlands	17	5	12	9	0	0	0	0	49
Shrubland	13	2	1	0	0		0	0	16
Wetlands	**39**	**3**	**17**	**7**	**0**	**7**	**0**	**0**	**72**
Wet Shrubland	4	0	4	0	0	0	0	0	8
Herbaceous Wetlands	35	3	13	7	0	7	0	0	64
Grasslands	**30**	**14**	**26**	**12**	**0**	**0**	**0**	**0**	**89**
Warm Season Herbaceous	22	9	18	10	0	0	0	0	64
Savanna	8	5	8	2	0	0	0	0	25
Agricultural Lands	**24**	**4**	**10**	**11**	**0**	**0**	**0**	**0**	**49**
Aquatic Habitat Classes	**0**	**0**	**23**	**0**	**0**	**36**	**139**	**41**	**239**
River	0	0	4	0	0	3	46	19	72
Stream	0	0	4	0	0	5	17	7	33
Creek	0	0	1	0	0	3	24	5	33
Impoundment	0	0	2	0	0	0	9	1	12
Backwater	0	0	6	0	0	3	19	1	29
Lake	0	0	2	0	0	8	19	4	33
Pond	0	0	4	0	0	14	5	4	27
Total	**166**	**43**	**99**	**58**	**8**	**44**	**139**	**41**	**598**

Priorities for Habitat Protection

It is tempting to establish priorities for protecting SGCN and their habitats based on their numerical order in Table 4-6 i.e. the habitats with the most SGCN should receive the highest priority for protection. There are several factors that argue against taking only that approach:

- Agricultural lands make up an overwhelming proportion of the state and have the lowest number of SGCN. Row crops and pastures have very little vegetative and wildlife diversity, however, and they appeal to generalist species that can survive in small blocks of associated habitat. The low number of SGCN found in agricultural lands likely reflects their general unattractiveness to wildlife.

- The amount of native prairie remaining in the state is usually listed as 30,000 acres, most in extremely small and scattered plots. Pasture in Iowa has historically been grazed so heavily that habitat remains only for species attracted to short and sparse grasslands. Anecdotal evidence indicates that as cattle husbandry has shifted to confinement operations at least some pastures are now lightly grazed. No quantitative estimates are available.

- Most CRP lands in Iowa are planted to cool season grasses that provide habitat for some SGCN but not the full array that would be found in a like acreage of native prairie. History suggests that the CRP program, like past U.S. Department of Agriculture land retirement programs, will eventually end and those grasslands will revert to row crops.

- Most ungrazed grasslands are road ditches planted to a variety of cool season grasses that are mowed frequently during the nesting season. Only habitat generalists like meadowlarks and red-winged blackbirds are attracted to these habitats.

Most of the grassland SGCN are habitat specialists that evolved in vast expanses of native prairie. They were adapted to a diversity of vegetative conditions ranging from bare ground following new burns to dense littler layers and shrubby invasions after years without burning or grazing. Few of Iowa's current grasslands meet those criteria.

Wooded lands probably provide the greatest amount of somewhat-natural wildlife habitat of any of the broad habitat categories, yet they have the greatest number of SGCN. The remnant timber stands of the 1970's are in the process of developing into mature forests. Some have changed character from oak-dominated to more shade-intolerant species like sugar maple, particularly in the Paleozoic Plateau. These older stands provide habitat for species adapted to late successional stages. At the same time, a million acres of recently grazed pasture is reverting to early successional forest. There may simply be a wider range of habitat niches available in wooded habitats that are attracting a greater diversity of wildlife. Forest-dwelling migratory birds may be imperiled in some other part of their range and thus are on the list of SGCN. On the other hand, the issues of fragmentation, habitat block size and the degraded quality of many of Iowa's wooded habitats make it difficult to know if they are productive habitats or are merely population sinks.

Setting priorities for conserving wildlife habitats is thus affected by all these factors:

- The general lack of all wildlife habitat in Iowa;
- The lack of specific knowledge on the distribution and abundance of most SGCN;
- The presence of SGCN in all terrestrial and aquatic habitats;
- The difficulties in identifying habitat quality.

Given these conditions, the best approach may be to accept that all wildlife habitats in Iowa that support SGCN have been greatly reduced and all are imperiled to some extent by land use decisions. Efforts to preserve SGCN should address all species in all habitats.

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 IWAP. **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.

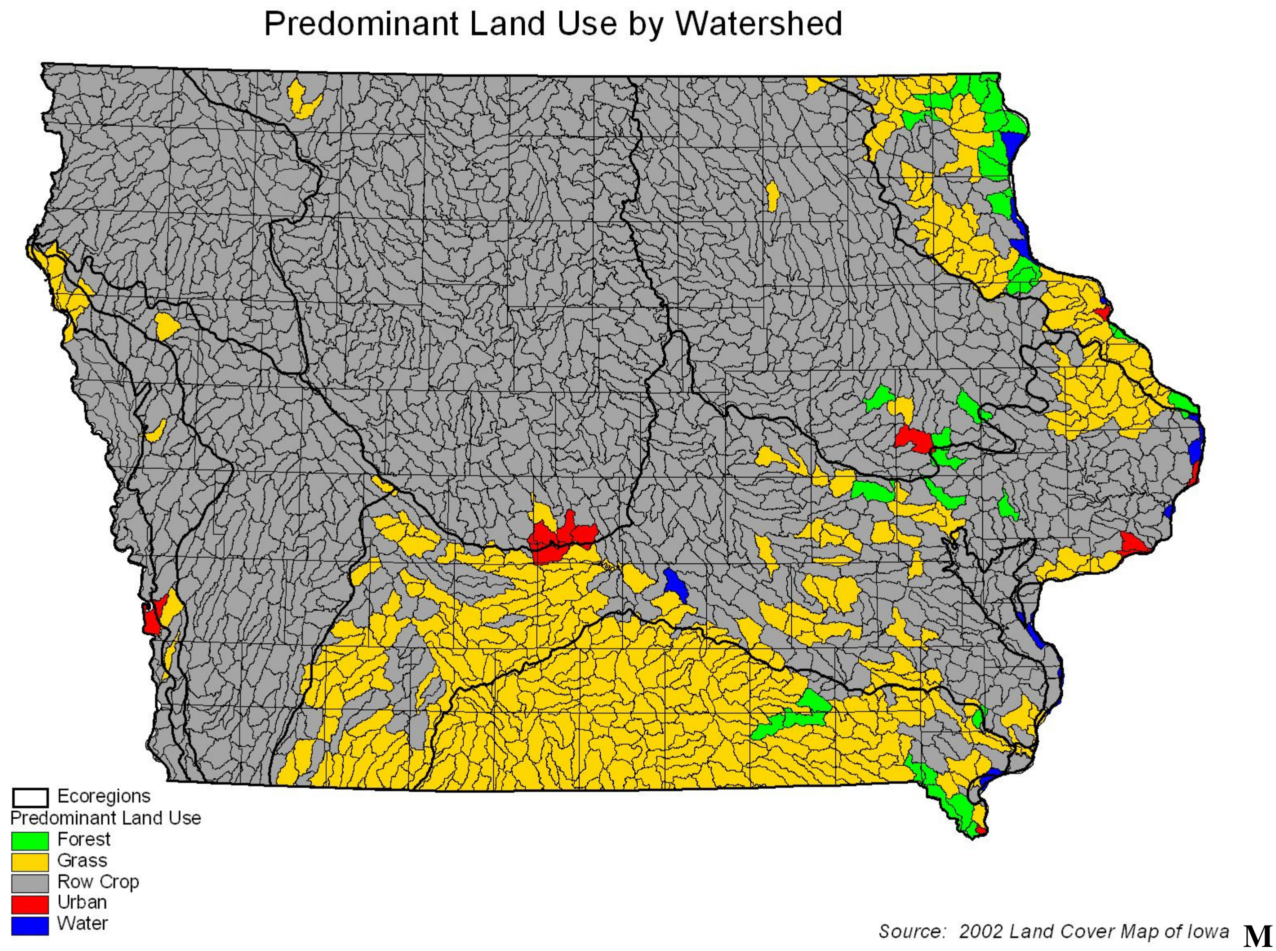
Most of these stresses are caused by altered hydrology throughout the State of Iowa. Tiling, loss of wetlands, stream channelization, and other factors have increased the volume and velocity of water in streams and rivers. This has lead to increased bank erosion, loss of aquatic vegetation, and loss 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										

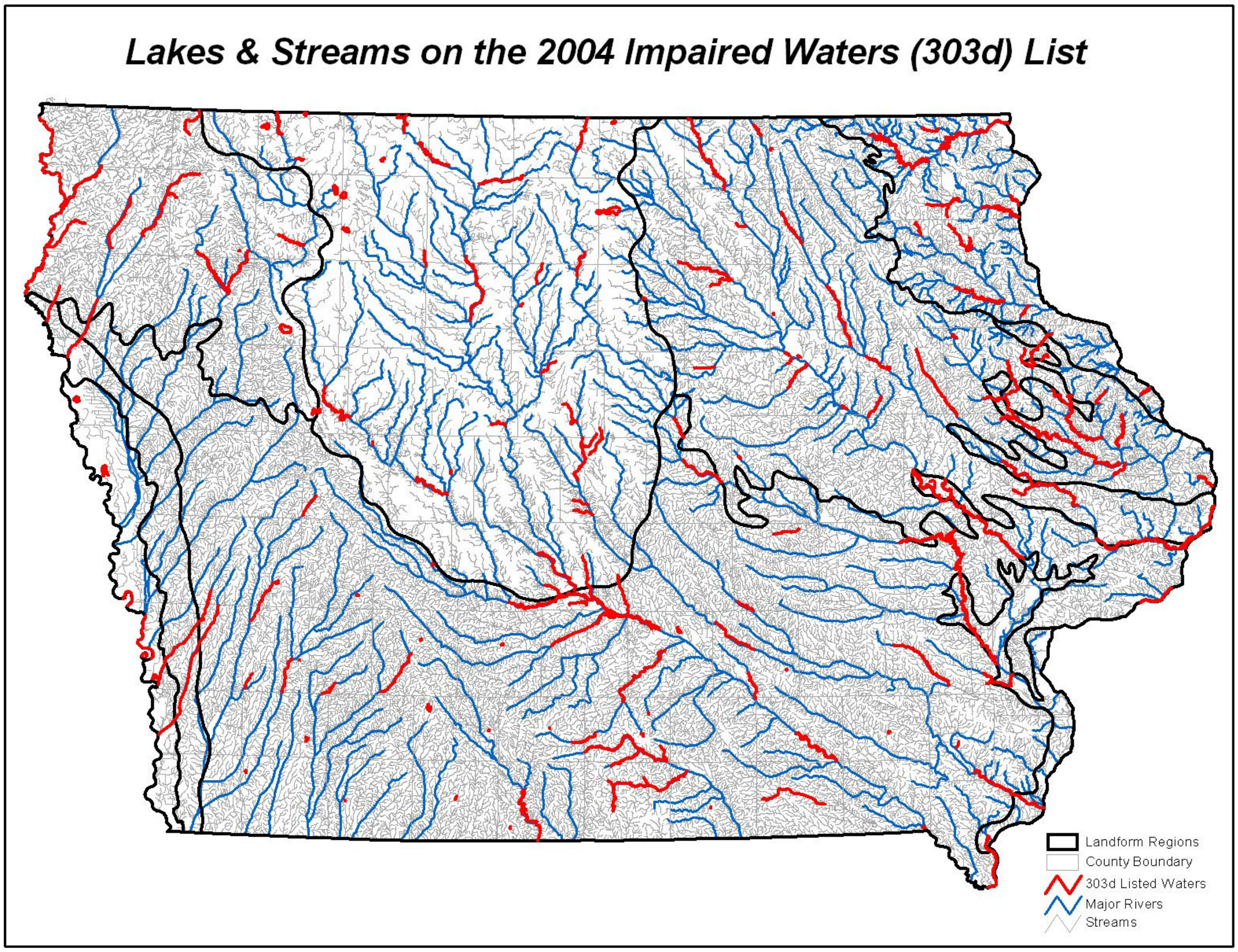
Map 5-1. Predominant Land Use by Watershed



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 *impaired 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 5-2. 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 IWAP (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 IWAP 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.)