SECURING A FUTURE FOR

FISH AND WILDLIFE

A Conservation Legacy for Iowans

THE IOWA WILDLIFE ACTION PLAN

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STATE OF IOWA

THOMAS J. VILSACK, GOVERNOR
SALLY J. PEDERSON, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
JEFFREY R. VONK, DIRECTOR

September 9, 2005

Dear Iowans:

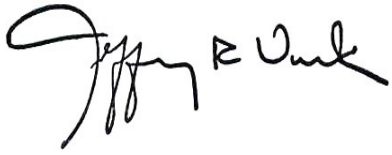
This document - *The Iowa Comprehensive Wildlife Conservation Plan* - is a guide for the conservation of Iowa's wildlife for the next 25 years. Two years in the making, it is the product of a cooperative effort between more than 100 professional fish and wildlife biologists, educators, land managers and concerned citizens who provided the guidance and information essential to its development.

This is Iowa's first truly comprehensive plan designed to aid all wildlife - from birds to freshwater mussels and fish to butterflies. Fully one-third of Iowa's native fish and wildlife is declining rapidly as a result of habitat loss and declining water quality. This plan will improve the status of these declining species and at the same time benefit common wildlife that we all know and enjoy.

This is a habitat-oriented plan that when completed will double the amount of permanently protected wildlife habitat in the state. It will help preserve Iowa's precious wildlife heritage, provide recreation benefits to our citizens, improve our quality of life and increase the economic activity from bird watching, hiking, nature photography, fishing, hunting and many other wildlife-associated activities..

When you read the plan I hope you will share my excitement for the potential it expresses for fish and wildlife and the citizens that enjoy them. Please join me in enthusiastically endorsing this plan and support the funding necessary to see that it becomes a reality.

Sincerely,



Jeffrey R. Vonk
Director

Foreword from the Steering Committee

In October 2003, the Iowa Department of Natural Resources (IDNR) assembled the nucleus of a steering committee to develop a Comprehensive Wildlife Conservation Plan for Iowa. The thought of creating such a plan was daunting. We were charged with developing a plan that would surpass anything ever prepared for the conservation of Iowa's wildlife. A comprehensive review of the status and needs of *all* of Iowa's wildlife had never been attempted. The Iowa Board of Conservation, drawing on the work of Aldo Leopold, created *The Iowa Twenty-five Year Conservation Plan* for game species in 1933. That plan did not begin to address the status of, stresses to, or needs of all the great diversity of vertebrate and invertebrate wildlife. Game species management plans have been used by IDNR for years, but the only other wildlife plans developed in Iowa were restoration plans for selected individual species or for rare and endangered habitats.

We committee members represent the IDNR, non-governmental conservation organizations, academia, and private enterprise. All have some special expertise and a special interest in the future of Iowa's wildlife. We recognized from the start that this plan must be useful not just to IDNR, but to every individual and organization concerned about wildlife in Iowa.

To help us with this monumental task we added members and assembled working teams of specialists to deal with various faunal groups and other pertinent issues. Work teams coordinated with the Plan Author, Plan Coordinator, and Steering Committee Chair to provide species lists and environmental stresses, review draft chapters, and assist with a public Advisory Group meeting held in July, 2004.

We want this document to become more than just another plan to put on a shelf and ignore. It is our greatest wish that it will become the Iowa Wildlife Action Plan—a living document that can updated and used to help guide wildlife management in Iowa for many years. The steering committee hopes you may find this prospect as exciting as we do.

Douglas C. Harr	Terry W. Little	James J. Zohrer
Steering Committee Chair	Plan Coordinator	Plan Author

The Steering Committee:

Todd Bishop *Iowa DNR*	Kim Bogenschutz *Iowa DNR*	Don Brazelton *IACCB*
Angi Bruce *Iowa DNR*	Dave DeGeus *The Nature Consercancy*	James J. Dinsmore *ISU (ret.)*
Bruce Ehresman *Iowa DNR*	Marlene Ehresman *INHF*	Dale Garner *Iowa DNR*
Barb Gigar *Iowa DNR*	Daryl Howell *Iowa DNR*	Karen Kinkead *ISU*
Erwin Klaas *ISU (ret.)*	Monica Ulman *Iowa DNR*	Terry VanDeWalle *Earth Tech, Inc.*
Michelle Wilson *Iowa DNR*	Ric Zarwell *Iowa Audubon*	Guy Zenner *Iowa DNR*

Acknowledgements

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

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

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

U.S. Fish and Wildlife Service employees Michael Sweet and Dr. John Christian provided helpful comments on an earlier version of the Plan. Mike Sweet interpreted Federal planning guidelines, assisted with administrative issues and provided contact and resource information that made the entire planning process easier.

Thirty individuals provided comments on the first complete review draft of the Plan. Dr. James Dinsmore (Iowa State University, retired), Jeff Lerner (Defenders of Wildlife), Jim Munson (U.S. Fish and Wildlife Service) and Jeff Kopaska (IDNR Fisheries Bureau) provided especially thoughtful reviews.

DNR employee Kerri Wells designed the cover.

Dr. Terry Little and Doug Harr edited and compiled the final document.

James Zohrer
Plan Author
E Resources Group

Chapter One

Introduction, Purpose and Process

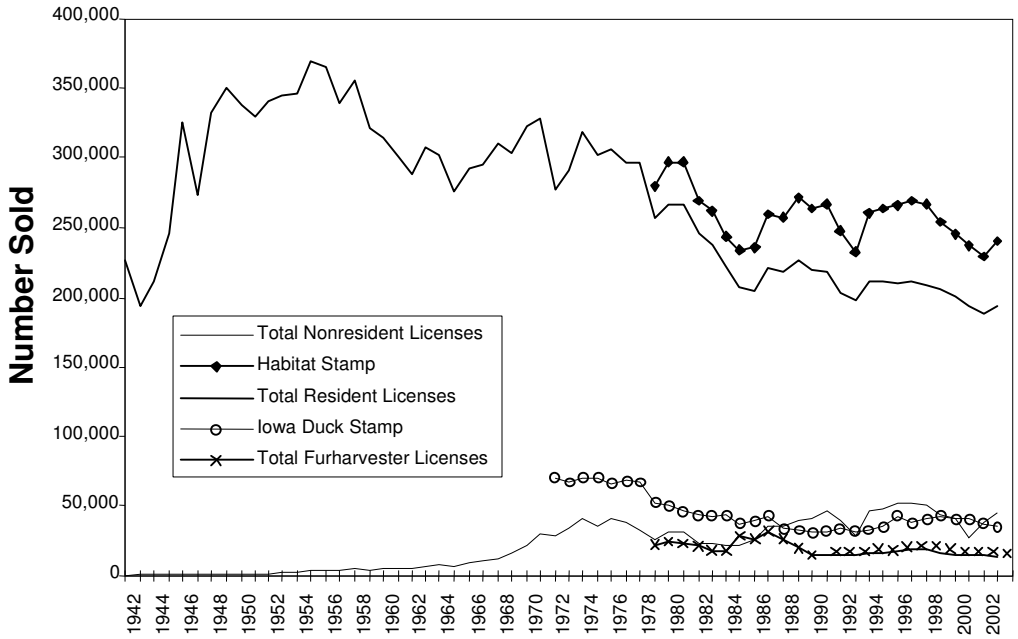
Introduction

Fish and wildlife conservation programs in Iowa have been funded nearly entirely from license fees paid by hunters and anglers and by Federal excise taxes collected on hunting and fishing equipment. Iowa Department of Natural Resources (IDNR) conservation efforts have historically featured game animals in spite of the fact that just 147 of the 999 species addressed in this plan are hunted, fished or trapped. Wildlife professionals have long recognized that nongame wildlife (animals that are not fished, hunted or trapped) is an important component of natural ecosystems and that their status is often an indicator of general environmental health. IDNR has been involved for 25 years in the restoration of charismatic nongame like river otters, Trumpeter swans, peregrine falcons and others (See Chapter 2) in an attempt to generate a broader funding base for nongame programs. Without a dedicated funding source, however, most nongame species have benefited only from game-oriented programs that have coincidentally restored or improved habitat for a wide range of species.

The number of hunting licenses sold in Iowa has declined 45 percent over the last 60 years (Figure 1-1) and fishing license sales are decreasing at 1 percent annually. This decline in field sports has been blamed on the rural-to-urban migration of the past century and to competition for citizen's time in our increasingly busy, technology-driven lives. Whatever the reason, this decline in license buyers foretells a potential drop in financial support for wildlife programs if the trends continue. Increases in license fees and the growth of deer and turkey hunting have increased IDNR revenues and masked this erosion in underlying support. Evidence suggests this growth has stabilized and is likely to decrease as baby boomers reach retirement, and probable retirement from hunting and angling. The funding available to maintain wildlife programs into the future could be very much in jeopardy unless alternate sources of funding are found.

Significant national efforts to find funding for nongame wildlife programs began during the last quarter of the 20th century. Congress passed the Nongame Act in 1980 to appropriate funds to the states for nongame management. In 1981 the Iowa legislature initiated a state income tax check-off (Chickadee Checkoff) to provide matching funds for anticipated Federal grants. The Nongame Act was never funded, however, and check-off funds have never been adequate to address the many needs of nongame species. Currently the Chickadee Check-off generates approximately $150,000 annually, compared to $30 million generated by hunters and anglers.

Figure 1-1. Sales of Iowa hunting licenses



In 1989 the International Association of Fish and Wildlife Agencies began a nationwide campaign to develop stable, sufficient, long-term funding for nongame programs. *Teaming With Wildlife* rallied state and territorial fish and wildlife agencies to develop grassroots coalitions of nongame enthusiasts that would lobby Congress for funds. The proposed funding mechanism was a Federal excise tax on nongame-related materials and equipment that would have been apportioned to the states in the same manner as the taxes collected on hunting and angling equipment. This effort was opposed by the outdoor recreation industry and failed to gain support in Congress.

The *Conservation and Reinvestment Act* (*CARA*) was proposed in 1996 as a second attempt to find funding for nongame. Offshore oil and gas lease funds would be permanently redirected from the Federal treasury to state accounts that would have paid for a variety of wildlife, cultural and environmental protection programs. CARA would have generated $350 million nationwide annually for wildlife; $4.5 million would have been Iowa's share. CARA passed in the House of Representatives and had widespread support and momentum in the Senate when the terrorist activities of September 11, 2001, redirected Federal budget priorities. Permanent funding failed to pass, but the *Wildlife Conservation and Restoration Program (WCRP)* was enacted as a one-time appropriation for state nongame programs. Similar acts titled *State and Tribal Wildlife Grants (SWG)* have been passed annually since then. These grants

have required non-federal matching funds that vary from 25% to 50% depending on the year and type of program.

Purpose

As a condition of receiving SWG funds, Congress has mandated that state fish and wildlife agencies develop a *Comprehensive Wildlife Conservation Plan* (Plan) by October 1, 2005. The Plan must include eight required elements:

1. Information on the distribution and abundance of wildlife that IDNR deems to be indicative of the diversity and health of Iowa's wildlife. Low and declining populations of fish and wildlife are defined in the Plan as Species of Greatest Conservation Need (SGCN)

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

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

4. Conservation actions necessary to conserve SGCN and their habitats and priorities for implementing such actions.

5. Plans for monitoring SGCN and their habitats, for monitoring the effectiveness of conservation actions, and for adapting these conservation actions to new information or changing conditions.

6. Procedures to review the Plan at intervals not to exceed ten years.

7. Plans for coordinating, to the extent feasible, the development, implementation, review, and revision of conservation actions with Federal, state, and local agencies that manage significant land and water areas in Iowa, or administer programs that significantly affect the conservation of SGCN and their habitats.

8. Descriptions of public participation in the development, revision, and implementation of the plan.

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

The Planning Process

Steering Committee. Responsibility for developing the IWAP was vested by Congress in the Iowa IDNR, and by the IDNR in the department's Wildlife Bureau. To be sure that the Plan had the widest possible acceptance, the bureau identified a Steering Committee composed of employees and volunteers from government and nongovernmental conservation organizations (NGOs), educational institutions and the private sector (Table 1-1). Steering Committee members had demonstrated expertise in the many disciplines necessary for developing a Plan of this magnitude.

The Steering Committee developed a planning schedule with milestones, selected a plan author and assigned responsibilities for accomplishing specific tasks (Appendix 1). The first step was to describe the distribution and abundance of wildlife, identify SGCN and their habitats, and identify problems affecting them. Thirteen Working Groups led by steering committee members performed this time-consuming work (Table 1-2). These Plan elements are contained in the chapters 2 - 5 of this Plan titled *Iowa's Fish and Wildlife and Their Habitats - History and Status In 2005*

To provide a focus for the planning efforts, the steering committee made the following decisions:

- The IWAP would be a wildlife plan. Plants are not specifically discussed except in habitat-related sections.

- The IWAP would have a 25-year focus. Long-term continuity was needed to accomplish ambitious objectives, but achievements needed to be accomplished in a time frame that could be appreciated by Plan supporters.

- The IWAP would be strategic in nature. Operational plans to implement its vision and strategies would be crafted later to fit the unique missions and capabilities of conservation organizations and individuals interested in implementing them.

Much of the work undertaken by the Steering Committee and Working Groups was conducted through e-mail, regular mail and the telephone. Steering Committee meetings were held to coordinate Plan development, team updates, status reports, reviews and other activities (Table 1-3).

Table 1-1. IWAP Steering Committee

Name	Title	Affiliation	Plan Responsibilities
Richard Bishop	Wildlife Bureau Chief Retired 9/04	IDNR	Plan Director
Dr. Dale Garner	Wildlife Bureau Chief Effective 9/04	IDNR	Plan Director
Dr. Terry Little	Wildlife Research and Wildlife Diversity Supervisor	IDNR	Plan Coordinator
Doug Harr	Wildlife Diversity Program Manager	IDNR	Steering Committee Chair
Todd Bishop	GIS Systems Supervisor	IDNR	GIS data
Don Brazelton	Executive Secretary	Iowa Association of County Conservation Boards	County Conservation Boards - funding - legislation
Kim Bogenschutz	Fisheries Biologist	IDNR	Aquatics (fish and invertebrates)
David DeGeus	Director of Conservation Programs	The Nature Conservancy	TNC input and NGO's
Bruce Ehresman	Wildlife Diversity Biologist	IDNR	Birds, wildlife diversity programs
Marlene Ehresman	Program/Planning Associate	Iowa Natural Heritage Foundation	Landscapes and habitats
Dale Garner (Replaced by Guy Zenner) 11/04	Executive Officer Waterfowl Biologist	IDNR	Federal plan coordination
Angi Bruce	Wildlife District Supervisor	IDNR	Wildlife management and private lands
Daryl Howell	Senior Environmental Specialist	IDNR	T & E species and small mammals
Dr. Ervin Klaas	Professor Emeritus	Iowa State University	GAP, mammals, terrestrial invertebrates
Terry VanDeWalle	Biologist	EarthTech, Inc.	Reptiles and Amphibians
Ric Zarwell	Important Bird Area Coordinator	Audubon	Birds
Monica Ulman	GIS Specialist	IDNR	GIS data and mapping

Table 1-2. IWAP Steering Committee Working Groups

Working Group Leaders	Responsibilities	Others Having Initial Input
Dr. Terry Little	Game Species	Todd Bogenschutz - IDNR Peter Fritzell - IDNR
Daryl Howell and Dr. Ervin Klaas	Mammals	Dr. John Bowles, Professor Emeritus, Central College
Kim Bogenschutz	Fish and Mussels	Daryl Howell John Olson - IDNR, Environmental Specialist Tom Wilton - IDNR, Environmental Specialist Kelly Poole - IDOT, Aquatic Ecologist Scott Gritters - IDNR, Fisheries Biologist
Bruce Ehresman	Birds	Dr. James Dinsmore, Professor Emeritus, ISU Ric Zarwell Doug Harr Robert Cecil - Author, Iowa Ornithologists Union (IOU) Ann Johnson - IOU Darwin Koenig - Author Bob Russell - U.S. Fish and Wildlife Service
Terry VanDeWalle	Reptiles and Amphibians	Dr. J.L. Christiansen -Professor, Drake University
Daryl Howell	Butterflies	Jerry Selby - Private Consultant Dr. Diane Debinski - Professor, ISU
Daryl Howell	Land Snails	
Dr. Erv Klaas	Dragonflies and Damselflies	Ann Johnson - IOU
Dr. Erv Klaas	GAP	Kevin Kane - ISU
Todd Bishop	GIS	Monica Ulman
Barb Gigar Michelle Wilson	Education and Recreation	IDNR Fisheries Education IDNR Planning and Coordination
Dr. Karen Kinkead	Monitoring and Evaluation	Dr. Erv Klaas, Bruce Ehresman, Kim Bogenschutz, David DeGeus
Angi Bruce	Management and Habitat	Brent Olson -IDNR Forestry Scott Moats - TNC Kevin Pape - IDNR Parks Monica Ulman - IDNR - Wildlife Kelly Smith - IDNR - Wildlife Dan Cohen - Buchanan CCB Tom Gengerke - IDNR - Fisheries Joe Boyles - Polk CCB Marlene Ehresman

Table 1-3. Iowa Steering Committee Meetings

2003	2004	2005
July 1, 2003	February 5, 2004	January 18, 2005
October 23, 2003	April 27, 2004	April 6, 2005
December 3, 2003	August 10, 2004	
	September 21, 2004	
	November 9, 2004	

Advisory Group. To assure the Plan would involve a diversity of conservation viewpoints, representatives of 105 conservation, recreation, education and agricultural support organizations were invited to serve on a formal Advisory Group; 93 individuals representing 59 organizations agreed to participate (Appendix 2-1).

The Advisory Group met in Des Moines on July 17, 2004. The purpose of the meeting was to develop a vision for the IWAP and strategies for attaining that vision by the year 2030. The Advisory Group was updated on the planning process and the status of wildlife and their habitats in Iowa (Appendices 2-2 and 2-3). The large group then broke into eight focus groups and developed vision elements and conservation actions (Appendices 2-3 and 2-4). When condensed by the steering committee, these vision elements and conservation actions form the basis for the second part of this Plan - the *Iowa Conservation Action Plan* (ICWAP)(Chapters 6 - 10).

Stresses. The steering committee and fisheries and wildlife research and management biologists from the IDNR identified stresses affecting Iowa's wildlife in each of 8 major landform regions. Terrestrial and aquatic stresses were evaluated and ranked for each of the major taxonomic classes included in the Plan (Chapter 5 and Appendices 16 and 17).

Other planning. To complete the Plan, new Working Groups (Table 1-2) were formed by the steering committee to develop priorities for research and monitoring needs, identify priorities for conservation actions and site specific opportunities for Plan implementation, and develop education and recreation strategies.

One of the key factors identified during the process of determining the SGCN was the lack of current, credible information on the distribution and abundance of many nongame species. Iowa GAP provides habitat-based distribution information, but much of the information used in GAP models is old or anecdotal - little is based on formal wildlife surveys. A new Working Group identified research and monitoring needs and proposed a model for statewide evaluation of wildlife populations as the Plan is implemented (Chapter 7).

A Working Group utilized information from Iowa GAP and DNR GIS coverage maps to identify regions of the state with the greatest potential for protection of key habitats (Chapter 8). These maps also indicate regions where habitat is lacking and restoration programs are needed to improve wildlife populations.

Two additional required Plan elements are priorities for implementing conservation actions and plans for coordination and review. These are covered in Chapters 8 and 9, respectively.

Estimated costs for implementing the IWAP are presented in Chapter 10.

Public participation. Persons with much of the ecological and conservation expertise existing in the state were included in various stages of the planning process, either as formal participants or consultants and reviewers on specific portions of the IWAP. A variety of efforts were made to ensure that information about the Plan received statewide distribution to the public as well:

- A popular article - *Iowa Wildlife Species of Greatest Conservation Need* - was published in the January/February 2005 issue of the *Iowa Conservationist* magazine. The *Conservationist* has a circulation of 25,000 including every school and public library in the state, and a readership of 100,000 individuals.

- A section on the IDNR's Wildlife Diversity web site provided an overview of the IWAP.

- From March 2004 through June 2005, 20 formal presentations were given on the Plan that reached approximately 1,500 individuals. These included IDNR staff, affiliated conservation agencies, NGOs and professional wildlife groups throughout the state.

The first complete draft of the IWAP was finished in April 2005, and was made available to the public in several ways:

- A complete draft and executive summary were placed on the IDNR's web site with email links to a post office that received comments.

- Paper copies or a CD were supplied to readers upon request.

- Notice was sent directly to the 165 individuals representing 92 different organizations that were invited to the Advisory Group meeting (Appendix 2).

- Statewide news releases advertised completion of the Plan, where it was available and how to comment.

- The public comment period for the draft IWAP was held from May 1st through June 10th, 2005. A total of 30 written comments were received and incorporated in whole or part into the final version of the Plan.

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

IOWA'S FISH AND WILDLIFE

AND THEIR HABITATS

HISTORY AND STATUS IN 2005

CHAPTER TWO

THE STATE OF IOWA'S NATURAL COMMUNITIES

Physiography

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

Climate. Iowa's climate is classified as humid continental and is characterized by warm summers and cold winters. A small portion of northern and northeastern Iowa are in the cool - summer subtype (Hillaker 1993). The average temperature in the summer ranges from 71 degrees F in the north to 73 degrees in the south part of the state. December to February winter temperatures average 22 degrees with an average winter difference of 6.5 degrees between north and south. Temperature minimums of -25 degrees F are not uncommon in northern Iowa.

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

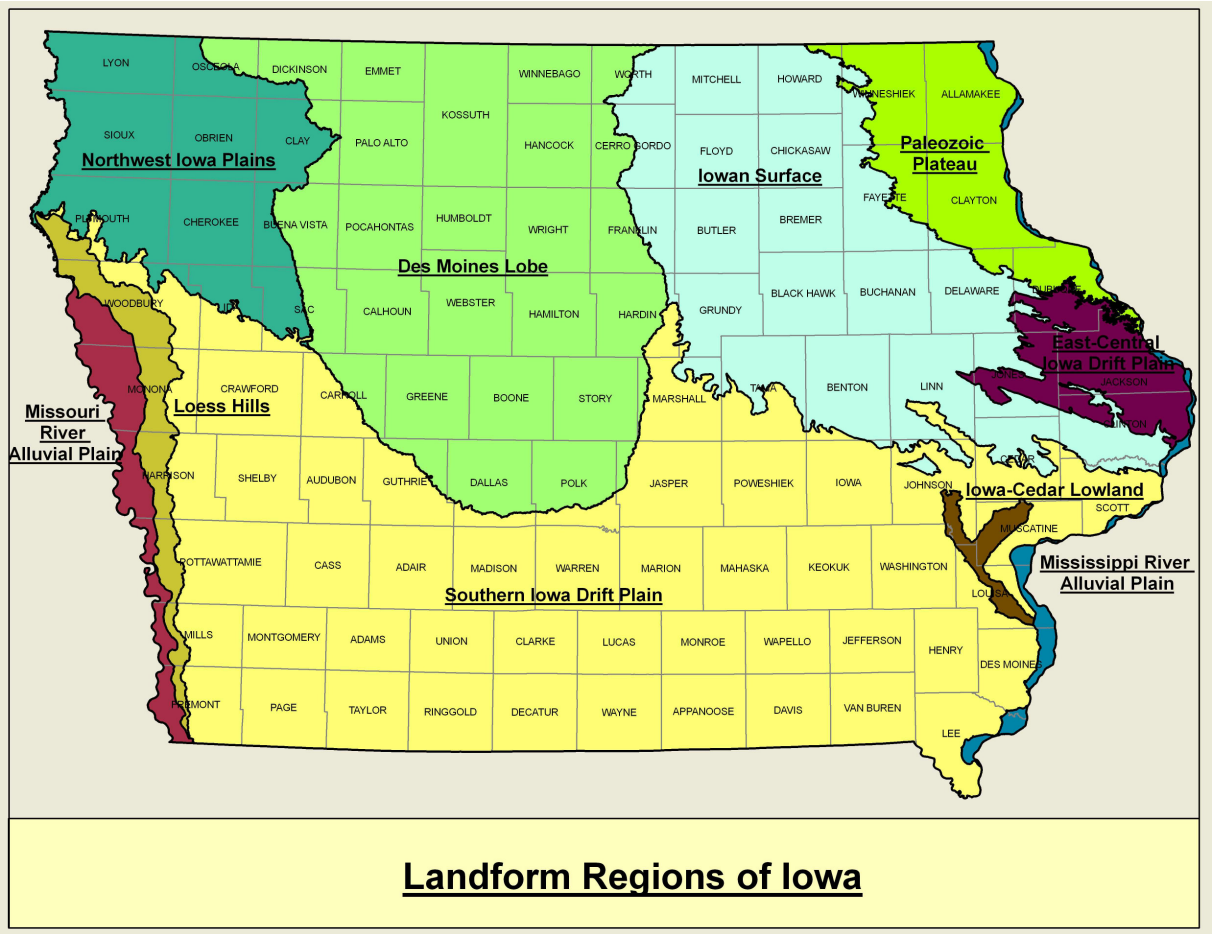
The average annual precipitation is 32 inches. The northwest part of the state is the driest with an annual precipitation of 28 inches while the southeast is the wettest with an annual precipitation of 36 inches. Iowa often experiences seasonal extremes and frequent local, rapid weather changes due to the convergence of cold, dry Arctic air, moist maritime air from the Gulf of Mexico, and dry Pacific air masses. Like most states, periods of severe drought and periods of excessive precipitation can have a dramatic impact on terrestrial and aquatic vegetation as well as their associated fish and wildlife species.

These climatic factors combine to influence the length of the growing season across the state. Late frosts in the spring and early freezes in the fall result in a reduced growing season of 135 days in northeastern and northwestern Iowa. The longest growing season is in southeastern Iowa, with an average of 175 days. The state average growing season is 158 days long.

Geology. Iowa's natural communities are as much a result of its recent geologic past as they are a result of climatic conditions (Prior 1991). Prior (1991)

divides the state into seven geologic regions based on the underlying bedrock as well as the location of glacial and loess deposits. (Map 2-1). The boundaries of these landform regions coincide well with the boundaries of other habitat based classification systems. The italicized names for regions are those listed in Prior (1991). The names in parentheses are habitat-based names for the landforms that describe the native vegetation that was present at the time of settlement. Descriptions are taken from Prior (1991) and Iowa GAP.

Map 2-1. Landform Regions of Iowa



Source: Iowa DNR

The Loess Hills (Tallgrass Prairie) is a unique landform that formed at the end of the last Ice Age about 18,000 years ago. The formation is only one to fifteen miles wide but is about 200 miles long extending from near Sioux City, Iowa to St. Joseph, Missouri. Although deposits of windblown soils (loess) are found in many parts of the world, nowhere else but in China do they reach as high as in Iowa where some of the hills are more than 200 feet above the adjacent Missouri River valley. The Loess Hills landform has other features that are easily noticed. Bedrock is exposed naturally in only a few places and the soil has unique physical properties. If the topsoil on the slope of a hill is removed, the

exposed loess will erode quickly and deep gullies will form. Even when covered with topsoil, loess can slump, often in a unified way across a slope creating "cat-step" ledges along the sides of hills. However, when a loess hill is cut vertically the exposed wall will stand for decades.

The Des Moines Lobe (Prairie Potholes) has a landscape that is gently rolling with abundant moraines, shallow wetland basins or potholes, and a few relatively deep natural lakes. This landform still retains the imprints of recent glacial occupation. Loess is entirely absent. The most prominent landform patterns left by the Wisconsin glacier on the Des Moines Lobe are the end moraines. The Des Moines Lobe is part of the Prairie Pothole Region that extends north and west into western Minnesota, eastern North and South Dakota, and the Canadian Prairie Provinces. Most of the potholes have been drained with ditching and underground tile lines to make way for agriculture. Agriculture was also responsible for greatly increasing the rate at which streams and drainage patterns developed in this geologically young landform.

The **Southern Iowa Drift Plain** (*Tallgrass Prairie*) is the largest of Iowa's landforms. Like the Des Moines Lobe, it is composed almost entirely of glacial drift, but the Pre-Illinoisan glaciers that deposited material in this part of Iowa were much older. As a result, deep glacial drift, ranging from a few to several hundred meters, is the only evidence of their occupation. Instead of poorly drained and relatively level landscapes, streams have had time to erode the land surface and form well-defined drainage systems. Hilltops have similar elevations that reveal the approximate level of the land surface constructed by the last ice sheet. As erosion slowly dissected this landscape, a layer of loess ranging from 2 to 10 meters was deposited over the glacial till. Throughout the Southern Iowa Drift Plain the terrain varies considerably, but the pattern of relief resulting from its history of erosion is the dominant feature of the region. Many of the larger rivers had glaciers standing in their headwaters at the time the Des Moines Lobe was ice-covered. These valleys obtained much of their present width, depth, and alluvial fill from flooding as the Wisconsin ice sheet melted away from northcentral Iowa. In many places the rivers have cut through the glacial drift into the underlying sedimentary bedrock. The rough wooded terrain adjoining these valleys supports many scenic and recreational areas and important wildlife habitat.

The **Iowan Surface** *(Eastern Tallgrass Prairie)* landform extends over a large region of northeastern Iowa and is characterized by long, gently rolling slopes, low relief, and open views of the horizon. Pre-settlement vegetation in this region was primarily prairie with heavily wooded floodplains along the larger watercourses. Drainage networks are well developed, but stream gradients are low with some scattered areas of poor drainage and natural wetlands. The area was once part of the Pre-Illinoisan Southern Iowa Drift Plain but experienced large-scale and more destructive erosion events, the latest occurring during the coldest part of the Wisconsin glaciation 16,500 to 21,000 years ago. Frost action,

down slope movement of water-soaked soil materials, and strong winds were the dominant geologic processes in this region. Layers of loess are thin and scattered. Glacial boulders are numerous and many are very large. Elongated ridges and isolated oblong hills called pahas occur in the southern part of the Iowa Surface region. These features are covered with a mantle of silt and sand believed to have accumulated in response to strong northwesterly winds that occurred during the period of glacial cold. Soils mapped on the larger pahas indicate they developed under forest vegetation rather than prairie. Karst topography occurs in the northern part of the landform where cavities in the underlying limestone bedrock collapsed and formed sinkholes. Fens are also present but more scattered than in the Des Moines Lobe.

The **Northwest Iowa Plain** (*Eastern Tallgrass Prairie*) contains many of the terrain features and geologic materials present in other landforms and is similar in appearance to the Iowa Surface with a uniform low relief. This landform was and still is a relatively treeless, gently rolling landscape. Despite these similarities, the landscape differs from other regions because of a combination of factors. The western uplands of this region are underlain with highly eroded, Pre-Illinoisan glacial tills. The eastern part of these tills is covered with later glacial deposits from an early Wisconsin glacial advance. The entire region was then subjected to vigorous erosion activity that accompanied the later advance of the Wisconsin ice sheet. As a result, features of a freshly glaciated landscape were lost as a well-established branching network of streams formed over the entire region. The deeper thickness of the loess mantle, the overall elevation of the land surface, and the present precipitation and vegetation distinguish the Northwest Iowa Plains from the state's other landforms. Windblown loess is abundant and nearly continuous across the region ranging in thickness from 4 to 16 feet. Altitudes throughout the Northwest Iowa Plains are uniformly higher than any other portion of the state and topographically are continuous with the High Plains of the Dakotas. Average annual precipitation is lower than other parts of the state. Thus, the region is higher, drier and less timbered than any other in the state. Although bedrock exposures are rare in the Northwest Iowa Plains, the oldest bedrock in Iowa (Precambrian-age Sioux Quartzite) occurs here along the Big Sioux River.

The **Paleozoic Plateau** (*Prairie to Hardwood Transition*) is the most distinctive of Iowa's landforms because of its abundant rock outcroppings, karst topography, a near absence of glacial deposits, many deep narrow valleys, cool-water streams, and heavily wooded uplands. Numerous gorges and ravines cause abrupt local changes in the direction of slopes and exposures. These sites provide abundant cool, moist and wooded habitats rich in diverse communities of plants and animals. Seeps and springs are common features along valley sides where strata of varying permeability are exposed and signify subterranean drainage systems. Ice caves and cold-air (*algific*) slopes are unique to this area. Unusual microclimates associated with these features support a particularly rare and

sensitive biological habitat in Iowa. The steep rocky slopes are unsuited for agriculture and remain heavily forested. Remnant prairies occur on south and west facing slopes. Ecologists believe these prairies were more extensive before the suppression of naturally occurring fires following European settlement.

Alluvial Plains, often called floodplains, are constructed by water flowing off of the landscape and carrying with it boulders, cobbles, gravel, sand, silt, and clay. This process of erosion creates a dendritic-shaped landform of nearly level corridors with varying widths depending on the size and reach of the river. These corridors are largest along the Missouri and Mississippi Rivers but can be found along streams throughout the other landforms. The floodplain is a dynamic landform that is frequently disturbed, sometimes drastically, by flood and drought events. Stream channels may be cut off leaving backwater sloughs or oxbow lakes. Large-scale vertical changes may also occur within the floodplain due to the deposition of alluvium that forms terraces and benches. These structures are level but are elevated above existing floodplains by a distinct slope. Smaller tributaries that enter the floodplain of a larger river often form alluvial fans that may cover older floodplain materials. During low flow periods, wind becomes an important factor in the transport of materials. Exposed sand or soil having little or no vegetation to hold it place can be blown onto floodplain and terraces as well as onto higher elevations along valley margins. Sand dune topography occurs downwind of valley floors.

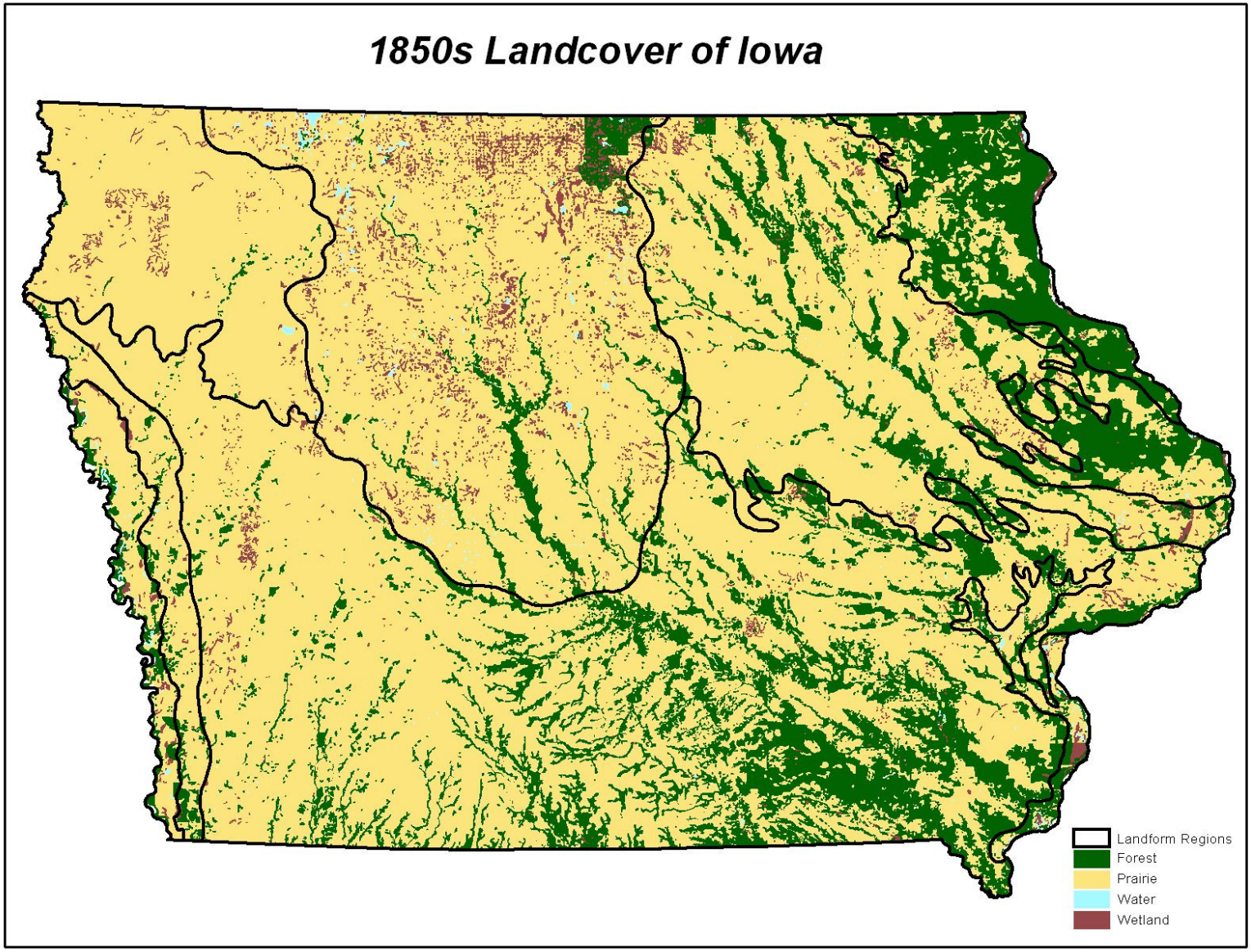
The glacial history and topography of each landform affect the type and distribution of current wildlife habitats and agricultural land use. These are discussed in Chapter 4.

Historic Plant Communities

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

Roughly two-thirds of the state (an estimated 23 million acres) was dominated by lush prairies. Most was tallgrass prairie, although short grasses were present on hot, dry sites. Nearly 7 million acres of forest or forest-prairie savanna covered much of the eastern third of Iowa and followed the river valleys into the prairies to the north and west. Around 4 million acres of prairie

Map 2-2. Landcover of Iowa in the 1850's (from Government Land Office original public land survey of Iowa)



pothole marshes dotted recently-glaciated and poorly-drained northcentral and northwest Iowa. Another million acres of backwaters, sloughs and flooded oxbows were found in the floodplains of the Mississippi, Missouri and larger inland rivers.

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

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

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

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

Fire and grazing. Drought, fire and grazing combined to make Iowa's prairie-wetland-forest ecosystem an even more diverse place. In wet years water levels were high, wetland vegetation gradually died out, and marshes began to look like ponds or small lakes. But dry weather runs in approximately 10-year cycles on the prairies, with severe drought at roughly 20-year intervals. Drought caused wetland basins to temporarily de-water. Seeds buried in moist wetland soils were able to germinate once the water was removed and dense stands of

emergent vegetation were replenished. Thus regenerated wetlands awaited only the end of drought to return them to their former productive condition.

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

Although fires were common, it is impossible to say how much and how frequently the prairies burned. Weather is seldom in complete synchrony over all of Iowa. Local dry spells undoubtedly created mini-droughts that lowered wetlands and produced frequent fires, while just a few miles away precipitation was normal. Even in normal years a dry late summer could result in a partial drawdown of marshes and occasional fires. The network of wetlands, creeks and rivers probably stopped smaller fires from expanding too greatly.

Grazers and browsers like bison, elk and deer also had an affect. They suppressed shrubs and slowed the growth of tall grasses where they fed intensively. Elk and bison created wallows - sandy areas where they rolled in the loose earth to remove hair and discourage insects. Prairie dogs, though not common in Iowa, kept the vegetation around their towns clipped short. Even gophers created small openings over their mounds where annual plants could gain a foothold.

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

Historic Wildlife Communities

Game animals. The great diversity of plant communities that covered pre-settlement Iowa also supported a diversity and abundance of wildlife that was foreign to settlers from the East. Iowa native Aldo Leopold, writing in 1931 in his *Game Survey of the North Central States*, said, "...*no region in the world was originally more richly endowed with game than this one, quantity and quality both considered. Contrary to common belief, the cream of its game country was the prairie type…"* Prairie animals like bison, elk, pronghorn, prairie chickens and

sharp-tailed grouse penetrated the tallgrass prairies from the West. White-tailed deer, wild turkeys, passenger pigeons, bobwhite quail and ruffed grouse followed the deciduous woodlands and river valleys into the prairie from the East.

Waterbirds. The prairie pothole and riverine wetlands provided excellent nesting habitat and attractive resting and feeding stops for millions of migrating ducks and geese between their nesting and wintering grounds. Giant Canada geese, trumpeter swans and a dozen species of ducks nested in Iowa, mainly blue-winged teal, mallards, redheads, northern shovelers, northern pintails and ruddy ducks. In excess of 4 million ducks may have been raised annually. One early hunter thought there were 10,000 Canada goose nests in Kossuth County alone.

Other waterbirds were also plentiful. Sandhill cranes were abundant during migration and nested here occasionally. Whooping cranes were less numerous, but nested frequently in the marshes of northcentral and northwest Iowa. More than 30 species of shorebirds migrated through Iowa. Of these, the woodcock, long-billed curlew, marbled godwit and upland sandpiper nested here, and the golden plover, Eskimo curlew and common snipe were abundant during migration.

Furbearers. Beaver, muskrat and river otters were found throughout Iowa, associated entirely with marshes, streams and rivers. Muskrat were most abundant in the prairie marshes of northcentral Iowa and maintained very high numbers. Beaver and river otters were associated more with riparian habitats. Mink and raccoon were not highly sought after, but both must have been abundant.

Predators. An variety of predators fed on this abundance of game animals. The gray wolf occurred in two forms, the lighter, smaller Great Plains wolf followed the bison and elk herds and was most common in the western two-thirds of the state. The timber wolf, a somewhat larger and darker version of the same species, inhabited the forested eastern third, mostly in the northeast corner, and would have fed mainly on deer. Coyotes were found statewide. Red foxes were found in the prairies and at the prairie-forest border in northern Iowa, the gray fox was found primarily in the eastern third of the state. Bobcats were numerous, occurring statewide in a variety of forested and shrubby habitats. Mountain lions, or cougar, were occasionally seen, but reports are few and far between. The lynx, a larger version of the bobcat normally inhabiting the coniferous forests of the Great Lakes states and Canada, was at least occasionally found here.

The black bear was the largest predator in pre-settlement Iowa. Although their preferred habitat was woodlands, they occasionally wandered into the prairies. Reports of black bears originate from 48 counties, most in eastern Iowa.

The grizzly bear, arguably North America's most fierce predator, was found occasionally on the Great Plains, but there are no known records from Iowa.

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

The wetlands must have been home for yellow-headed blackbirds, marsh wrens, American bitterns, black terns, and Sora rails as well as Canada geese, mallards, and muskrats. Wetland-prairie margins must have been nesting sites for song sparrows, sedge wrens and northern harriers.

Where shrubby, early successional stages of forest pushed into the prairies there must have been an abundance of cardinals, yellowthroats, rufous-sided towhees and rose-breasted grosbeaks as well as ruffed grouse and white-tailed deer. Larger stands of mature forest must have provided nesting sites for ovenbirds, scarlet tanagers, wood thrushes and pileated woodpeckers as well as wild turkeys. Riparian woodlands would have been home for black-billed cuckoos, redheaded woodpeckers, belted kingfishers and northern flickers as well as wood ducks.

Grasshopper and vesper sparrows would have nested in recently burned prairies. Prairies a year or two after burning would have provided nesting cover for bobolinks and dickcissels as well as prairie chickens. Henslow's sparrows, savanna sparrows and upland sandpipers would have nested in older prairies with dense ground litter. Loggerhead shrikes and mourning doves would have sought out grasslands with a shrub component. In all, more than 180 species of birds nested in Iowa.

Even less is known of the reptiles, amphibians and invertebrates. Pristine prairie potholes, riverine wetlands, prairies and woodlands provided homes for a diversity of lizards like the Great Plains skink and six-lined racerunner, common turtles like the ornate, snapping and painted turtles, snakes like the timber and Mississauga rattlesnakes and frogs like the leopard, green and gray tree frog. More than 60 species of reptiles and amphibians were eventually found in Iowa.

Impacts of Settlement

Settlement in Iowa progressed roughly southeast to northwest. Most of the south half of the state had been inhabited by the end of the 1840's; northcentral and northwest Iowa were settled in the 1850's; Lyon County in

extreme northwest Iowa was the last to be settled, receiving its first homestead family in 1866.

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

An Agricultural Revolution. At the same time Iowa was being settled a revolution was overhauling industry and agriculture:

- James Watt perfected the steam engine in 1790;
- Robert Fulton developed the first steam locomotive in the U. S. in 1802;
- The first steamboat plied the Mississippi River in 1811;
- A steam-powered dragline was used to finish the Erie Canal in 1825;
- Cyrus McCormick perfected a mechanical reaper in 1832;
- John Deere developed the first steel moldboard plow in 1836;
- By 1851 Deere was producing 10,000 steel plows a year and the fate of the prairie was sealed.
- In 1865 the first transcontinental railroad was completed and routes to the West were opened during the next 25 years.

The advent of improved farm implements, coupled with a rapidly expanding population base devoted mostly to agriculture, had a devastating and permanent impact on Iowa's native plant communities.

Forests. Woodlands were the first to go. Some early settlers preferred farming woodlands rather than open prairie, fearing that land too poor to grow trees would not grow crops either. While experience would quickly prove that wrong, forests felt the bite of the pioneer's ax early in our history.

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

Prairies. The affect on our extensive prairies and prairie-wetland complexes was even more devastating. When pulled by up to 5 teams of horses or yokes of oxen a steel *breaking plow* could shear through and break up 2 acres a day of the foot-thick sod with its intricately intertwined root systems. The newly exposed soil was so fertile that a crop, first wheat and later corn, was planted

directly on the overturned furrows. The next year a second plowing would complete the conversion of prairie to a field tillable by conventional methods. Starting in the 1850's, Iowa lost nearly 2 percent of its 25 million acres of native prairie a year, 3 million acres a decade, until less than 30,000 acres (0.1%) remained after 80 years.

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

The first drainage attempts were with hand-dug, open ditches that drained shallow lakes and large marshes into permanent streams. Steam dredges did not replace hand labor until nearly 1900. Underground ceramic tiles were developed to drain smaller potholes into ditches as early as 1858. By 1917 modern clay tiles were used to drain seasonally wet fields into extensive, inter-connected drainage systems that had eliminated all but the largest wetlands. By 1906 just 25 percent of the original 4 million acres of wetlands remained.

Wildlife. Iowa's original wildlife populations suffered a similar fate as her native plant communities. Species that competed with humans for space, or were particularly useful for food or fiber, or required very specific habitats that were eliminated or drastically reduced did not survive. Others of less importance to humans held on in low numbers wherever suitable habitat remained, but their future remained suspect. A few species that could adapt to the remarkable change in habitats or were favored by the conversion to a diversified agricultural environment increased for a time, at least until agriculture became too pervasive.

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

Wild turkeys, passenger pigeons, prairie chickens and waterfowl all fed occasionally on settler's crops and were considered pests, and all were valuable as table fare or to sell at local markets. The spread of railroads into the Midwest in the 1860's and 1870's allowed hunters to reach the best hunting grounds and permitted shipping frozen game to markets in Chicago, Milwaukee and as far as New York City before it spoiled. Game was served as a delicacy in many

eastern restaurants in the late 19th century. As city dwellers developed more leisure time in the 1880's, hunting for sport or recreation also became more popular.

The take of game birds was enormous. A single net could capture 1,500 passenger pigeons. Entire flocks of turkeys could be pot shot from the roost on cold winter nights. Hunters could occasionally take 100 or more prairie chickens in a day (seasonal takes of 900 or more chickens were recorded). Sport hunters were able to take up to 100 ducks in a single day. The best market hunters could take up to 3,000 ducks in a season. One group of 7 hunters shipped 14,000 ducks east in a single year. A careful hunter willing to pick his shots could take a half dozen mallards or 8 or 9 prairie chickens with a single shot. Avid woodcock hunters could take 40 birds a day; one market hunter took up to 3,000 woodcock a year in northeast Iowa. A hunter could easily take several ruffed grouse in a day but apparently few were ever sold at market. A variety of shorebirds - long-billed and Eskimo curlews, marbled godwits, upland and golden plovers and common snipe - were frequently hunted and at least some sold at market. Whooping and Sandhill cranes were also hunted for the table and because they were a pest in grain fields.

For most of Iowa's early history this activity was totally unregulated. Seasons, bag limits, shooting hours and restrictions on weapons did not exist. Settlers shot game for the table year around as they could find it. Sport and market hunters were active primarily in Fall and Spring so that game would not spoil before it could be consumed or sold. By the 1880's market hunters were building freezers to prolong their hunting opportunities. Waterfowl suffered the additional indignity of having their eggs collected for food or by egg collectors, a common hobby in the later 1800's. There seemed to be no need for regulation - the game was limitless, far more than anyone could possibly use.

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

Ever smaller flights of passenger pigeons continued into the mid 1870's, dwindled more into the 1880's and 90's and were gone by 1900. Wild turkeys were gone from northeast Iowa by 1854, from most of central Iowa by the 1870's, and disappeared from southern Iowa by 1910. Ruffed grouse were able to hold

on into the 20th century only in the most heavily forested counties of northeast Iowa.

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

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

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

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

Change Continues in the 20th Century

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

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

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

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

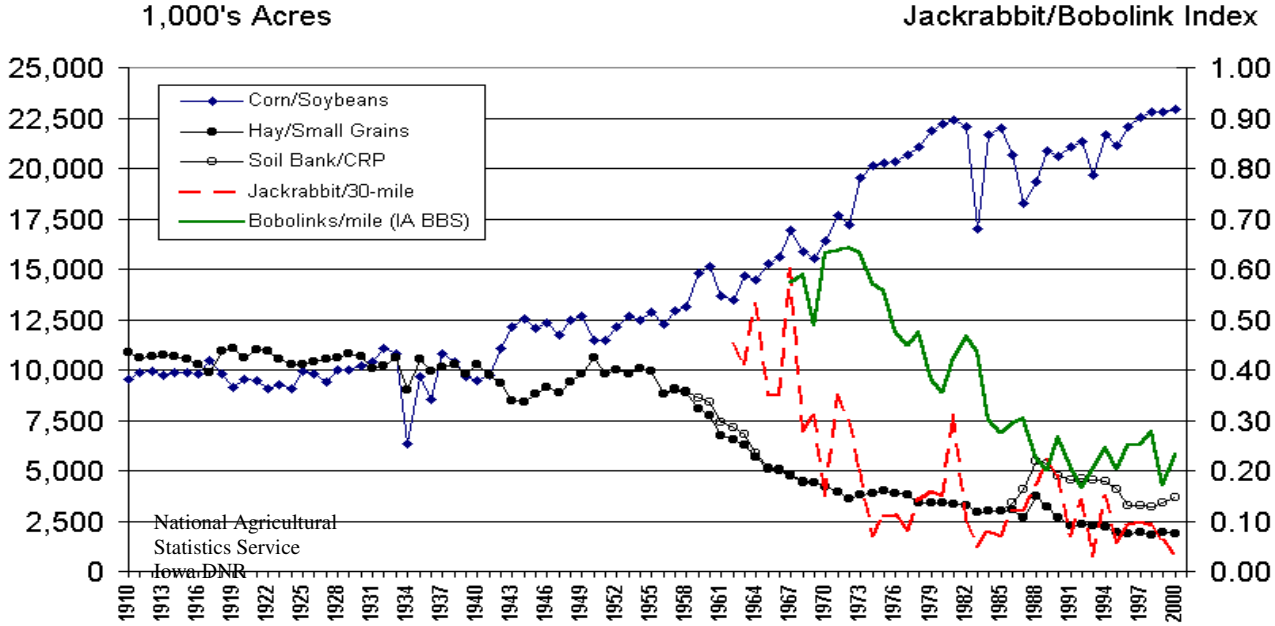
The last half of the century brought even more change. Modern tiling machines could mechanically dig and insert underground perforated field tiles to drain even the wettest areas. The use of agricultural chemicals – herbicides, pesticides, and fertilizers – became the norm and weeds and insects were, if not conquered, at least minimized as a threat to crop yields. The first pesticides were organochlorines -DDT and its derivatives- that had devastating long-term effects on bird populations that led to the ban on their use in the 1970's. The newer generations of pesticides - organophosphates - have no residual effects that are known at this time, although Roundup, the most widely used herbicide, has recently been implicated in the decline of amphibians.) Soybeans were introduced as a cash crop and genetically modified crops with built-in pesticide resistance were developed. Livestock operations shifted from on-the-farm to confinement operations and the need for extensive livestock forage (hay and small grains) was reduced. Crop rotations eventually were simplified to continuous corn or soybeans or corn-soybean rotations over most of the state. Planting and harvesting equipment and the tractors to pull them became ever larger. Modern grain combines became so efficient that little waste grain or crop residue was left in the fields for wildlife food or cover. By 2000 the average farm had increased to more than 1,000 acres and the number of farms in Iowa had decreased from 150,000 to just 90,000 in a half-century.

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

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

In the early 1970's grain export quotas were removed to open up international markets. Row crops in Iowa grew by more than 3 million acres at the expense of hay and pasture (Figure 2-1), most in the southern third of Iowa. The distribution of the ringnecked pheasant nearly reversed itself as a result. The new croplands in southern Iowa allowed pheasants to flourish where the bobwhite quail had been the dominant game bird. The added pressure to raise rowcrops eliminated most of the remaining wildlife habitat in northern Iowa, however, and pheasant populations there plummeted.

Figure 2-1. Changes In Cropping Patterns and Representative Grassland Wildlife



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

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

Figure 2-2 Statewide Pheasant Trends

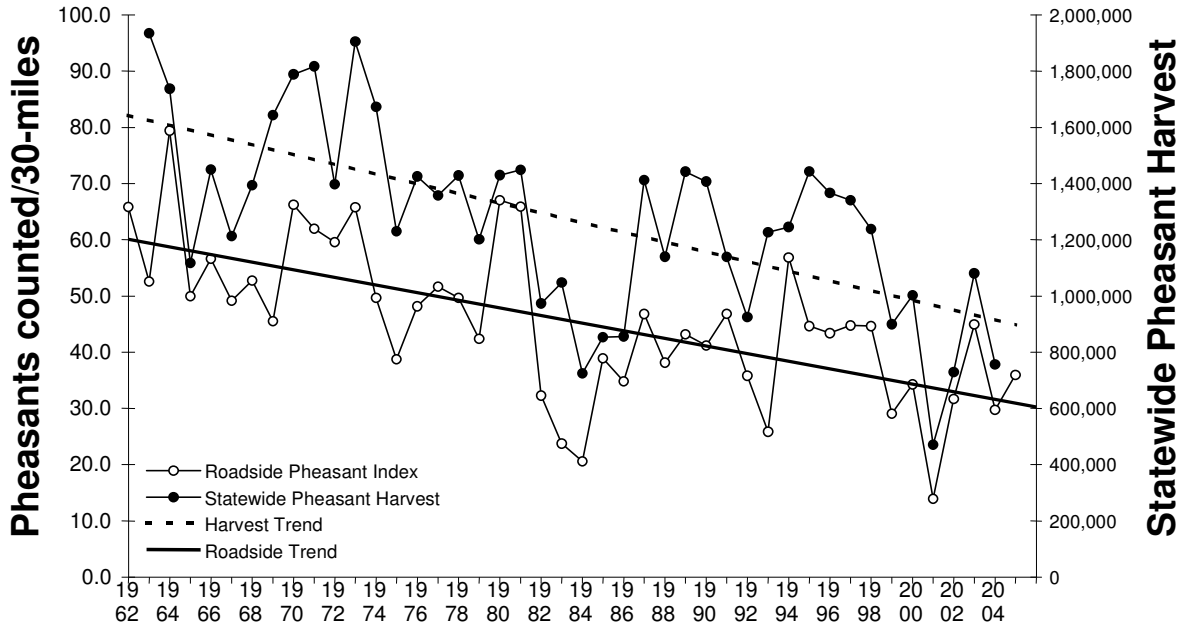


Figure 2. Mean number of pheasants counted on 30-mile August roadside survey routes, statewide, 1962-present compared to total statewide pheasant harvest.

enrolled in CRP saw declines in pheasants and quail. IDNR-sponsored research would eventually find that nongame birds like Henslow's sparrow that nested in mature grasslands would respond to the habitat provided by older CRP fields.

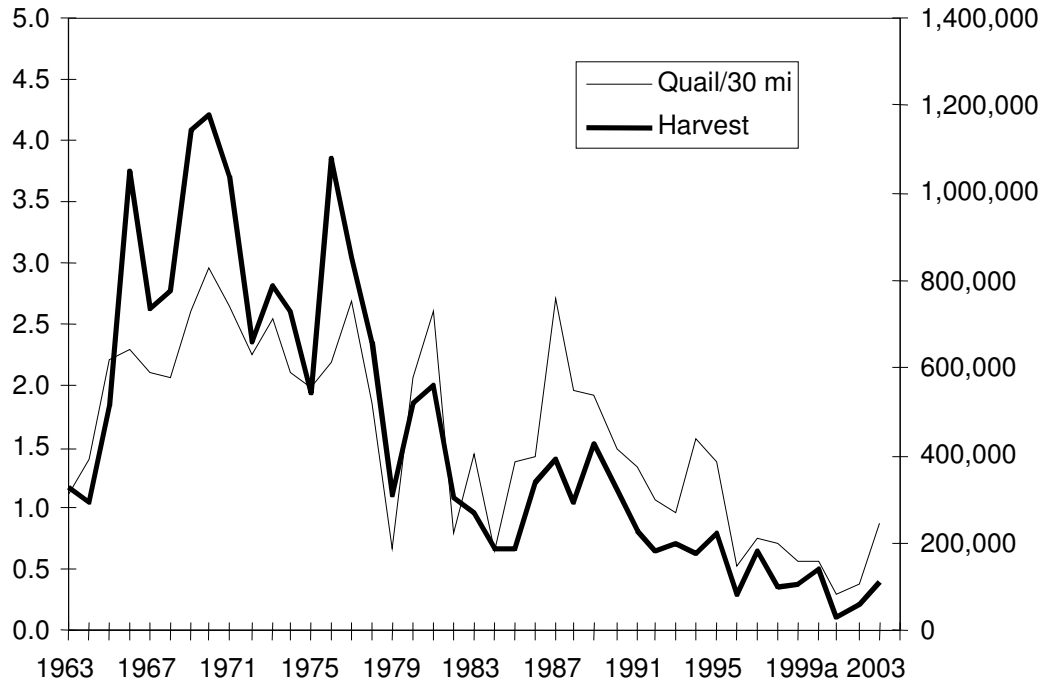
Small mammals and the avian and mammalian predators that fed on them would increase also. The return of the bobcat to Iowa is at least partly explained by the prey provided in CRP fields.

CRP acreages in whole fields peaked at 2.2 million acres, but modifications in the late 1990's and early 21st century reduced whole-field enrollments to 1.5 million acres today. Most contracts will expire in 2007 and 2008. Recent farm bills have included a number of permanent and short-term programs designed to provide soil and wildlife conservation benefits as well as subsidize the production of commodity crops. The Continuous CRP (buffer strips), Wetland Reserve Program (WRP), Wildlife Habitat Incentive Program (WHIP), Farmed Wetland Program (FWP) and others have been beneficial, but most have been implemented on smaller parcels than the original CRP fields. Potential problems with habitat fragmentation, connectivity between habitat blocks and their value to area-sensitive species is not well understood (see Chapter 5).

Summary. The result of this improved technology and the flurry of often-conflicting farm legislation has been a gradual and long-term decline in wildlife habitat on private agricultural lands. Farm operations have shifted from diversified agriculture to corn and soybean monocultures. Between 1900 and 2004 row crop acreages increased from 9.1 million acres to 21 million acres (Figure 2-1). Hay and small grain acreage decreased from 6.8 million acres to a current 1.1 million acres. Larger farms and field sizes have eliminated fencerows, windbreaks, waterways and other on-farm habitat. The nearly exclusive use of farm chemicals for weed and insect control has eliminated food and cover for songbirds and other wildlife. Conservation practices subsidized by various titles of recent farm legislation have helped slow this trend, but the funding available to implement them has never equaled the amount USDA has spent subsidizing commodity crops that encourages maximum production.

The impact on of these trends on wildlife that utilizes agricultural lands has been slowly devastating and is the subject of much of the remainder of this Plan. The loss of grasslands as row crop agriculture has become dominant has resulted in substantial declines in bobolinks and white-tailed jackrabbits (Figure 2-1), two once-common native grassland species. Even the popular ringnecked pheasant, until recently the state's most well known game animal (Figure 2-2) is in the midst of a 50-year decline in numbers. A similar trend can be seen for bobwhite quail (Figure 2-3). Other examples can be found in *Trends in Iowa Wildlife Populations and Harvest* (2004 and earlier years) published by IDNR.

Figure 2-3. Trends In Bobwhite Quail Populations and Harvest.



These landscape changes have impacted aquatic wildlife as well, although they are not as well documented. Advertisements to attract settlers to Iowa in the 1850's stressed the vast acreages of fertile soils, abundant wildlife and sparking clean waters teeming with game fish. A muskellunge museum specimen at Iowa State University was caught on the Skunk River near Ames in the 1880's.

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

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

Wildlife Conservation

Wildlife Restoration. Not all wildlife trends of the past half-century have been negative. The creation of the Iowa State Conservation Commission (now IDNR) in 1935, the gradual development of wildlife science and management as professions after World War II, and the formation of IDNR's Wildlife Diversity Program in 1981 have returned a portion of Iowa's native wildlife to the state. White-tailed deer, wild turkeys and giant Canada geese are now more abundant than at any time since the late 1800's. Other restoration programs have returned ruffed grouse to southern Iowa, river otters to the state's streams, peregrine falcons, ospreys and trumpeter swans nest again in Iowa. Bald eagles, bobcats and Sandhill cranes have reappeared as a result of successful conservation programs elsewhere. Details of these and other wildlife restoration programs are explained in *Trends in Iowa Wildlife Populations and Harvest - 2004.*

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

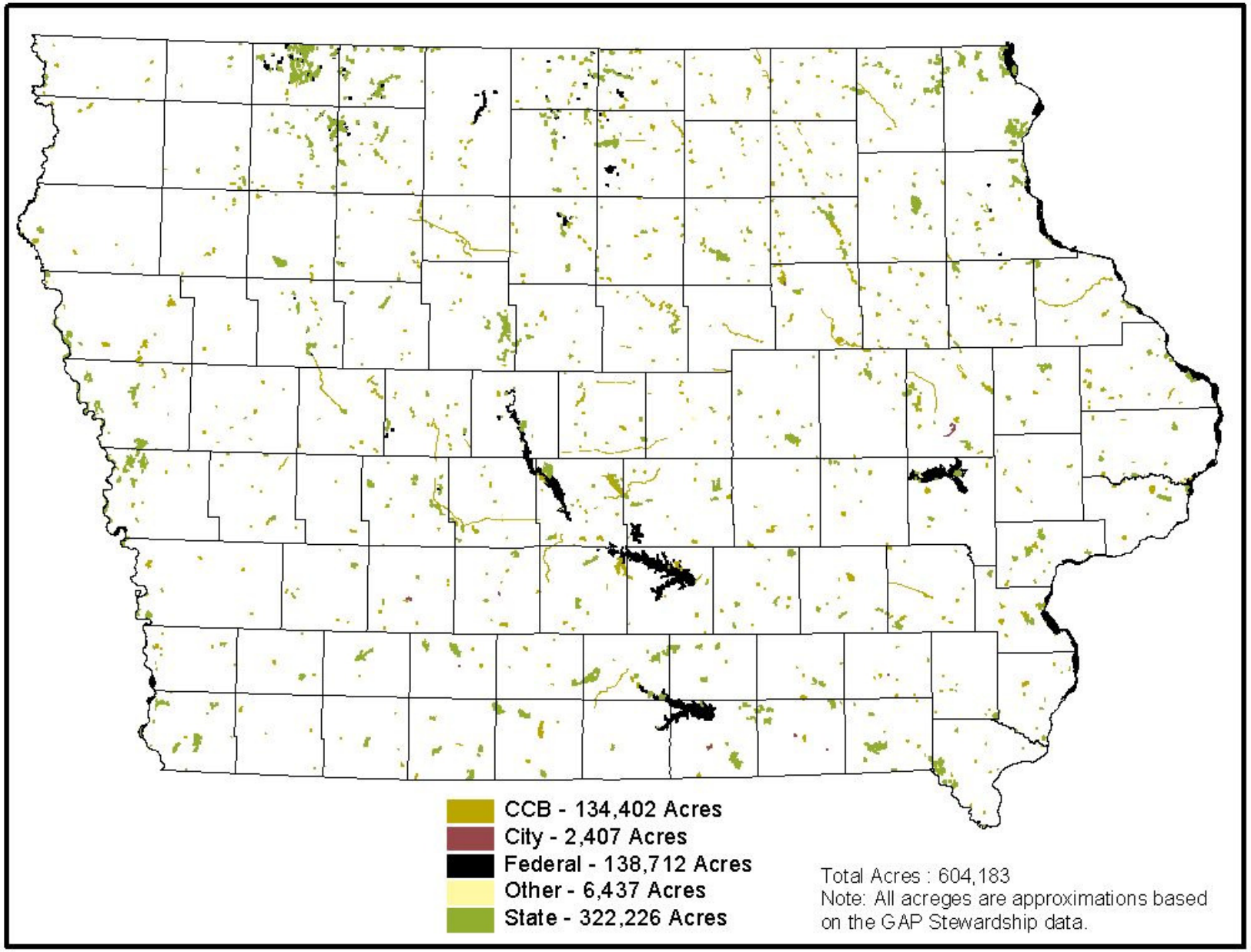
IDNR has aggressively sought funds for habitat protection through the North American Waterfowl Management Plan, the North American Wetlands Conservation Act, State Wildlife Grants, the Environmental Protection Agency, Iowa County Conservation Boards and others. IDNR also partners with a number of NGOs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

Since 1980 IDNR has acquired 100,000 acres of land to enhance or restore habitat for wildlife. Research sponsored by IDNR has found that these restored lands are colonized quickly by birds that utilize the appropriate habitats as they develop. Little is known about responses from less-mobile wildlife like amphibians and reptiles.

In spite of the aggressive efforts to protect wildlife habitat, Iowa remains one of the states with the highest proportion of privately held land (Map 2-3). Public conservation lands accounted for just over 600,000 acres in 2004, or just 1.7% of the land area of the state (Iowa GAP).

The IDNR owns nearly half of the public conservation lands (322,000 acres), including state parks, state forests and wildlife management areas. Federal ownership accounts for 138,000 acres in four flood control reservoirs, 5 national wildlife refuges and 57,000 acres of WRP easements. IDNR has land management agreements on portions of the reservoirs but little control over water levels. County Conservation Boards own 134,000 acres.

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



Habitat on private lands. Wildlife habitats on private lands have also received attention from IDNR programs. Farm Game Habitat crews roamed the state in the 1950's and 1960's helping landowners establish habitat on their property. In 1971 the number of IDNR wildlife management biologists was doubled and they were housed in USDA farm service center offices to promote contacts with private landowners. In the 1980's farmstead shelterbelts and switchgrass cost-sharing programs were introduced to promote these practices on private land. For the past 20 years IDNR biologists have actively promoted USDA farm bill practices (e.g. CRP, WRP) that provide landowners funds to assist with developing wildlife habitat. The Wildlife Bureau's Private lands Program was formed in 2002 to take better advantage of wildlife-friendly USDA farm programs and other Federal grants like the Landowner Incentive Program (LIP).

The success of private lands assistance programs has been mixed. Wildlife habitat has been affected on 65,000 acres. In the past, however, private land habitats have disappeared when land ownership or landowner objectives change or as government subsidies for habitat protection have ended. Some of the new programs (WRP, LIP) require permanent easements and habitat improvements will remain. Others are short term and will likely revert to more financially rewarding uses when government programs end.

Iowa's Natural Communities Today

The result of a century and a half of change as a result of human intervention on Iowa's landscape has been a shift in the composition of Iowa's plant communities and the wildlife that inhabits them. Few undisturbed natural plant or wildlife communities exist today. Less than 0.1% of Iowa's native prairies (30,000 acres), 5% of its wetlands (422,000 acres), and 43% of its forests (2,800,000 acres) remain.

Of these, forestlands are the only habitats that are increasing on private lands without state or Federal intervention. The shift from raising livestock on the farm to confinement operations has reduced the need for pasture in the past decade and a half. Today Iowa has nearly 1 million acres of pastureland reverting to early successional forest, most in the Southern Iowa Drift Plain, the Paleozoic Plateau and the Loess Hills.

Map 2-4 shows the land cover in Iowa in the year 2002. The majority of the state is covered with row crop, primarily corn and soybeans. Most of the remainder of the state is in grassland, often conservation reserve, road ditches or pasture, with lesser acreages of timber and other habitat types. More details on the current status of Iowa's wildlife are provided in Chapter 3, and the status of wildlife habitats in Chapter 4.

Map 2-4. Landcover of Iowa in 2002 (IDNR Landsat 5 and 7 Enhanced Thematic Mapper Images)