Chapter 3: District Environment and Current Management

In this chapter:

This chapter describes the existing physical, biological and social environment of the Iowa Wetland Management District (WMD, district) and its surroundings. It also described the current management activities that are occurring on district land.

Physical Environment

Geographic Setting

The Iowa WMD is part of the larger Prairie Pothole Region (PPR) (figure 1-2). This geographic area of central North America, mostly the Midwestern Great Plains, consists primarily of midgrass and tallgrass prairies interspersed with wetlands. Stretching northwest from northern Iowa through southwest Minnesota, eastern South Dakota, eastern and northern North Dakota, southwest Manitoba, and southern Saskatchewan to southeast and east-central Alberta (and even a little of northern Montana), the region is covered with thousands of shallow, sometimes seasonal ponds known as potholes or sloughs. The area is the summer home and breeding grounds of some 45 million mallard, pintail, gadwall, and teal ducks as well as many other shorebirds, songbirds, and gamebirds.

More specifically, the Iowa WMD acquisition boundary includes a 35-county area in north-central and northwest Iowa (figure 1-1). The district spans from the Minnesota border to Des Moines, from Cherokee to Grundy Center, and from Guthrie Center to Newton. The district includes the cities of Fort Dodge, Spencer, Mason City, Clear Lake, Marshalltown, Webster City, and Charles City. The acquisition boundary encompasses over one-third of the State of Iowa including both the largest county by size (Kossuth) and the largest county by population (Polk).

Current Management

The geographic setting of the district and its surroundings cannot be managed.

Ecosystem Setting

At the time of the periodic advance and retreat of glaciers, the district was a mix of grasslands and forests of spruce, aspen, and oak. Stretching north of Des Moines—in areas where the ice had melted—marshes, wetlands, and bogs were common. This environment supported a variety of herbivores, revealed today in fossils, including mammoth, mastodon, giant ground sloth, musk ox, a variety of bison, and elk. However, within a few centuries, temperatures warmed and the ice melted for the last time. New forests filled the river valleys, and prairies stretched west and south with marshlands to the north (State Historical Society of Iowa, 2010).

Two ecoregional provinces are represented in the district: Eastern Broadleaf Forest and Prairie Parkland (Bailey, 1995). Within the Eastern Broadleaf Forest Province the district lies within the Minnesota and Northeast Iowa Morainal Oak Savanna section. Within the Prairie Parkland Province the district lies primarily within the North-Central Glaciated Plains section with a small portion in the Central Dissected Till Plains. Furthermore, the district lies primarily within the Southern Des Moines Lobe and Upper Minnesota River-Des Moines Lobe subsections with much smaller portions reaching into seven other subsections (figure 3-1). The Des Moines Lobe is also recognized as a landform of Iowa (figure 3-2) and is described in the Topography and Geology section below. A smaller portion of the district also stretches into the Northwest Iowa Plains, Iowan Surface, and the Southern Iowa Drift Plain landforms; however, these are most prevalent farther to the northwest, northeast, and south, respectively (Prior, 1991).

Current Management

The district manages the ecosystem setting primarily through activities designed to restore cropland to perennial grassland in the uplands and to wetlands in the lowlands. Wetland restoration is directly linked to generally improved hydrology.

Topography and Geology

The landscape of the district is considered geologically young, as it was affected by the most recent glacial advance in Iowa. The Pre-Illinoian (over two million years ago) and Illinoian (300,000 to 130,000 years ago) glacial deposits are buried under the Wisconsinan deposits from about 50,000 years ago. As the environment cooled, a large ice sheet formed in the Hudson's Bay region and began to spread south. One lobe entered central Iowa and moved as far south as Greene County. Then, as the climate warmed about 30,000 years ago, this lobe retreated.

As temperatures cooled again, another glacier known as the Des Moines Lobe, entered Iowa and moved down through its center to the modern-day city of Des Moines about 17,000 years ago. By 15,000 to 12,000 years ago, the ice sheet was gone, leaving behind a flat to undulating terrain. The landscape was poorly drained and filled with pebbly deposits from the stagnant decaying ice; sand and gravel from swift meltwater streams; as well as clay and peat from glacial lakes. The landscape was also left devoid of any loess deposits since the ice sheet was still covering it while those deposits were occurring elsewhere in the state. Today, glacial moraines form prominent features in the area including Ocheyedan Mound in Osceola County, Pilot Knob in Hancock County, and Pilot Mound in Boone County.

Current Management

The topography and geology of the district and its surroundings cannot be managed.

Figure 3-1: Bailey's Ecoregional Provinces, Sections, and Subsections for the Iowa WMD

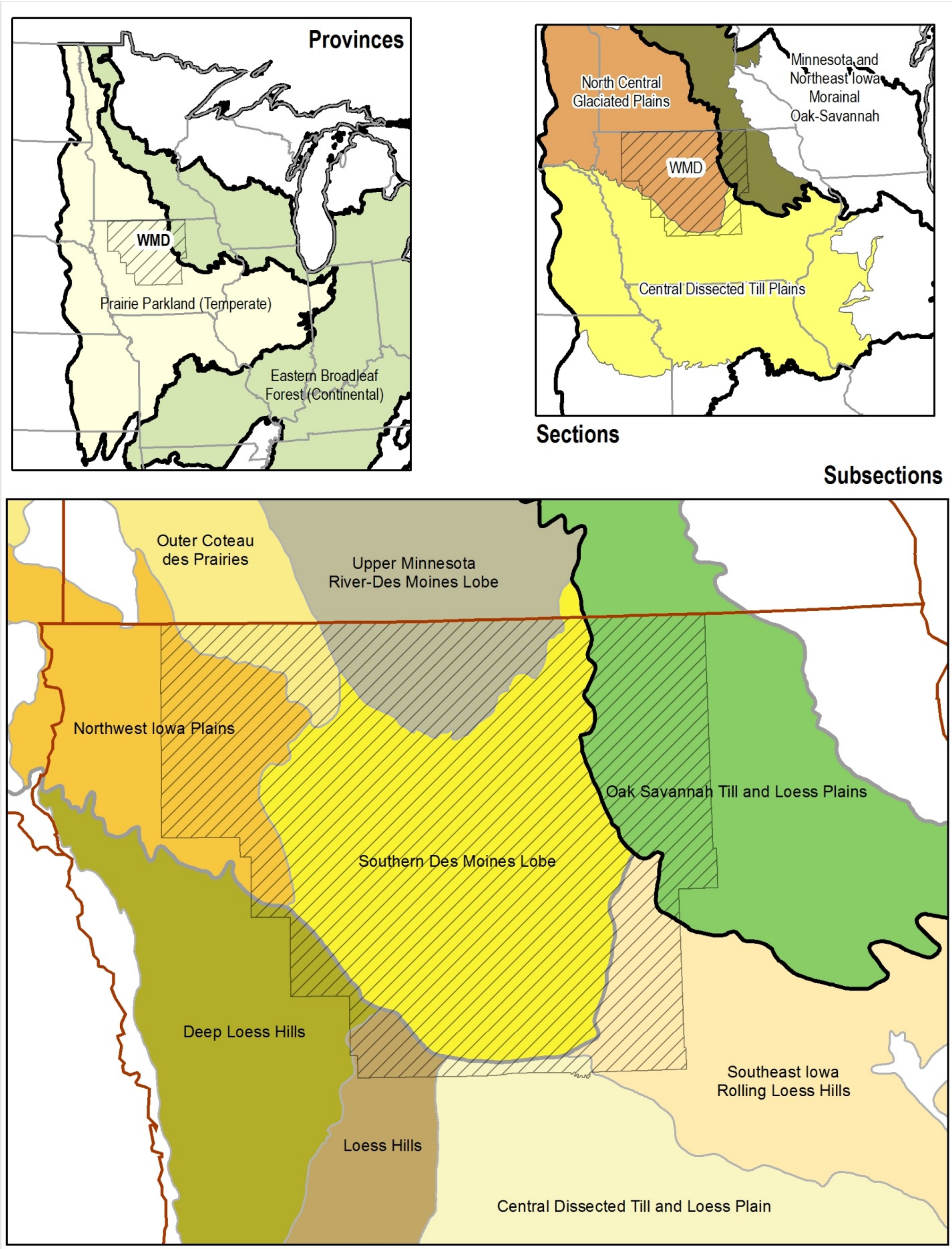
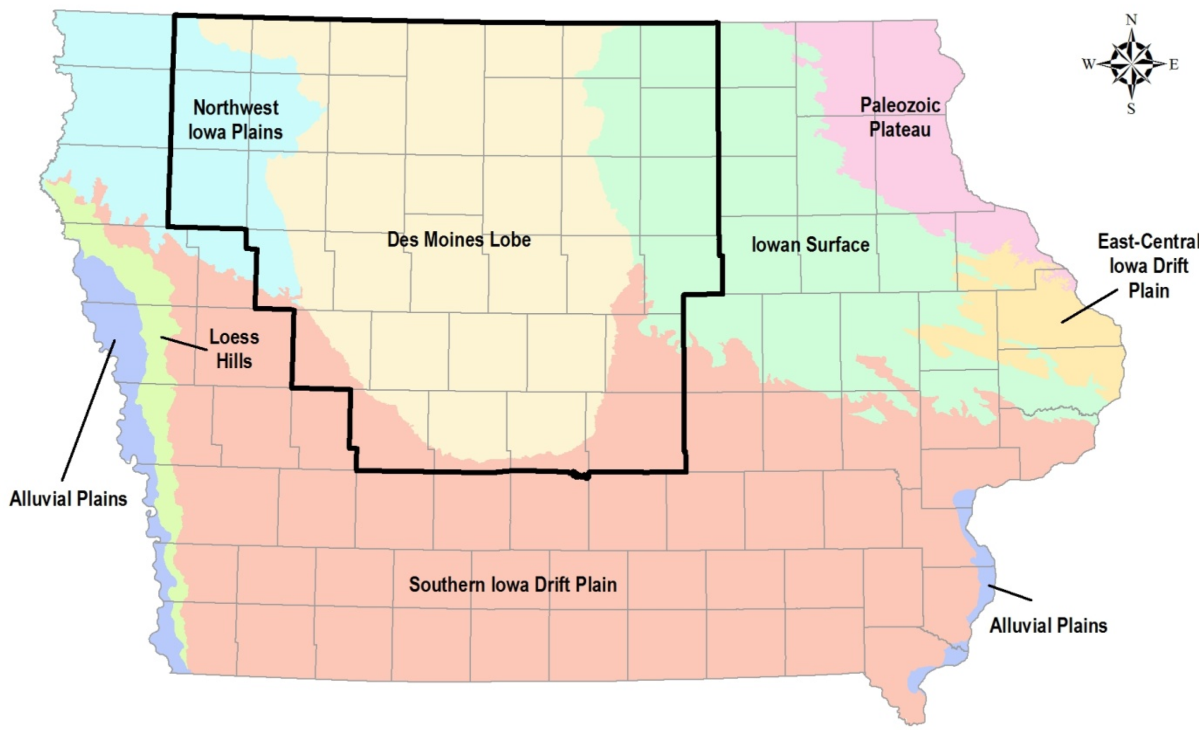


Figure 3-2: The Landforms of Iowa



Climate

The district climate is characterized as extreme mid-continental or humid continental with warm, usually hot, and humid summers and cold, snowy winters. The average summer temperature is 76 ºF, and the average winter temperature is 33 ºF. The July high averages 85 ºF while the January low averages 8 ºF. The average annual daytime relative humidity is around 72 percent,

increasing across the district from southwest to northeast. Prevailing winds are from the northwest with average wind speeds of 11 miles per hour.

Total annual precipitation increases across the district from the northwest to the southeast with an average of 30 inches. About two-thirds of this precipitation falls between April and September with a peak in late spring/early summer. Average annual snowfall is around 31 inches. The length of the growing season varies from 135 days in the northwest portion of the district to 155 days in the southeast portion. An approximate twenty-year drought cycle occurs in Iowa, which may be important in limiting the occurrence of some prairie species and certain northern wetland species and is critical in restricting woody species (Eilers and Roosa, 1994).

Predicted Change

Iowa is no exception to the well-documented changing climate across the globe (ICCIC, 2010). Geologic records of Iowa show that the state's climate has always been changing, although at a slower rate than today. Statistically significant changes in Iowa's precipitation, streamflow, nighttime minimum temperatures, winter average temperatures, and dewpoint humidity readings have occurred during the past few decades. Iowa has already been experiencing warmer winters, longer growing seasons, warmer nights, higher dewpoint temperatures, increased humidity, greater annual streamflows, and more frequent severe precipitation events than were prevalent during the past 50 years (ICCIC, 2010).

Regardless if the impacts from such changes seem positive or negative; it is likely that these trends will continue, especially with increased global release of greenhouse gas (GHG) emissions. Unfortunately, Iowa is among the states with the largest GHG emissions per capita. However, Iowa is also among the states that could benefit the most economically by mitigating climate change using energy efficiency and renewable sources of energy (ICCIC, 2010).

More specifically, the PPR of Iowa appears to be particularly vulnerable to impacts from climate change. Even though much of the land in this area is in row crop agriculture, most of what is left of the state's wetlands also occur here. Since climate, precipitation, and temperature heavily influence the functionality of wetlands, these systems are expected to change dramatically with the changing climate. The most recent literature (Johnson et al., 2010) predicts the Iowa portion of the PPR will become the most dynamic and therefore productive when compared to the western portion of the PPR that is expected to dry significantly. However, the literature also suggests that the area will have "too few functional wetlands and nesting habitat to support historic levels of waterfowl and other wetland-dependent species."

According to the *Iowa Climate Change Adaptation & Resilience Report* (EPA, 2011), Iowa's climate has changed in the following ways:

- Precipitation in Iowa has increased since the 1940s: Total annual precipitation has increased about 10 percent; more rain falls during spring and early summer with more heavy downpours.
- Stream and river flow have increased about 20 to 50 percent since the 1940s: More days have high stream flow in central Iowa, and spring soil moisture is close to saturation more frequently.
- Statewide winter temperatures have increased: On average, there are about five more frost-free days than in 1950; thaw-freeze cycles are more frequent.
- Wind speeds have declined over the last 30 years, potentially worsening air quality.

These increases are predicted to continue well into the future. Floods, heat waves, and severe weather events are all also predicted to increase with these changes in Iowa's climate.

In general, these trends are similar to those found throughout the PPR from 1906 through 2000 (Millet et al., 2009). More specifically, the western portion of the PPR, which includes the Dakotas and portions of Montana and Canada, has been getting drier while the eastern portion, which includes Iowa and southwestern Minnesota is becoming wetter. As this gradient steepens, the productive wetland ecosystems of the PPR will shift and shrink.

Historically, the climate of the western (portions of Montana, Saskatchewan, and Alberta) and eastern (Iowa and southwestern Minnesota) portions of the PPR would have limited wetland productivity due to either insufficient moisture and very long time between vegetation cover change or slow vegetation cover change, prolonged lake-marsh conditions, and too much water, respectively (Johnson et al., 2010). The most dynamic and therefore most productive wetlands would have occurred in the middle of these two extremes, across the Dakotas and parts of Canada.

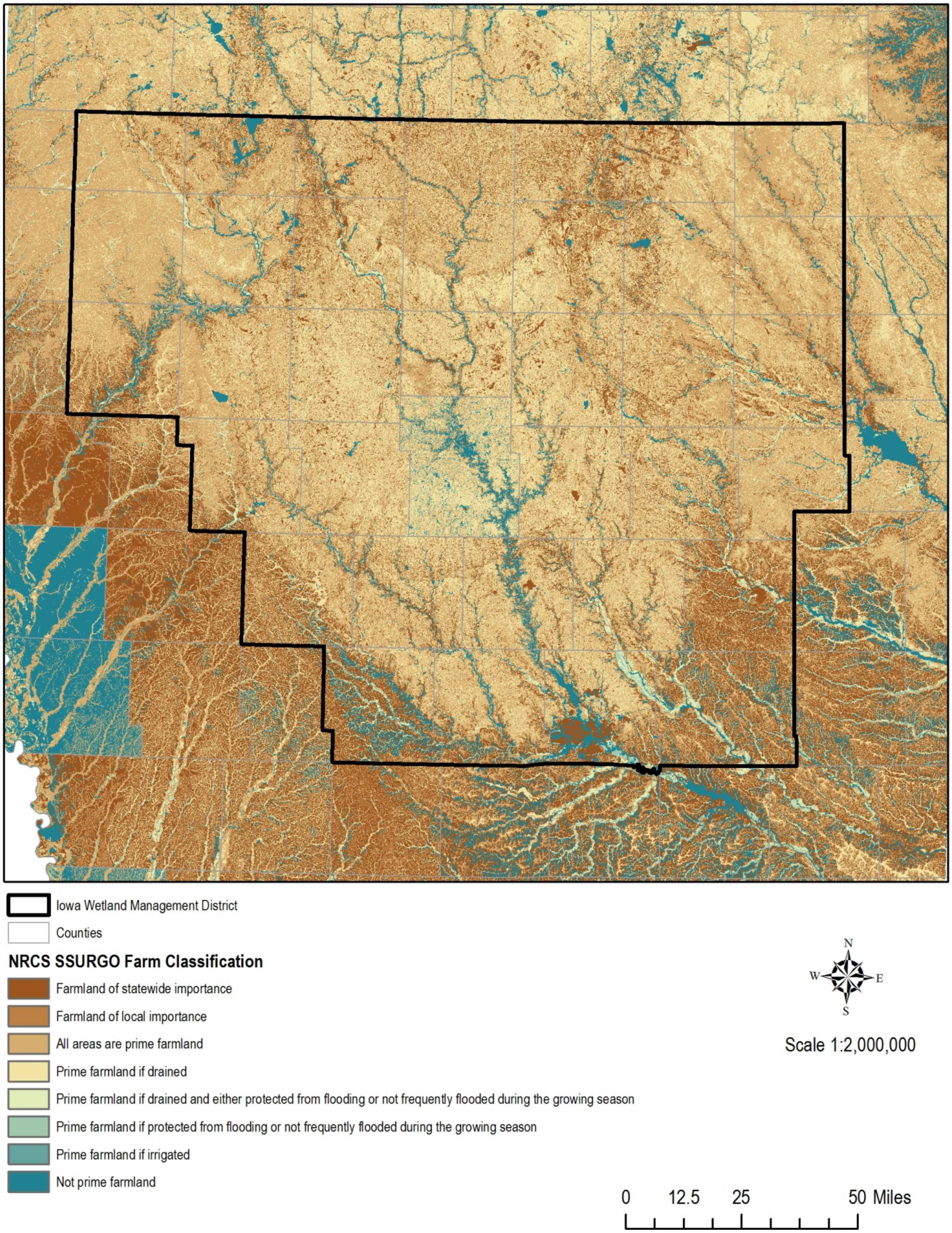
Three climate change scenarios, (temperature increase by 2 ºC, 4 ºC, and 4 ºC plus a 10 percent increase in precipitation) suggest that in the future, the eastern portion of the PPR could see improvements in wetland productivity (Johnson et al., 2010). A dryer climate could create a more balanced water/vegetation cycle, more dynamic wetlands, and therefore more productive wetlands. This both highlights the importance of the Iowa WMD within a changing climate but also poses a potential conservation challenge since much of the area has been drained and plowed for agriculture. It seems likely that this area will "have too few functional wetlands and nesting habitat to support historic levels of waterfowl and other wetland-dependent species" (Johnson et al., 2010). The challenge is further compounded by the high cost of wetland and grassland restoration in Iowa, high commodity prices, increased agricultural desires, and in turn high land values. Restoration of drained wetlands in Iowa, although expensive, could help diminish the effects of climatic drying and droughts in the western portion of the PPR (Millett et al., 2009). If any of these scenarios hold true, climate change would strongly reduce the contribution of the western PPR to overall wetland-associated biodiversity and would make the eastern PPR much more important. However, significant wetland restoration would have to occur in the eastern PPR to offset less productive conditions in the western PPR (Millett et al., 2009). Furthermore, adaptation of farming practices in wetland watersheds may buffer the effects of climate change on wetlands (Johnson et al., 2010).

Overall, a decrease in water supply to wetlands in the western PPR will likely cause significant shifts in plant communities either as direct responses to water level changes or indirectly through altered soil chemistry, decomposition, and disturbance regimes. For example in Minnesota, calcareous fens, providing habitat for a relatively large portion of rare plant species, may have reduced flow from lower hydraulic head in the ground water recharge favoring non-calciphitic vegetation (Galatowitsch et al., 2009). Unfortunately, several invasive species, including reed canarygrass, will also be favored. A shortened hydroperiod for wetlands will also severely affect vertebrates because of their longer life cycle requirements. These changes (based on a doubling of carbon dioxide output) could cut the U.S. mid-continent breeding duck population in half (Johnson et al., 2010).

The Soil Resource

The parent material of the district is all sedimentary rock including shales, sandstones, limestones, and dolomites. The western one-half is from the Cretaceous Era, the eastern one-half is from the Middle Paleozoic Era featuring Silurian, Devonian, and Mississippian Periods. The southern portion is from the Upper Paleozoic Era featuring Pennsylvanian and Permian Periods. The soils of the district are those typical of much of the Midwest, primarily mollisols with some alfisols. Mollisols naturally form under grassland cover with deep organic matter and are prime farmland especially if drained. Alfisols naturally form under hardwood forest cover with clay-enriched subsoil and high native fertility and are also prime farmland (figure 3-3).

Figure 3-3: Soils of the Iowa WMD



Changes to the soil resource, such as erosion, are common occurrences in Iowa. It is well known that land use has a large influence on soil erosion rates and that soil erosion has a negative influence on soil fertility and its overall production potential (farmers often have to add fertilizer to maintain crop production). In the 1950s, after recognizing the increased potential for soil erosion under modern agriculture, the USDA developed soil-loss tolerance values, also known as "T-value." This represents the amount of erosion loss the soil can withstand without sacrificing long-term productivity. The T-value for most soils in Iowa is 5 tons/acre/year. While the T-value is a useful concept for maintaining long-term sustainability of the site, there are conditions where those values could result in excessive sediment delivery to receiving waters to the detriment of fish and other aquatic organisms. In fact, Montgomery (2007) compiled studies from across the globe and confirmed that erosion rates from conventionally plowed agricultural fields average 1–2 orders of magnitude greater than rates of erosion under native vegetation and rates of soil production. Many of the erosion rates from fields in this study were at or above T-value, while most rates from native vegetation were less than T-value.

The Science-based Trials of Rowcrops Integrated with Prairies (STRIPs) project through Iowa State University at Neal Smith National Wildlife Refuge (NWR, refuge) has had similar results. The project is looking at the impacts of integrating small strips of prairie within row-cropped agricultural landscapes. Treatments consist of varying proportions of perennial vegetation within a row crop system. The 10 percent perennial vegetation treatments either have the perennial vegetation all at the bottom of the watershed or in contour strips distributed from the lower to the upper portions of the watershed. The 20 percent perennial vegetation treatment has contour strips distributed across the watershed. Two additional watersheds located adjacent to the study area with 100 percent reconstructed native prairie are also included for comparison. Preliminary data shows that from 2008 to 2012 soil lost from watersheds that contain 100 percent agricultural fields ranged from over 19,000 lbs./acre/year to over 1,000 lbs./acre/year. Soil lost from watersheds with the 20 percent perennial vegetation treatment ranged from 960 lbs./acre/year to 32 lbs./acre/year. Soil lost from watersheds with 100 percent reconstructed native prairie ranged from 300 lbs./acre in 2010 to 118 lbs./acre in 2011. Therefore, wetland and grassland cover types like those in the district are not only contributing less to soil erosion but are also trapping runoff water, soil, and nutrients from adjacent agricultural land. Furthermore, as this positive effect ripples across the landscape, downstream infrastructure including roads, culverts, and bridges are protected from the force of sedimentation and water as well.

Current Management

The soil resource is currently managed indirectly through habitat and vegetation management. Conversion from agricultural row crops to perennial grassland and wetland cover, permanent protection of remnant prairie, restoration of existing non-native grassland, restoration of pothole hydrology, and the use of prescribed fire all affect the soil resource.

Water Resources

Iowa's Des Moines Lobe forms the southernmost extent of the PPR of central North America. It terminates at the confluence of the Des Moines and Raccoon Rivers of which the Raccoon forms the southern and western border of the lobe. Small potholes and large, open water lakes are scattered throughout the landscape.

Prairie Potholes

Prairie Pothole

Prior to agricultural drainage, this region contained abundant wetlands, many associated with "prairie potholes" or "kettles" evident from the General Land Office (GLO) surveyors' maps and notes (figure 3-4). Recent geologic studies of the Des Moines Lobe have changed ideas concerning the origin and hydrology of these wetlands and their relationship to other aspects of the landscape. Geologists previously thought that Iowa's potholes and kettles formed when chunks of buried glacial ice melted to create isolated, bowl-shaped depressions on the freshly exposed land surface between 14,000 and 11,500 years ago. These depressions were thought to be "closed," having no drainage outlets. More recently, detailed examination of aerial photographs and subsurface earth materials has revealed that many of these depressions are only partially closed; they actually join with neighboring depressions to form linked systems.

While subtle features on the ground, the linked depression systems stand out as dark web-like patterns when viewed from the air. The links outline the routes of former meltwater channels, and some of these actually connect drainage ways that today lie in two separate surface drainage basins. The linked-depressions originated as part of a glacial karst system that developed in a stagnant glacier loaded with sediment. As the glacier's surface melted, water entered cracks in the ice and began to widen and deepen. These eventually formed drainage tunnels within the stagnant glacier that joined with other drainage ways near the base of the ice. As water flowed through the system, sediment within the ice also entered the tunnels. Over time, fine-grained silt and clay were flushed from the tunnels, but more coarse sand and gravel settled along the routes. When all the ice was melted, the former branching passages, with their permeable sand and gravel deposits, were preserved as linked systems set into and intermingling with other surrounding glacial materials.

The real importance of this finding is in ground water quality. Rather than the sluggish ground water system previously envisioned for large parts of the Des Moines Lobe, the linked depressions actually act as a system of "natural drainage tiles" that join poorly drained upland areas with surface waters. This linkage provides a previously unrecognized pathway for dissolved contaminants, such as crop nutrients, to enter the region's waters (Iowa DNR, 1997).

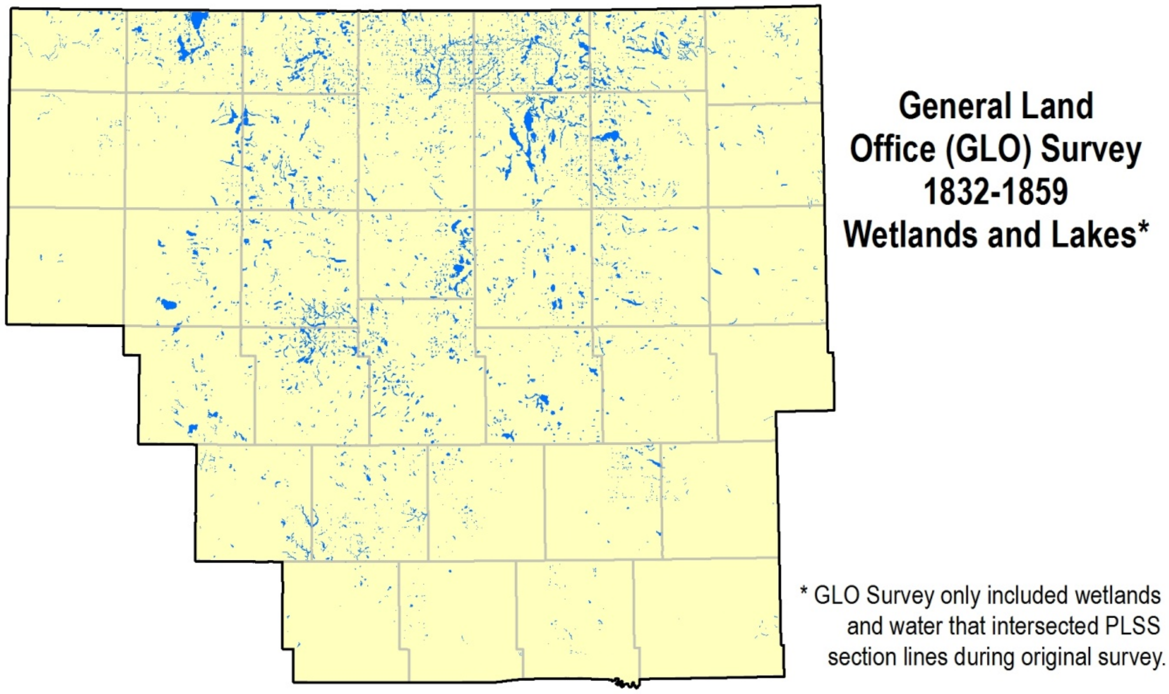
Historically, these depressions provided an infiltrative hydrology, allowing surface water to be collected, stored, and gradually released to larger streams and underground aquifers. However, for nearly a century and a half, farmers drained, dredged, and tiled the wetlands and small streams on the Des Moines Lobe until approximately 99 percent were gone (figure 3-4). Larger streams and rivers were dredged and straightened for faster removal of surface water. Today, the landscape looks much different, dominated by agriculture that consists primarily of corn and soybeans. This alteration has led to an imbalanced hydrological regime. In the upstream or headwater portion of small streams, water moves off the land much faster, allowing greater stream bank and bed erosion, creating increased transport and deposition of materials (including soil and agricultural chemicals), along with more severe flooding downstream. Draining of wetlands has lowered the water table, causing natural underground springs and small streams to stop flowing. Most of these hydrological changes have occurred within a human lifetime (Anderson, 2001).

Watersheds and Rivers

Historically, small prairie streams, meandering through the tall grasses, subtly linked the marshes, sloughs, and wetlands to larger streams and rivers, making it difficult to determine exact watershed boundaries. Today, after improved drainage from both natural and anthropogenic causes, the watersheds of the district are more easily defined. The western most portion (about one-third) of the district drains to the Missouri River, while the rest of the district drains to the Mississippi River. The primary watersheds, from west to east include the Missouri-Little Sioux, Des Moines, and Upper Mississippi-Iowa-Skunk-Wapsipinicon. Major rivers that run through the district include the Little Sioux, Des Moines, Raccoon, Iowa, Cedar, Shell Rock, Upper Iowa, Boone, Winnebago, and Skunk (figure 3-5).

Many of these rivers have been environmentally degraded since they have been dammed, deepened, straightened, and rerouted to better regulate flood control and allow for development. Only the Boone and Upper Iowa do not have stretches within the district listed as impaired on the Iowa Impaired Waters List for 2010. However, several stretches of the Upper Iowa outside the district are listed as impaired. Reasons for listing include concerns for human health (fish consumption), aquatic life, and primary contact—recreation due to high levels of bacteria, mercury, and unknown impacts on freshwater mussels (Iowa DNR, 2010).

Figure 3-4: Historic and Existing Wetland Comparison of the Iowa WMD



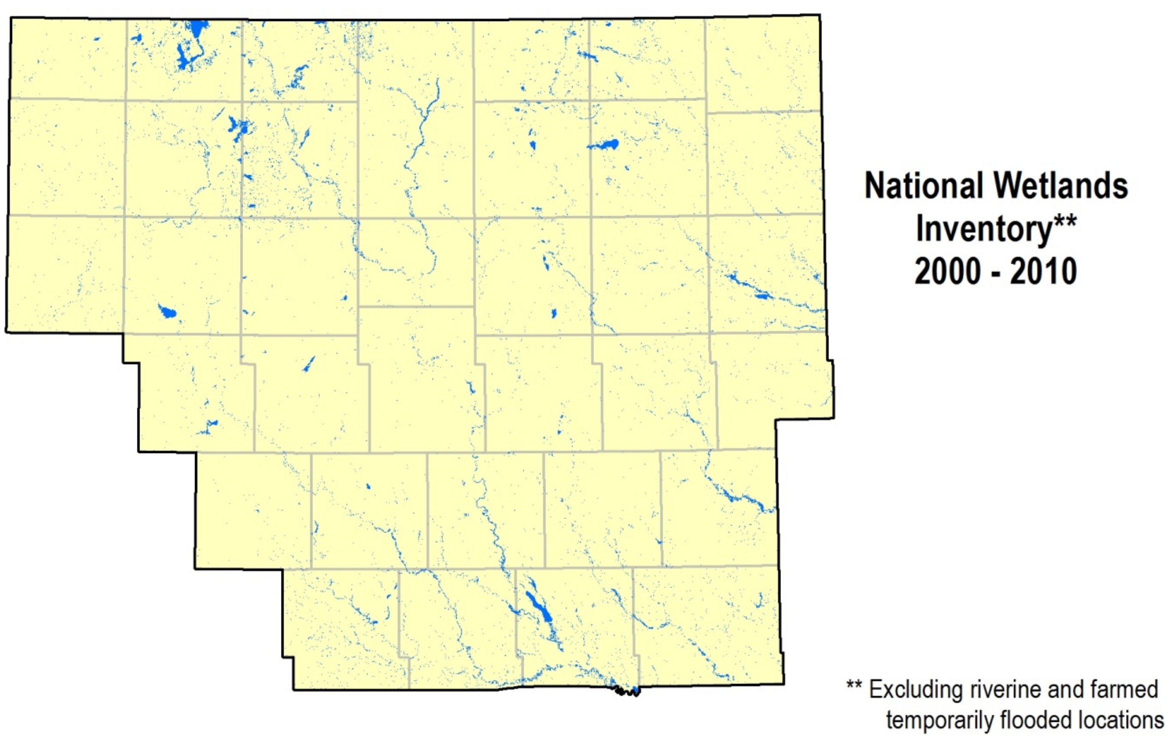
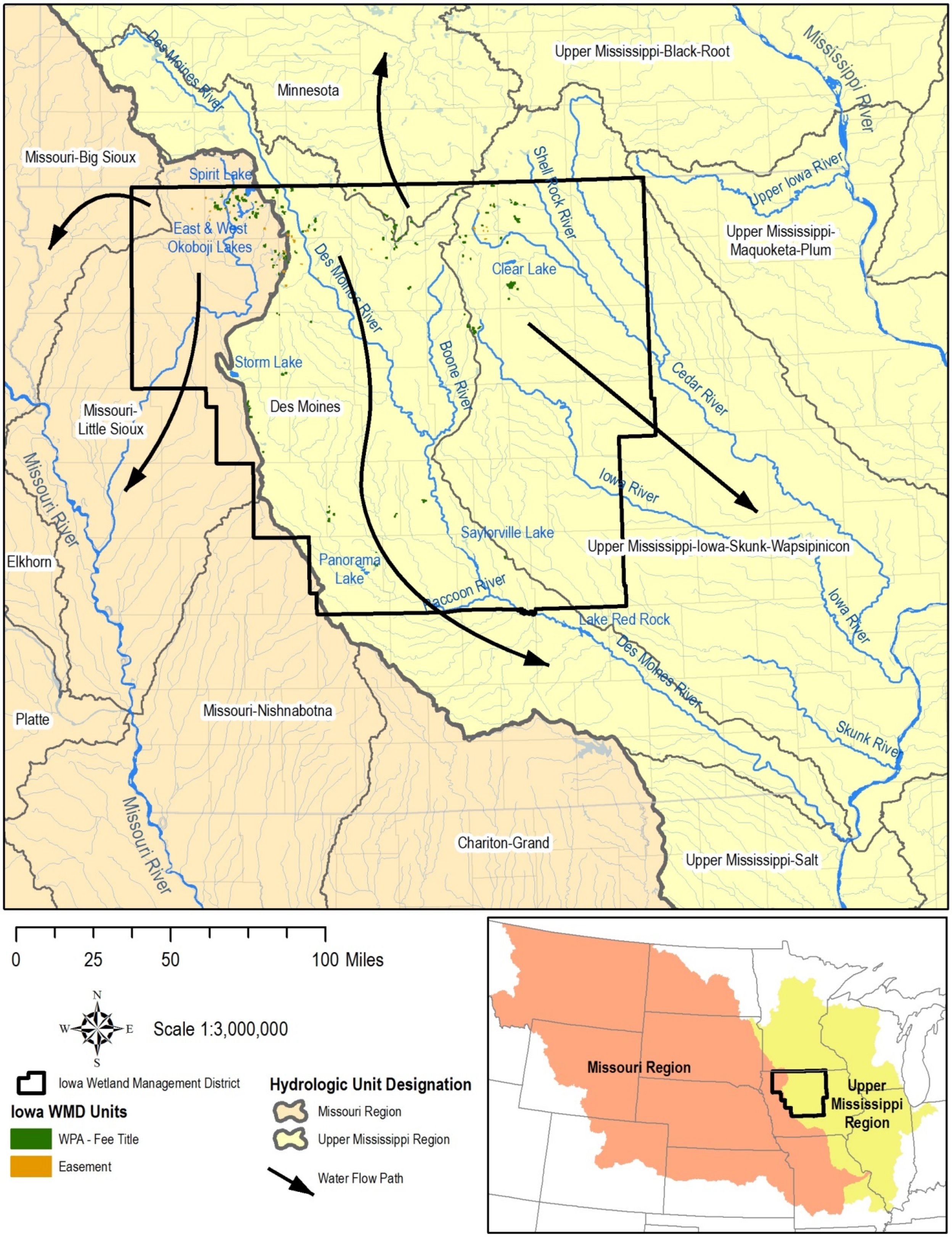


Figure 3-5: Watersheds, Rivers, and Lakes of the Iowa WMD



Lakes

Shallow Lake

The district includes many lakes, large and small, shallow and deep (figure 3-5). Saylorville Lake near Des Moines is a large man-made lake completed in 1977 as interest in flood protection for the city of Des Moines peaked after several major floods of the Des Moines River. Spirit Lake, East Okoboji Lake, and West Okoboji Lake near Spencer are Iowa's largest natural (glacial) lakes and have become known as the Iowa Great Lakes. Storm Lake near the City of Storm Lake is Iowa's fourth largest natural lake, while Lake Panorama near Guthrie Center is Iowa's largest private lake. Clear Lake near Mason City is another large natural lake of Iowa. Saylorville, West Okoboji, Spirit, and Clear lakes are all listed as impaired waters for the state due to high levels of bacteria (Iowa DNR, 2010).

Drainage and Pesticides

Drainage Tile Installation

The PPR of Iowa has been drastically altered since settlement. The glaciation that created this area left a landscape that was flat to rolling with few well defined drainage networks. Wetlands were connected by small, subtle prairie streams. Dense, deep-rooted vegetation and poorly developed drainage resulted in an infiltrative hydrology. Water was collected, stored, and slowly released to larger rivers and underground aquifers. This is in stark contrast to the present conditions in Iowa's PPR. Streams and drainage ways have been deepened and straightened. Thousands of miles of drainage tile have been installed. The once vast prairie has been replaced with corn and beans. The result is a landscape that removes water quickly and increases soil erosion, nutrient and pesticide transport, and downstream flooding. Hydrologic changes in the landscape go far beyond the loss of the vast majority of the wetland basins. The water table has been lowered significantly, and both surface and subsurface drainage patterns have been drastically altered.

Since Waterfowl Production Areas (WPAs) are only islands in this sea of intensive agriculture with highly altered drainage patterns, the frequency, intensity, and duration of water flowing into many units is abnormally high. Siltation, nutrient loading, and contamination from point and non-point sources of pollution are a serious problem on many WPAs. WPAs are also threatened by farming trespass, dumping, wildfires, and pesticide applications on adjacent agricultural land. A study in Ontario, Canada examined the effects of habitat and agricultural practices on birds breeding on farmland and determined that the most important variable decreasing total bird species abundance was pesticide use (Freemark and Csizy, 1993).

Recent changes in agriculture have accelerated the impact of pesticides on surrounding land. Genetically altered Roundup® ready corn, soybeans, cotton, and sugar beets have expanded the window of opportunity for pesticide applications and promises to kill everything green on fields except the genetically altered crops. Another altered crop, Bt. Corn, contains a genetically engineered insecticide. Even the pollen from this plant can kill certain insects, such as monarch butterflies.

Research has shown that insecticides commonly used for sunflowers, soybeans, and corn can kill wildlife directly and indirectly by decreasing the amount of food available. For example, ducks feed on grain much of the year, but in the spring they shift to aquatic invertebrates such as insect larvae, amphipods, and snails and depend on this food source for reproduction and survival. Even when aerial insecticide applications are completed carefully and wetlands are avoided, the chemicals drift into wetlands in measurable amounts and kill aquatic invertebrates (Tome et al., 1991 and Grue et al., 1986).

Insecticides have a direct effect by killing aquatic invertebrates, but herbicides also have an indirect effect on food available to waterfowl. The U.S. Fish and Wildlife Service (FWS, Service) conducted a study of the impact of agricultural chemicals on selected wetlands in four WMDs in Minnesota (Ensor and Smith, 1994). Herbicides from surrounding agricultural land enter wetlands and disrupt the functional interaction between vegetation structure and aquatic invertebrate life. The changing dynamic reduces food available to breeding waterfowl.

Seasonal and semi-permanent wetlands, which are the majority of WPA wetlands, are the most exposed to agricultural chemicals. These wetlands are small and interspersed with croplands, which increases the probability of pesticides from overspray and aerial drift. Most pesticides are applied to crops in the spring and early summer, coincident with maximum runoff and waterfowl breeding. Therefore, prairie pothole wetlands may involve interactions of multiple herbicides and possibly insecticides creating a unique “chemical soup" in each individual wetland (Ensor and Smith, 1994). Ensor and Smith’s study showed that "typical agricultural use" of pesticides on surrounding land had a significant impact in reducing the biological quality of WPA wetlands.

The extensive open ditches and drainage tile also play a critical role as conduit for the transmission of exotic species into wetlands. Rough non-native fish species such as carp can reside in ditches and drainage tile surviving even low dissolved oxygen levels. These fish travel upstream through ditches and tile reaching wetlands, where they cause turbidity in the water, disturbing wetland soils, and preventing aquatic plant growth.

Current Management

At the district level, water resources are primarily managed indirectly through habitat and vegetation management. For example, the planting of perennial grassland cover around district wetlands provides a protective buffer that reduces silt and nutrient loading of the wetlands. However, some district wetlands use water control structures to allow the manipulation of water levels for management purposes such as rough fish control, wetland revegetation, or the prevention of negative impacts to adjacent private cropland. In fact, agricultural drainage activities are the biggest challenge for the district when implementing management actions. Wetland restoration in the district must be carefully orchestrated as not to interrupt drainage on adjacent private land. In many cases, drainage must be maintained across WPAs so neighboring fields continue to drain. This often involves outletting tile into district wetlands, rerouting tile and/or replacing tile with nonperforated pipe, and/or installing water control structures. As mentioned above, this water brings excessive soil and nutrient runoff from adjacent crop fields into the wetlands in the district. Restoring wetlands in this landscape have foreseen consequences. If a restorable wetland is connected to a surface ditch, the restored wetland may act as a sediment retention basin and not function as a true wetland. This effects the vegetation in the wetlands and ultimately waterfowl production in those wetlands.

Air Quality

Iowa's rural setting tends to promote better air quality than some other states in the Nation. However, Iowa's tradition as a working lands state, especially agriculturally, actually exposes its air to numerous potential sources of pollution. Existing air quality within the district is subject to air pollutants from the following:

- Internal combustion engines, including vehicles, tractors, outboard motors, and chainsaws
- Agricultural sources, including livestock confinements and field dust
- Private sources, including burning brush piles
- Industrial sources, including factory and other large industry output in larger cities

Current Management

While several district management activities, such as using chainsaws, seeding cropland to native prairie, and driving trucks and tractors, release pollutants into the air, perhaps the activity of most concern regarding air quality is prescribed fire. Prescribed fire is one of the basic tools used to achieve a variety of management objectives in the fire dependent tallgrass prairie ecosystem within the district. Tallgrass prairie evolved with recurring fire and is therefore dependent on recurring fire for maintenance.

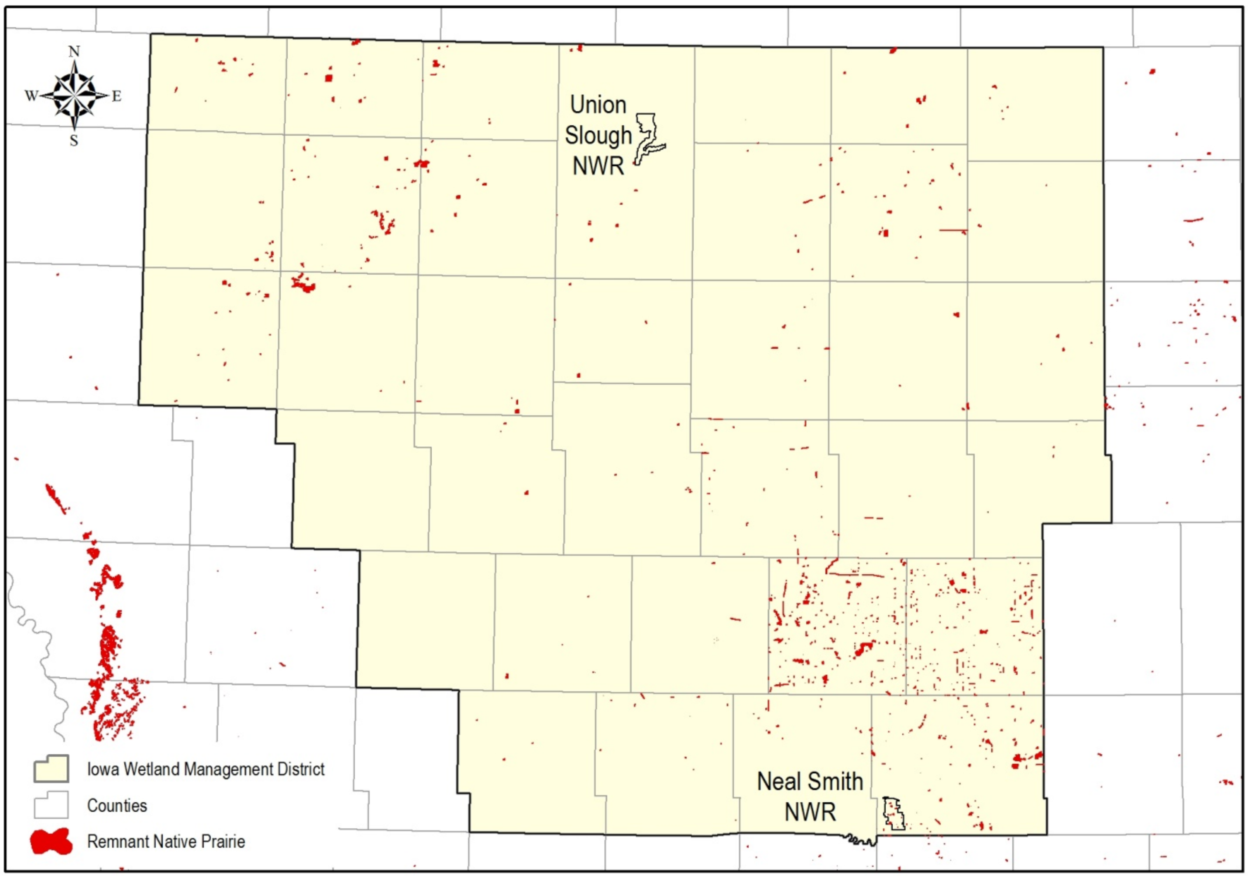
While prescribed fire affects air quality by releasing particulates and pollutant gases, it is only a sporadic and temporary source of air pollution. Air quality impacts are short-lived since a specific burn plan is written, indicating, among other variables, particular wind requirements (direction and speed) for igniting any given fire. Wind typically dissipates smoke rapidly. Approximately 5,000–7,000 acres of habitat are burned in the district each year either for restoration or maintenance of grasslands. This acreage will likely increase if the district continues acquisition. Presently, the vast majority of prescribed fire occurs in the spring with little accomplished in the fall. There is a desire for more autumn and summer prescribed fires; however, a variety of factors makes this challenging. Overall careful planning and good communication has reduced negative impacts to neighbors and sensitive facilities in the area.

Habitat

Often called the Prairie Pothole Region, the Des Moines Lobe was glaciated up until 12,000 years ago. As the glaciers receded, the lobe that extended into north-central Iowa left behind

7.6 million acres of grasslands, with the tallgrass prairie biome as a prime example, and two to three million acres of wetlands and small interconnected swamps. This prairie/wetland complex evolved under the influence of climate and processes such as fire and grazing. After the glaciers receded, the climate became much warmer and drier. This change led to a dramatic expansion of prairie over a period of several thousand years. About 3,000 years ago, the climate turned cooler and wetter. This should have favored the expansion of trees, but the prairie in Iowa was maintained by regular fires and grazing by large herbivores. However, in the late 1800s, Iowa suffered significant losses in wetland and grasslands as settlers began converting the rich soils of these habitats to cropland. Nonetheless, this region contains some of Iowa's finest remnants of the tallgrass prairie (figure 3-6). Prairie bush clover (*Lespedeza leptostachya*), a plant endemic to the upper Midwest, is found on some of these remnants (Eilers and Roosa, 1994).

Figure 3-6: Iowa's Remaining Tallgrass Prairie Remnants



Based on the Potential Natural Vegetation data derived from the USDA Natural Resources Conservation Service, Soil Survey Geographic database soil descriptions, historically over 90 percent of the district was prairie; over six percent was savanna and just over one percent was forest (figure 3-7). Pothole wetlands were not uniquely identified as a habitat type; however marsh, bog, muck/peat, and water were identified (figure 3-7). Since not much of these categories show up in the district, it is likely that the pothole wetland habitat is included in prairie, considered "wet prairie." Currently, over 80 percent of the district is in row crop agriculture while nearly eight percent is developed. Surprisingly, seven percent remains in grassland agriculture or herbaceous cover. Finally, two percent is forested and just over one percent is wetlands (figure 3-8).

During the Comprehensive Conservation Plan (CCP, Plan) planning process, a vegetative cover type Geographic Information System (GIS) layer was created. Aerial photography interpretation was used to classify the vegetation covering the district into several general categories including agriculture, developed, disturbed, grassland, open water, trees, and wetland. This layer was compared to a similar layer created by the Iowa DNR a couple of years ago; however, that layer did not include WPAs managed by Union Slough NWR (within the district) or the district's newest acquisitions. Table 3-1 summarizes the number of acres per cover type category. Figure 3-9 displays one WPA as an example showing the layer that was created during the CCP planning process.

Table 3-1: Iowa WMD Vegetative Cover Type Classifications as of Summer 2011

Cover Type	DNR Managed (acres)*	Union Slough NWR Managed (acres)*	Acquired After DNR Classification (acres)*	Total (acres)*
Agriculture	3,385	0	342	3,727
Developed	143	23	0.4	166.4
Disturbed	34	8	1	43
Grassland	13,262	2,839	86	16,187
Open Water	850	54	0	904
Trees	311	93	3	407
Wetland	3,235	276	6	3,517
Total	**21,220**	**3,293**	**438.4**	**24,951.4**

*Acres are based on GIS polygons and calculations, not on legal survey documents.

Figure 3-7: Potential Natural Vegetation of the Iowa WMD

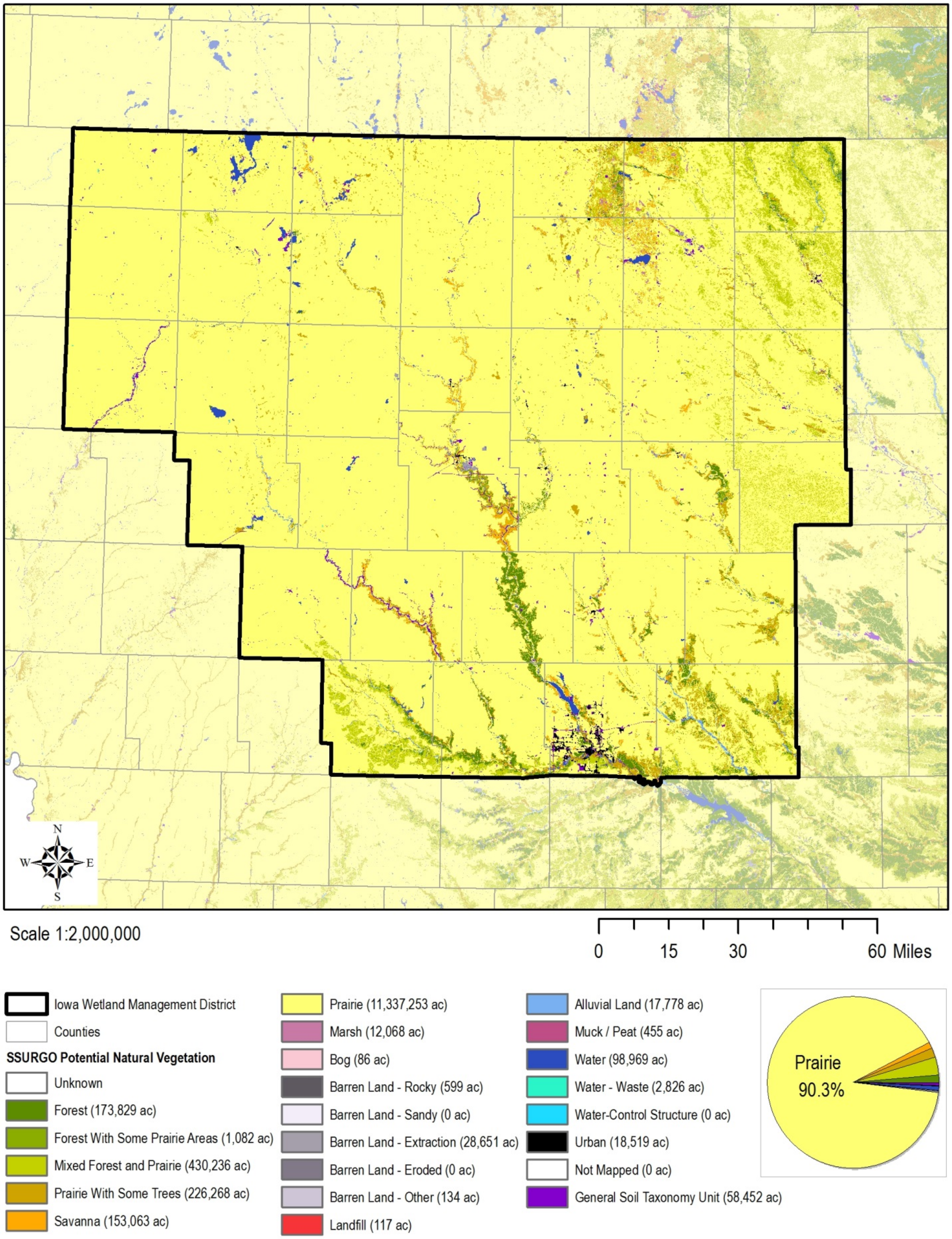


Figure 3-8: National Land Cover (2006) of the Iowa WMD

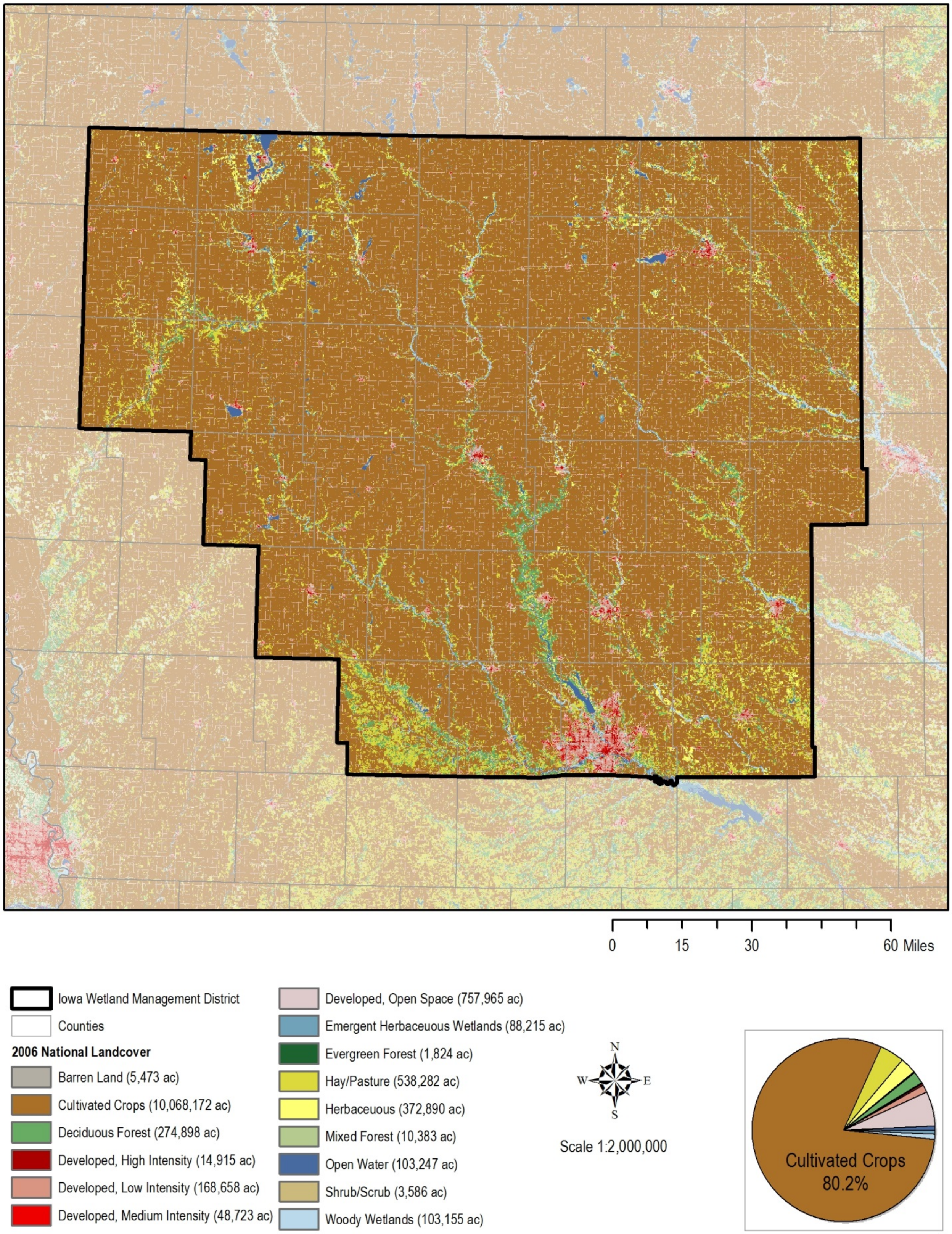
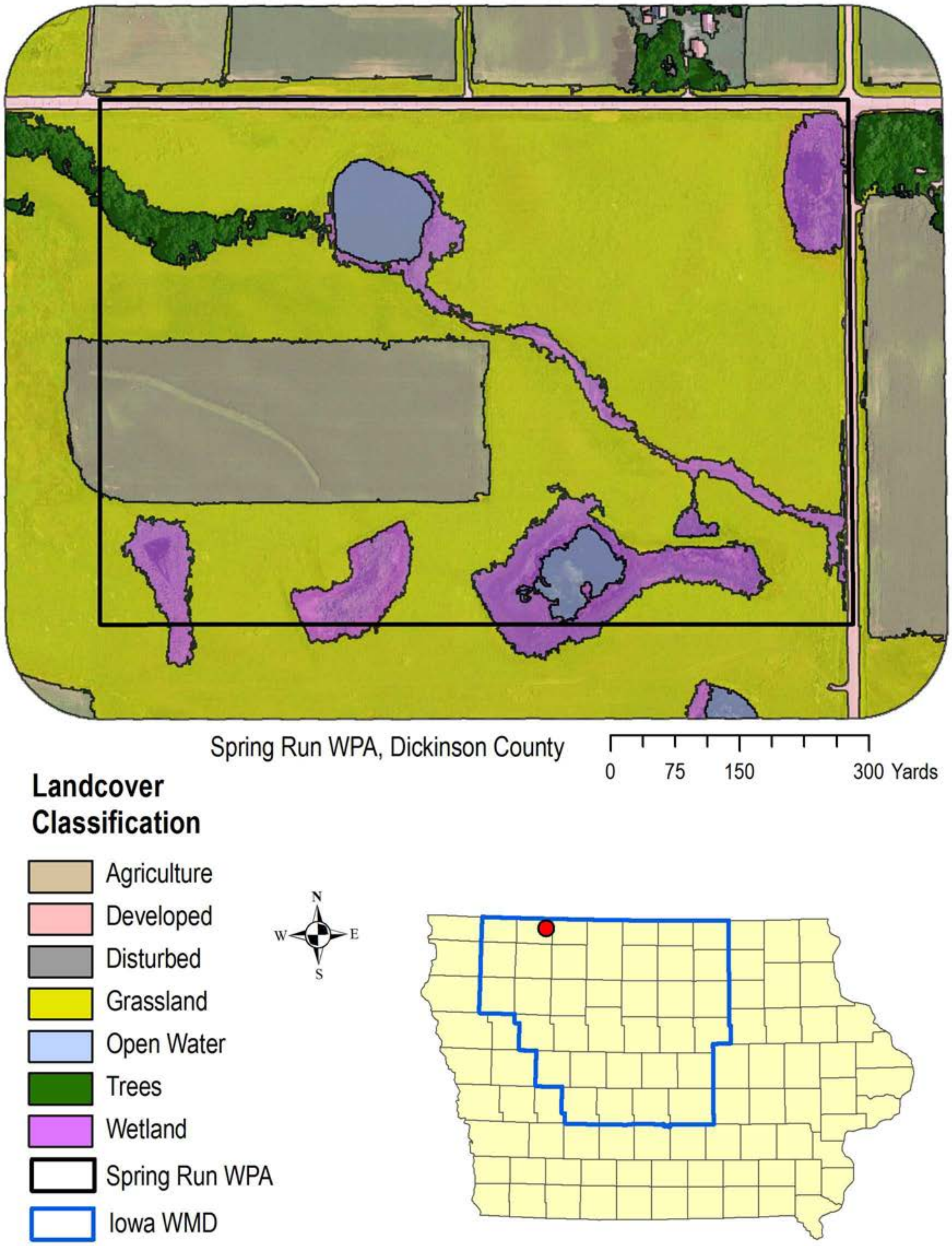


Figure 3-9: Vegetative Cover for Spring Run Waterfowl Production Area in the Iowa WMD



Wetlands

Prairie wetlands and prairie streams are an important part of the prairie ecosystem. The PPR is characterized by numerous, shallow wetlands known as potholes. These wetlands provide essential fish and wildlife habitat, permit ground water recharge, and act as filters of sediment and pollutants. They reduce floods by storing water and delaying runoff. The PPR of more than 300,000 square miles once included about 20 million acres of wetlands; today, only about 5.3 million acres remain in 2.7 million basins within five pothole area states, including Iowa. More than 78 percent of these wetland basins are smaller than one acre in size. They were poorly drained, and in the spring they retained water, acting like a great landscape sponge. Over the course of the season, water drained slowly.

Settlers found the shallow wetlands difficult to farm as the high water table kept the ground saturated for extended periods in wet years. Therefore, the vast prairie pothole wetlands of north central 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. However, in 1850, Congress passed the Swamp Land Act. It directed each county to survey all wetlands and sell them at auction for five cents per acre. 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. When the land was converted to farms, the new owners built drainage ditches, straightened streams, and drained shallow wetlands off their land. Now, in the spring, water rushes off the land and floods the streams and rivers. Drainage has been so extensive that in many areas the water table has been lowered and the hydrology of the entire region has been transformed. In Iowa, 99 percent of pre-settlement wetlands have been lost (from 2.3 million to 26,470 acres), primarily between the 1780s and the 1980s (Noss et al., 1995).

The fluctuating water levels in the shallow wetlands are natural to the dynamic pattern of precipitation in the prairie. The changing water level results in circular bands of vegetation around each basin, because different plant species have different tolerances for saturated soils. The depth of the basin also affects the kind of vegetation that grows. The drying pattern is one of the features used to classify wetland basins. Deeper basins have perennial emergent vegetation such as cattails and dry up every five to 10 years. Wetlands that dry up every other year or on a several year cycle are called semi-permanent or permanent wetlands. Basins that dry up every year are temporary or seasonal wetlands. Some very shallow basins, called ephemeral wetlands, dry up early in the spring after the frost leaves the ground.

Freshwater wetlands like those in the PPR are among the most productive in the world (Weller, 1981). The dynamic water cycle creates a rich environment for many waterfowl and other marsh birds. Cycling water accelerates decomposition of marsh vegetation, resulting in a natural fertilizer. When the basins recharge in the spring, the water becomes a soup of nutrients and supports a diverse and healthy population of aquatic invertebrates, which feed reproducing waterfowl and marsh birds throughout the spring and summer. In the larger basins, the vegetation changes from densely closed cattail (*Typha sp.*) or bulrush (*Scirpus sp.*) cover to open with little cover over a period of years. In the process of transition, the cover vegetation moves through a phase, known as hemi-marsh, when clumps of emergent vegetation are interspersed with open water (Weller, 1981). In this phase, the structure of the vegetation itself creates habitat and stimulates the production of aquatic invertebrates, which in turn hosts the maximum number of marsh birds. Unfortunately, this phase is only temporary and most wetlands cycle out of it in one to three years.

Unfortunately, large-bodied fish appear to be critical determinants of wetland condition. Common carp (*Cyprinus carpio*), bullhead (*Ameiurus sp.*) and other large fish were not historically abundant in Iowa prairie pothole wetlands but now occur in many of these ecosystems and are causing significant problems. Large fish stir up wetland sediment while foraging, which reduces water clarity. Fish foraging activities also increase nitrogen and phosphorus in the water, which stimulates noxious algae blooms. Fish can also physically uproot plants and reduce the number of invertebrates by eliminating their habitat and consuming them. Large fish may be introduced to wetlands when nearby streams and rivers flood. When the flood water recedes, many fish are stranded in the ponds where they often thrive. Fish can also invade wetlands from streams and rivers via constructed drainage ditches (Galatowitsch and van der Valk, 1994).

According to the National Wetlands Inventory, updated over the past several years, the district contains approximately 372,722 wet acres. Those wet acres are either associated with rivers (riverine: 35,498 acres), lakes (lacustrine: 55,065 acres), or marshes, swamps or ponds (palustrine: 282,159 acres). However, nearly 40 percent (107,893 acres) of the palustrine acres are temporarily wet areas that have been farmed through, usually having very little or no wetland emergent vegetation (figure 3-10). The various water regimes for the wet acres in the district are presented in table 3-2.

Figure 3-10: National Wetlands Inventory of the Iowa WMD

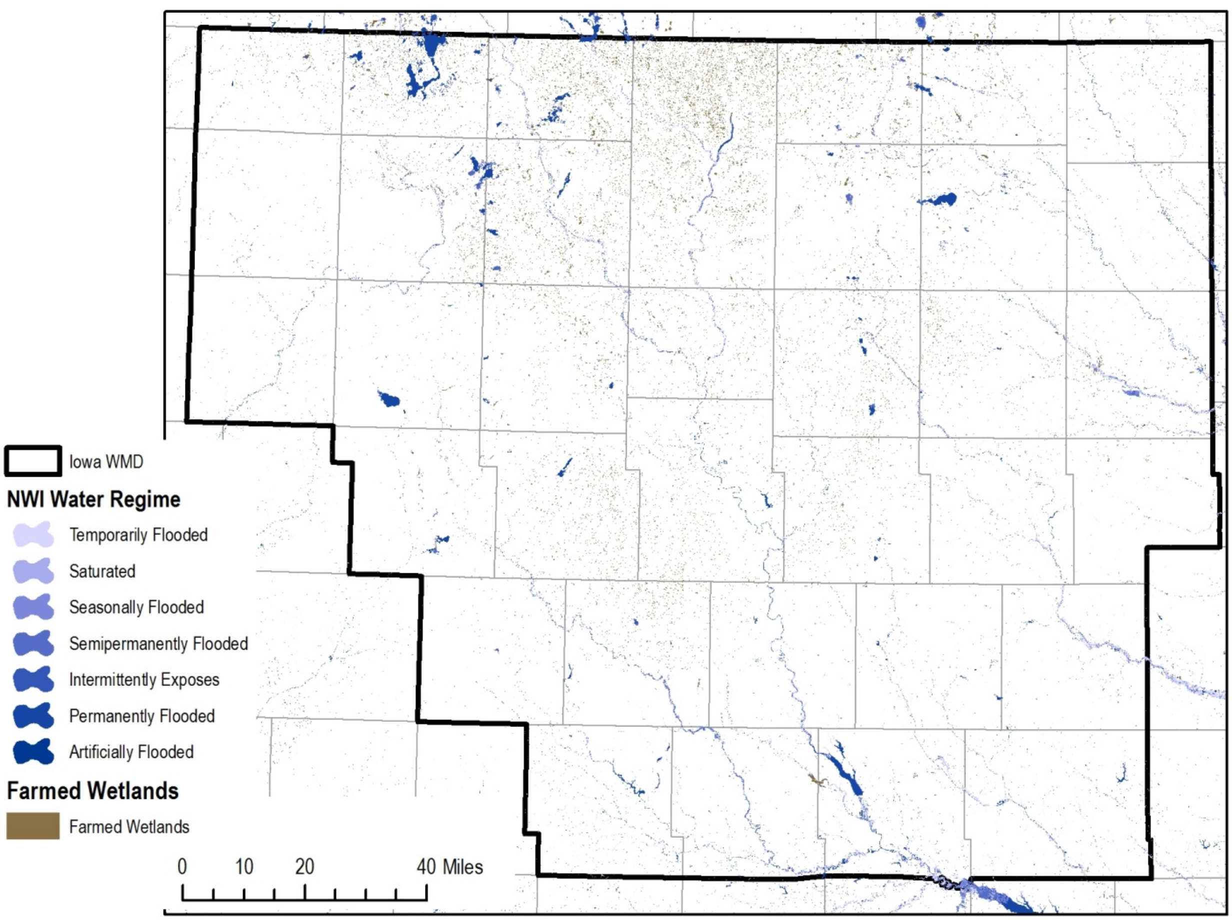


Table 3-2: National Wetlands Inventory Water Regime for the Iowa WMD's Wet Acres

National Wetlands Inventory Water Regime	Acres
None	470
Temporarily Flooded including "ditched and farmed"	194,960
Saturated	1,107
Seasonally Flooded	54,438
Semi-permanently Flooded	19,504
Intermittently Exposed	24,586
Permanently Flooded	75,014
Artificially Flooded	2,642

Current Management

The goal of wetland management in the district is to provide diverse wetland complexes that provide high quality nesting and migratory habitat for waterfowl and other water birds. Most new lands acquired for the district have been crop fields for many decades. This has resulted in the draining of all wetlands on the property. After acquisition, one of the first management actions taken on these lands is to restore the drained wetlands. Wetland restoration is accomplished in a variety of ways including the removal and/or alteration of underground drainage tile, the plugging of drainage ditches, the construction of dikes or the installation of water control structures. After restoring the hydrology, most wetlands are allowed to naturally revegetate. Seeding appropriate wetland plants into the various zones of the wetland can increase plant diversity. This is rarely completed due to a lack of appropriate seed source, high cost, and extensive time commitment. The few attempts that have been made to increase plant diversity by seeding wetland areas have been met with mixed results at best. Once restored, the manipulation of vegetation is the primary management action that is being used more often with Iowa DNR zone seedings. Prescribed fire and water level manipulation are the most common tools used to manage wetland vegetation.

Native Grasslands

The natural prairie of Iowa was more than just a monolithic sea of grass, with some containing 200 plant species. 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 (*Carex sp.*), sloughgrass (*Beckmannia sp.*), cordgrass (*Spartina pectinata*), bluejoint (*Calamagrostis canadensis*), and various panicgrasses. Common forbs (constituting 80 percent of the plant species in some areas) included such species as gayfeather (*Liatris pycnostachya*), cup plant (*Silphium perfoliatum*), turk's-cap lily (*Lilium superbum*), prairie clover (*Dalea sp.*), various coneflowers, and New England aster (*Symphyotrichum novae-angliae*). Better-drained loamy soils on slopes and broad ridges were covered with more moderate stands of switchgrass (*Panicum virgatum*), big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), and forbs like compass plant (*Silphium laciniatum*), rattlesnake master (*Eryngium yuccifolium*), smooth blue aster (*Symphyotrichum laeve*), wild indigo (*Baptisia sp.*) and goldenrod (*Solidago sp.*). Drier sites on gravel and sand ridges or steep slopes supported shorter and more open stands of little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), and needlegrass (*Stipa sp.*), with forbs like pasqueflower (*Pulsatilla patens*), ground plum

(*Astragalus crassicarpus*), pucoon (*Lithospermum sp.*) and downy gentian (*Gentiana puberulenta*).

Purple Prairie Clover

Today, remnants of prairie and their associated wetlands are scattered and rare across their historic range, especially in Iowa. In fact, all types of tallgrass prairie are considered endangered ecosystems (85–98 percent decline), but tallgrass prairie east of the Missouri River and on mesic sites across its range is critically endangered (>98 percent decline). In Iowa, 99.9 percent of the natural tallgrass prairie has been lost. Remnants totaling approximately 30,000 acres remain mostly on dry and dry-mesic sites too rocky, sandy, dry, or inaccessible to plow (Noss et al., 1995). These remnants form the last refuge for many species of prairie plants and wildlife (Zohrer, 2005).

As is often the case when something reaches levels so low that it is in danger of disappearing completely, tallgrass prairie has enjoyed a resurgence of interest over the last several decades. This has led to more plantings using native species. At first, monotypic stands of switchgrass were planted. Then mixes of three to five species of native grasses were used. Today, many prairie plantings include diverse mixes of native grasses and forbs, often up to 70 species of forbs and grasses. Although they still fall short, these diverse plantings do more closely resemble remnant prairie.

Savannas are areas of scattered, open canopy trees surrounded by tallgrass prairie. The dominant savanna tree species is burr oak (*Quercus macrocarpa*). Historically, pockets of savanna were found in portions of the Des Moines Lobe landform in Iowa. Notably, Winnebago and Worth Counties contained significant tracts of savanna. Savanna is important to bird species such as red-headed woodpecker (*Melanerpes erythrocephalus*), Eastern bluebird (*Sialia sialis*), loggerhead shrike (*Lanius ludovicianus,*) and orchard oriole (*Icterus spurius*).

Current Management

Remnant prairie in the district is managed to provide high quality habitat for migratory birds. It is also important to preserve the remnant prairie for its intrinsic value. Some remnant prairie provides habitat for threatened and endangered species, and in fact, tallgrass prairie is itself an endangered ecosystem. All management activities on these lands occur only after considering the long-term effects they will have on the prairie community, especially effects on any known threatened or endangered species. Common management activities on these lands include prescribed fire, tree and brush removal, invasive species control, haying, and grazing.

The majority of district lands were crop fields when they were purchased. Therefore, most of the upland in the district was seeded with a goal of planting vegetation attractive as nesting cover to waterfowl and other migratory grassland birds. Currently, most new seedings planted

Tallgrass Prairie

in the district are diverse mixes of local ecotype native grasses and forbs. These diverse mixes often contain 50 to over 130 species. Some of the oldest native seedings in the district contain a single species such as switchgrass or big bluestem. There are also intermediate diversity seedings that contain anywhere from a mix of three to seven native grasses to a mix of ten to twenty native grasses and forbs. As the seed mixes evolved from low diversity to high diversity, it became clear that the geographic origin of the seed used was important. Southern ecotype seed will grow in northern Iowa but frequently does not produce viable seed. Varieties from too far north of Iowa tend to be susceptible to disease. Therefore, great care is taken to ensure that all native seedings use appropriate ecotype seed. Once established, planted native grasslands are managed with prescribed fire, tree and brush removal, invasive species control, haying and grazing.

Savanna is not a habitat type that is targeted for purchase by the district. Restoring and managing savanna has little, if any, benefit to ground nesting waterfowl. In fact, savanna habitat is likely to attract avian and mammalian predators that will be a detriment to ground nesting waterfowl. However, some past acquisitions have contained a few small areas that may be degraded savanna. Savanna is an important habitat type; however, it is not currently the district's highest priority. Therefore, the current strategy to manage these savanna areas is passive—to leave them as they are for now.

Non-Native Grasslands

Prior to settlement, most of Iowa was covered with tallgrass prairie. As the state was settled and the prairie was broken up, introduced species gained a foothold. Europeans brought familiar plant species with them as they settled Iowa. Some of these new species were introduced intentionally as pasture "improvement." Other species were introduced by accident from hay that was imported from overseas to feed livestock. Regardless of how they got here, many of these species have flourished since their introduction to Iowa. Grasses like smooth brome (*Bromus inermis*), timothy (*Phleum pretense*), orchardgrass (*Dactylis glomerata*), and Kentucky bluegrass (*Poa pratensis*) are now common grasses throughout Iowa. Broad-leaved plants such as crownvetch (*Coronilla varia*), birdsfoot trefoil (*Lotus corniculatus*), alfalfa (*Medicago sativa*), and Canada thistle (*Cirsium arvense*) are also commonly found in Iowa's grasslands today.

Current Management

There are many acres of non-native grassland in the district. In some cases, the land was purchased with existing stands of the non-native grassland. Hayfields, old pasture or land that had been enrolled by the previous landowner in CRP are frequently covered with non-native species such as smooth brome.

Non-native grasslands are, at times, planted on old crop fields in the district, because they are attractive as dense nesting cover for ducks and other migratory birds. Haying after July 15 is the primary tool used to manage these areas. Waiting until July 15 to mow the grass allows nesting birds a chance to hatch and fledge before the field is cut. Haying controls invasive woody vegetation and invigorates the alfalfa in the stand. Cool season introduced species are also planted at times as firebreaks around building sites or other sensitive areas.

Prescribed fire is also used to manage non-native grasslands. If the fire is conducted in the early spring, it will also invigorate the stand. Fire also works well as a first step in converting the non-native stand to native grassland. The fire removes all the vegetation from a site, and then as the plants resprout, the area is sprayed with a non-selective herbicide, killing the non-native plants and preparing a clean seedbed for the native seeding.

Other Habitats

In the northern part of the lobe, glacial knobs and ridges were partially or wholly surrounded by shallow marshes. The wetlands protected the ridges from frequent prairie fires and promoted the establishment of savannas. These are especially noticeable near Pilot Knob State Preserve. Some of these glacial knobs are known as “dry knobs” and contain such species as sideoats grama, hairy grama (*Bouteloua hirsuta*), prairie junegrass (*Koeleria macrantha*), cutleaf anemone (*Pulsatilla patens*), and little bluestem. Unfortunately, many of these knobs are being highly modified by land use; especially gravel mining (Eilers and Roosa 1994). Conversely, the shallow marshes or wet depressions in the area contain an array of plants most of which are at or near the southern terminus of their ranges. Some of these include watershield (*Brasenia schreberi*), water horsetail (*Equisetum fluviatile*), tall cottongrass (*Eriophorum angustifolium*), common mare’s-tail (*Hippuris vulgaris*), tufted loosestrife (*Lysimachia thyrsiflora*), buckbean (*Menyanthes trifoliata*), cosmopolitan bulrush (*Schoenoplectus maritimus*), and common rivergrass (*Scolochloa festucacea*) (Eilers and Roosa, 1994).

The Des Moines Lobe contained many peatlands and sedge swales as well. The peatlands contained drepanocladus moss, unlike those of the more northern parts of the United States, which are largely composed of sphagnum. However, in this part of the lobe is found the state's only example of a sphagnum bog (called by some researchers a "nutrient-poor fen" or "poor fen"), existing in Pilot Knob State Preserve. Recent palynological evidence indicates that this bog has been present since before Euro-American settlement and is probably a relic from conditions that prevailed at the end of the Pleistocene. A number of rare taxa, such as the following, are found on the floating mat: star sedge (*Carex echinata*), creeping sedge (*C. chordorrhiza*), mud sedge (*Carex limosa*), roundleaf sundew (*Drosera rotundifolia*), slender cottongrass (*Eriophorum gracile*), and bog willow (*Salix pedicellaris*) (Eilers and Roosa, 1994).

The Des Moines Lobe was also known to contain fen habitat. In fact, the northwestern portion of the lobe was thought, until recently, to be the only part of Iowa where fens existed. Today, fens are known to exist on the Iowa surface as well yet exhibit different characteristics. Des Moines Lobe fens are more likely to have a deposit of tufa (calcareous or siliceous rock deposits of springs or ground water) at the surface; are divided into distinctive vegetative zones; lack ferns and are less likely than Iowa surface fens to have trees and shrubs. Plants unique to Des Moines Lobe fens include: cutleaf waterparsnip (*Berula erecta*), tall cottongrass (*Eriophorum angustifolium*), lesser fringed gentian (*Gentianopsis virgata*), Ontario lobelia (*Lobelia kalmia*), Huron green orchid (*Platanthera huronensis*), needle beaksedge (*Rhynchospora capillacea*), low nutrush (*Scleria verticillata*), hooded lady's tresses (*Spiranthes romanzoffiana*), seaside arrowgrass (*Triglochin maritima*), marsh arrowgrass (*T. palustris*), and lesser bladderwort (*Utricularia minor*) (Eilers and Roosa 1994). In Iowa, 40 percent of potential fen sites and 65–77 percent of actual fens have been destroyed by cultivation or drainage. Most of the remaining fens have been altered or threatened by grazing, cropland edge effects, woody plant invasion, drainage, excavation, or mining (Pearson and Leoschke, 1992).

Historically, forest in Iowa was concentrated in the eastern half of the state along the Iowa, Skunk and Des Moines Rivers and their major tributaries (Thompson, 1992). Today, Iowa's forest is widely scattered as woodlots and wooded margins of streams and rivers. The majority of the forest in the district is found along the middle section of the Des Moines River in Webster and Boone Counties. The Little Sioux River in the western part of the district also contains a fair amount of forest. Guthrie, Jasper, and Dallas Counties contain measurable amounts of forest as well.

Current Management

Currently, glacial knobs and ridges, sedge swales, fens, and peatlands in the district are not generally sought out for specific management. Prescribed fire as well as invasive species control, including tree and brush removal, are the primary management tools used on all these habitat types.

Forest is not a habitat type that is targeted for purchase by the district. Restoring and managing forest has little, if any, benefit to ground nesting waterfowl. Currently, district lands are not restored to or managed as forest.

Wildlife

Resident Wildlife

Plants

Plant species found within the district are numerous as 157 species alone are state listed (Iowa National Areas Inventory). Two, prairie bush clover and western prairie fringed orchid (*Platanthera praeclara*) are federal and state threatened; they are discussed in more detail under the Threatened and Endangered Species section below. Forty-eight other species are also state threatened, 18 species are state endangered, and 89 species are considered to be of special concern in the state (appendix A).

Swamp Milkweed

Mammals

Iowa has 40 species of mammals that are considered common in the state. Appendix B contains a list of 50 mammals known or likely to occur within the district (Iowa Gap Analysis Program [GAP]). The Indiana bat (*Myotis sodalist*) is both federal and state endangered, while the spotted skunk (*Spilogale putorius*) is state endangered. The southern bog lemming (*Synaptomys cooperi*) is considered state threatened, and the flying squirrel (*Glaucomys volans*) is considered of special concern. Mammals extirpated from the state include pygmy shrew (*Sorex hoyi*), eastern woodrat (*Neotoma floridana*), porcupine (*Erethizon dorsatum*), gray wolf (*Canus lupus*), swift fox (*Vulpes velox*), black bear (*Ursus americanus*), marten (*Martes americana*), fisher (*M. pennant*), wolverine (*Gulo gulo*), mountain lion (*Puma concolor*), Canada lynx (*Lynx canadensis*), moose (*Alces alces*), and pronghorn (*Antilocapra americana*).

Fish and Mussels

The water bodies within the district are home to many species of fish and mussels. Historically, Iowa waters were home to approximately 55 species of freshwater mussels; today only about half of those species can be found. Appendix B contains a list of fish species known to occur within the district (Iowa GAP) and mussel species primarily listed as species of greatest conservation need (SGCN) in Iowa (Zohrer, 2005). The Topeka shiner (*Notropis topeka*) is federally and state listed and is discussed in more detail under the Threatened and Endangered section below. Twenty other species are also state listed as threatened or endangered; they are noted in appendix A.

Reptiles and Amphibians

Iowa is home to 66 known species of reptiles and amphibians. Appendix B contains a list of the species known to occur within the district (HerpNet). The wood turtle (*Clemmys insculpta*) is state endangered, while the ornate box turtle (*Terrapene ornata*), Blanding's turtle (*Emydoidea blandingii*) and mudpuppy (*Necturus maculosus*) are state threatened. The smooth green snake (*Opheodrys vernalis*) and bullsnake (*Pituophis catenifer sayi*) are considered of special concern in the state. The eastern garter snake (*Thamnophis sirtalis*) is the only snake species to occur within the district that is not considered "protected"—that is, it is legal to kill or collect them in Iowa.

Insects

The habitats of the Des Moines Lobe contain a great variety of insects, although likely fewer species exist today than in the past. In the prairie, insects are important pollinators and food sources, especially for birds. Moths, butterflies, bees, and wasps are attracted to showy prairie flowers. The great mass of grasses, leaves, and stems provides an abundance of habitat for grasshoppers and other insects. Spittlebugs are responsible for the wet, saliva-like liquid that is found

Bee Pollinating Purple Prairie Clover

at the base of many grass leaves. Their young cover themselves with a frothy, bubbly liquid after they hatch that protects them from predators, parasites, and the drying wind and sun. Multitudes of ants aerate and mix the rich prairie soil. Insects are literally at the center of life on the prairie as prairie mammals, birds, reptiles, and amphibians need an abundance of insects in their food chains.

In the wetlands, insects were also important food sources for birds, mammals, reptiles, and amphibians as they outnumbered all other animals. In open waters, insects such as the water boatman (*Corixa sp.*) and backswimmer (*Notonecta sp.*) feed on plants, carrying bubbles of air with them as they make their dives. Water scorpions (Nepidae family), predacious diving beetles (*Thermonectus sp.*), and giant water bugs (Belostomatidae family) are predators that search wetland waters for zooplankton, other insects, and even tadpoles and larger crustaceans. Even the surface film of wetland waters contains insects, mosquito larvae, water striders (Gerridae family), whirligig beetles (*Gyrinus sp.*), and fishing spiders (*Dolomedes sp.*). Above the water, dragonflies and damselflies eat swarms of gnats, flies, and mosquitos; mayflies flutter after a hatch in spring and summer; and butterflies feed on the nectar of wetland flowers.

Threatened and Endangered Species

The district contains seven federally listed species. Three (Least Tern, Topeka shiner, and Indiana bat) are endangered, two (prairie bush clover and western prairie fringed orchid) are threatened. The Dakota skipper and Poweshiek skipperling are listed as candidate species. The district also contains numerous state listed species. Most of these are discussed in their relevant subsections above. The following provides more information on the federally protected species:

Least Tern – Endangered (*Sterna antillarum*)

Least Terns nest along large rivers of the Colorado, Red, Mississippi, and Missouri River systems on barren to sparsely vegetated sandbars, sand and gravel pits, and lake or reservoir shorelines. They winter in coastal Central and South America. Threats to Least Terns include unusable nesting habitat due to human disturbance and alteration of river systems and pesticide use that reduces food availability such as small fish.

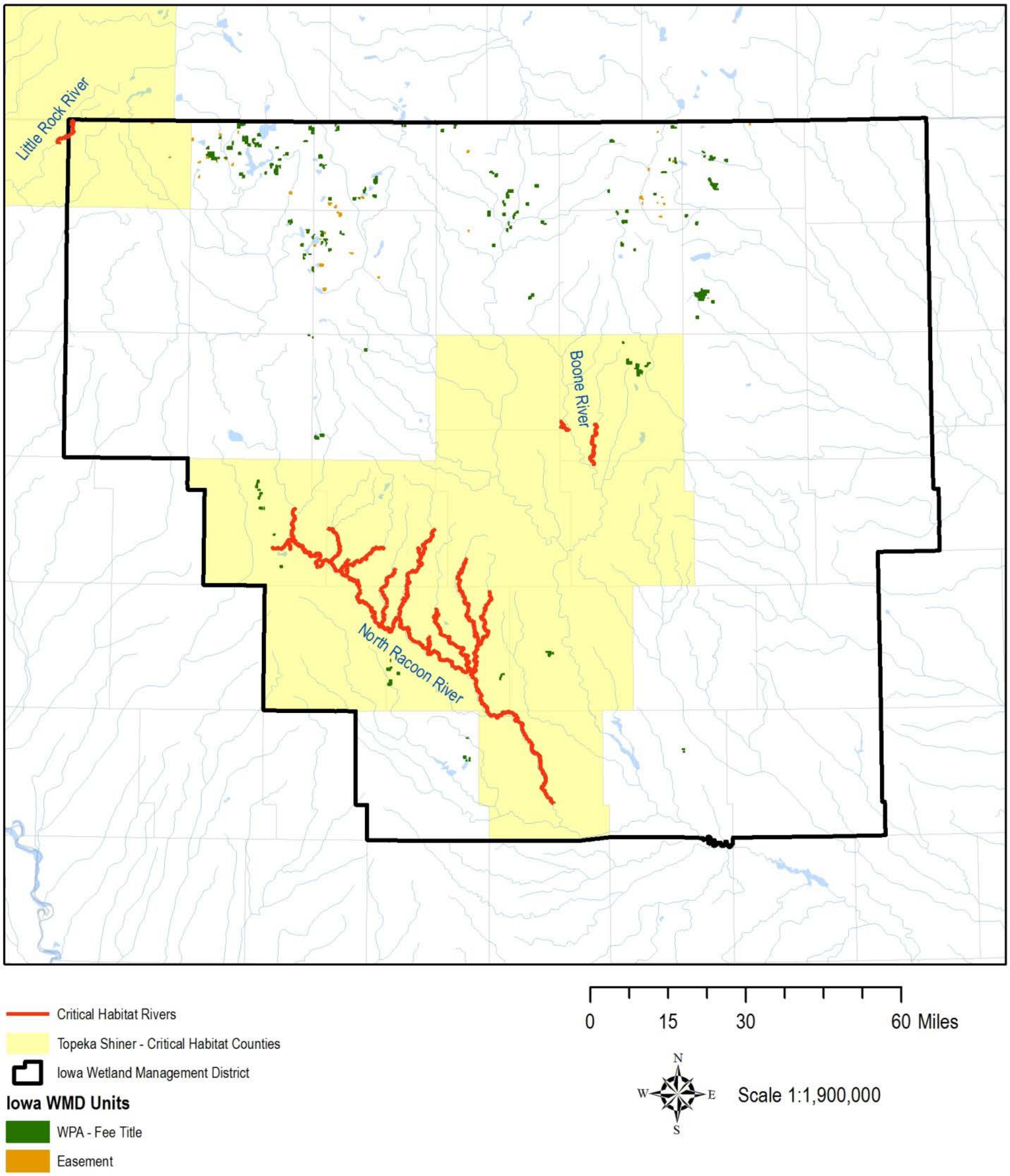
Current Management

The Least Tern is currently only in one county of the district, Polk. Its recovery plan calls for protecting, enhancing, and restoring breeding habitat to increase the population to 7,000 birds. However, most of the district does not contain suitable habitat currently, nor is it targeted for future acquisition. The focus for the district is prairie potholes and surrounding uplands that are generally heavily vegetated. Therefore, management of the district has virtually no impact on Least Terns.

Topeka Shiner – Endangered (*Notropis topeka*)

Topeka shiners were historically common in small to mid-sized prairie streams, oxbows, and off-channel pools, in the central United States. Currently, Topeka shiners are found primarily in small, isolated populations in Iowa, Minnesota and portions of South Dakota in small streams that run continually with good water quality and cool to moderate temperatures. Threats to the Topeka shiner include habitat destruction, sedimentation, and changes in water quality. Stream segments in the Raccoon River, Boone River, and Rock River watersheds in Iowa have been designated as critical habitat for Topeka shiners (figure 3-11). Critical habitat is a specific geographic area(s) that is essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery.

Figure 3-11: Topeka Shiner Critical Habitat in Iowa



Current Management

Although the district does not target stream habitat for purchase, the Topeka shiner may receive benefits from habitat management within the district. Wetland and grassland restoration on former crop fields can have dramatic impacts on downstream water quality. Most land purchased in the district is cropland. The restoration of grassland/wetland complexes in the district acts to slow the movement of water across the land. This results in a slower release of water to area streams and a corresponding reduction in sediment and other pollutants entering the streams. The Topeka shiner does not currently have a recovery plan.

Indiana Bat – Endangered (*Myotis sodalis*)

Indiana bats can be found hibernating during winter in caves or, occasionally, in abandoned mines and in summer roosting in forest gaps, fencelines, or edges of wooded areas under the peeling bark of dead and dying trees. Indiana bats eat a variety of flying insects found along rivers or lakes and in uplands. Threats to the Indiana bat include human disturbance, commercialization of caves, loss of summer habitat, pesticides and other contaminants, and most recently, the disease white-nose syndrome.

Current Management

Currently within the district, the Indiana bat only utilizes summer habitat in Jasper County. However, this location is not in one of the four priority recovery units; therefore, the recovery plan calls for enhancing and improving habitat on private lands and protecting foraging habitat, water sources, and travel corridors. The recovery plan does not include a specific population objective. The district is primarily managed for waterfowl and other migratory grassland birds; thus, forested land is not targeted for acquisition. In fact, many district resources are expended to prevent and/or remove woody species. Therefore, the majority of the district does not provide roosting sites for Indiana bats. However, the restoration of grassland/wetland complexes does provide areas that produce insects, which can be important to foraging Indiana bats.

Prairie Bush Clover – Threatened (*Lespedeza leptostachya*)

Prairie bush clover is found in midwestern hill prairies that are dry and gravelly and in thin soil prairies containing big bluestem and Indiangrass—especially in the Little Sioux River and Des Moines River valleys. Prairie bush clover is apparently able to grow in disturbed areas so its population may be stable or, if declining, declining slowly.

Threats to the prairie bush clover include conversion of pasture to cropland, overgrazing, agricultural expansion, herbicide application, urban expansion, rock quarrying, and transportation right-of-way maintenance and rerouting. Hybridization with the more common round-headed bush clover has also been identified as a potential threat in some areas.

Current Management

Prairie bush clover is only in remnant prairie vegetation on a few sites throughout the district. The recovery plan calls for protecting and managing 20 populations in the core area and 15 outside the core area. Five counties within the district are completely within the core area including Dickinson, Clay, Emmet, Kossuth, and Palo Alto; four other counties (Humboldt, Pocahontas, Osceola and O’Brien) are partially within the core area. Management activities occurring in the district that could affect prairie bush clover include prescribed fire, haying, grazing, and invasive plant treatments. Fire promotes healthy prairie plant communities and helps control invasive woody plants that may shade out prairie bush clover. However, fire during the growing season may kill prairie bush clover seedlings. Therefore, most district burns are conducted early enough in the spring that seedlings have not yet emerged. Fire and any other district management action that may affect prairie bush clover are carefully planned to avoid negative impacts to the plant.

Western Prairie Fringed Orchid – Threatened (*Platanthera praeclara*)

Western prairie fringed orchid occurs in moist, calcareous subsaline prairies and prairie sedge meadows and swales. The species may be stable, but loss of tallgrass prairie habitat has markedly reduced its original range. Present sites are threatened by human activities, land use changes, competition by invasive plants, indiscriminate grazing, annual mid-summer haying, and poorly timed prescribed fire.

Current Management

Currently, there are no known populations of western prairie fringed orchid in the district. The recovery plan calls for protectively managing sites harboring 257 more additional plants. Although prescribed fire is the main management tool used in the district grazing, haying, and invasive plant removal may also be used. Depending on timing and duration, all of these management tools can have either positive or negative impacts on western prairie fringed orchid. If a new acquisition contains orchids or a new population is discovered on existing property, the use of all of these tools will be carefully planned and implemented to avoid negative impacts.

Poweshiek Skipperling – Candidate Species (*Oarisma poweshiek*)

Poweshiek skipperlings are small, moth-like butterflies that are obligate residents of high, dry and low, wet tallgrass prairies. They are most often found in native prairie remnants in Iowa, Minnesota, North Dakota, South Dakota, and Wisconsin and in fens in Michigan. During preparation of a status assessment in 2005, there was evidence that populations were declining throughout its range, particularly in Iowa and Minnesota. Data since then confirms sharp population declines in most of its range. Of particular concern is its apparent disappearance from the majority of sites in the heart of it range in Iowa, Minnesota, and South Dakota. Population numbers in Iowa have likely dropped dramatically due to the huge losses of prairie across the landscape. In fact, the Service may propose critical habitat by the end of 2013 for the Poweshiek skipperling.

One important larval host plant is slender spike rush (*Eleocharis elliptica*), although there is good evidence from Minnesota and Wisconsin to indicate that prairie grasses, especially prairie dropseed (*Sporobolis heterolepis*) and little bluestem (*Schizachyrium scoparium*), are also important larval host plants (Shepherd, 2005). Adult Poweshiek skipperlings depend on nectar from a variety of flowers including blackeyed Susan (*Rudbeckia hirta*) and pale purple coneflower (*Echinacea pallida*). Threats to the Poweshiek skipperling include widespread conversion of native prairie for agriculture and other uses, woody and non-native plant invasion of prairie, over use of prescribed fire and overgrazing.

Current Management

The district is managed primarily to provide healthy, vigorous vegetation for the benefit of waterfowl and other migratory birds. Prescribed fire is the primary management tool used. Fire, if used too aggressively, however, can be a serious detriment to the Poweshiek skipperling. Fall and spring prescribed burns are likely to expose Poweshiek skipperling larvae and pupae to lethal temperatures. However, lack of fire can allow invasion of woody and non-native plants that threaten the long-term viability of the prairie. Losing the prairie plants will threaten the long-term viability of the Poweshiek skipperling and undermine the primary management goal of providing healthy, vigorous vegetation for use by migratory birds.

Currently, it is unknown if any Poweshiek skipperling populations occur in the district. There is a need to inventory all remnant prairie across the district to determine any presence. The Poweshiek skipperling does not currently have a recovery plan; however, protecting existing habitat, managing in a “butterfly friendly” manner, which includes mowing, burning, grazing, haying, and tree removal, and connecting fragments of native prairie are recommended. If the skipperling is found, management practices can be adjusted. Units could be subdivided and then burned on a rotational basis to leave some unburned refuge areas. Alternatively, haying could be used in place of fire, as long as cutting occurs after late July once skipperling eggs have hatched.

Dakota Skipper – Candidate Species (*Hesperia dacotae*)

The Dakota skipper is a small butterfly that is found on relatively flat and moist native bluestem prairie in which three species of wildflowers are usually present and in flower when in their adult (flight) stage: wood lily (*Lilium philadelphicum*), harebell (*Campanula rotundifolia*), and smooth camas (*Zigadenus elegans*). The Dakota skipper also is found on dry upland prairie that is often on ridges and hillsides dominated by bluestem grasses and needlegrasses where three wildflowers are typically present: pale purple coneflower (*Echinacea pallida*), upright coneflower (*Ratibida columnifera*), and blanketflower (*Gaillardia aristata*). Its only known location in Iowa was in the Little Sioux River valley; however, as of 2013, the Dakota skipper is believed to be extirpated from the state. Threats to the skipper include widespread conversion of native prairie for agriculture and other uses, over use of prescribed fire, and overgrazing.

Current Management

The district is managed primarily to provide healthy, vigorous vegetation for the benefit of waterfowl and other migratory birds. Prescribed fire is the primary management tool used. Dakota skippers are vulnerable to fire at virtually all life stages and likely depend on repopulation from unburned areas to persist. This strategy worked well when the prairie was a large, continuous, intact ecosystem. However it does not work well with the district’s present situation of small, isolated remnant prairie tracts. Healthy prairie tracts are essential for the long-term survival of the Dakota skipper. However, most management tools used to maintain small, isolated tracts of prairie can be detrimental to the Dakota skipper. Fire, haying, and intensive grazing can all eliminate Dakota skippers from a site. The challenge then, is managing remnant prairie in a high quality condition with the appropriate tools and timing as to not eliminate the Dakota skipper from the site.

The Dakota skipper is presumed extirpated from Iowa, so it is unlikely that any Dakota skipper populations occur in the district. There is, however, a need to inventory all remnant prairie across the district to determine any presence. There is no recovery plan for the Dakota skipper at present, but protecting existing habitat, managing in a “butterfly friendly” manner, which includes mowing, burning, grazing, haying, and tree removal, and maintaining or creating tracts that are at least 1,000 acres in size are recommended. If the skipper is found, management practices can be adjusted. Units could be subdivided and then burned on a rotational basis to leave some unburned refuge areas. Alternatively, haying could be used in place of fire, as long as cutting is delayed until at least mid-August to reduce adverse effects to any life stage.

Migratory Birds

Approximately 270 species of birds are known or likely to occur within the district (appendix A). Seventy-eight of those species are listed as SGCN in the Iowa state wildlife action plan. Thirteen of those SGCN are state listed as threatened, endangered, or of special concern. The Least Tern (*Sterna antillarum*) is the only federally listed (endangered) bird species in the district.

Waterfowl

The largest group of birds to utilize the district is waterfowl since the PPR is considered the largest breeding ground for waterfowl in the continental United States. National wildlife refuges account for less than two percent of the landscape, yet they are responsible for producing nearly 23 percent of the region's waterfowl. Surveys have shown that although the PPR represents only 10 percent of the breeding habitat, it averages 50 to 75 percent of the duck recruitment each year in North America (North American Bird Conservation Initiative, U.S. Committee, 2011). Waterfowl species that use the prairie wetlands of Iowa include: Mallard (*Anas platyrhynchos*), Blue-winged Teal (*Anas discors*), Northern Shoveler (*Anas clypeata*), Northern Pintail (*Anas acuta*), American Wigeon (*Anas americana*), Gadwall (*Anas strepera*), Wood Duck (*Aix sponsa*), Ruddy Duck (*Oxyura jamaicensis*), Redhead (*Aythya americana*), Lesser Scaup (*Aythya affinis*), Canvasback (*Aythya valisineria*), Ring-necked Duck (*Aythya collaris*), and Canada Goose (*Branta canadensis*).

The Service’s Habitat and Population Evaluation Team office receives survey data from the Iowa DNR for waterfowl populations within the nine most north and central counties of the district. In 2012, the survey resulted in 19.5 breeding pairs of all 13 species combined (Mallard, Gadwall, Blue-winged Teal, Northern Shoveler, Northern Pintail, American Wigeon, Green-winged Teal [*A. carolinensis*], Wood Duck, Redhead, Canvasback, Lesser Scaup, Ring-necked Duck, and Ruddy Duck). This was up from 16.0 in 2011, but down from 23.1 in 2010. The average duck pair density (pairs per square mile) in 2012 was 4.3, up from 3.6 in 2011 but down from 5.1 in 2010 (FWS, 2012a).

Rich soils and prairie wetlands make the region ideal for waterfowl but also highly productive for agriculture. The corn and soybean belt overlaps extensively with the southern PPR. Massive conversion of wetlands and prairie to agricultural fields has dramatically altered the landscape, the hydrology, and the region's carrying capacity for waterfowl. Some waterfowl species are more susceptible than others are to the transformation of prairie into agriculture. Mallards, Blue-winged Teal, and Canada geese have been successful in agricultural landscapes while species such as Northern Pintail, Gadwall, Canvasback, Redhead, and Lesser Scaup have not.

Current Management

Mallard Brood

The district is managed to produce a mosaic of wetland and upland habitats that are attractive to waterfowl and other migratory birds. Wetlands are restored and managed to provide diverse wetland complexes that support the various life requirements of migrating and nesting waterfowl. Once the wetland basins have been restored, manipulation of vegetation becomes the primary management action. Prescribed fire, mowing during dry periods, and water level manipulation are the tools used to manage wetland vegetation. Most prescribed fire in the district occurs in the spring, although some fall burning has been used in recent years with good success. In the late summer or fall, mowing and/or prescribed fire have been used to remove dense wetland vegetation from some shallow wetlands. This effectively opens up the wetland and makes it more attractive to waterfowl the following spring. Fish barriers have been installed on some wetlands in the district to reduce water quality problems caused by rough fish populations. Water quality improvements lead to improved plant and invertebrate resources that directly benefit waterfowl.

Most upland in the district is converted from row crop fields to permanent grass cover. In addition to reducing erosion by slowing water's movement across the land, grass cover also provides important nesting cover for waterfowl.

Shorebirds

Shorebirds Feeding in Shallow Water

The PPR occurs within one of the major migration routes for shorebirds in North America. The U.S. PPR provides breeding habitat for 13 of 20 species of shorebirds that breed in the contiguous United States and offers important stopover habitat for 30 species of arctic breeders. The long distance migrations made by shorebirds are energetically expensive and require stopover sites to rest and refuel. During migration, shorebirds find protein rich food available in abundance in small, shallow wetlands scattered across the PPR. Some of the shorebird species that use the PPR of Iowa include: Killdeer (*Charadrius vociferous*), Upland Sandpiper (*Bartramia longicauda*), Greater Yellowlegs (*Tringa melanoleuca*), Lesser Yellowlegs (*Tringa flavipes*), Stilt Sandpiper (*Calidris himantopus*), Hudsonian Godwit (*Limosa haemastica*), American Golden-Plover (*Pluvialis dominica*), Pectoral Sandpiper (*Calidris melanotos*), Spotted Sandpiper (*Actitis macularia*), Wilson's Phalarope (*Phalaropus tricolor*), Long-billed Dowitcher (*Limnodromus scolopaceus*), and Dunlin (*Calidris alpina*).

Shorebirds are a morphologically diverse group that use a wide range of habitat types within the PPR, including dry grasslands, riverine beaches and sandbars, natural wetlands, lake margins, and flooded agricultural fields. During migration, shorebirds are generally associated with shallow water and moist mudflats. More than 70 percent of the species require water depths of less than 10 centimeters, and many are less than five centimeters (Skagen and Thompson, 2000). Many species prefer vegetation height to be less than half their body height, and most species prefer foraging sites with less than 25 percent vegetative cover (Skagen and Thompson, 2000). Due to the dynamic nature of prairie pothole wetlands, shorebird use of these potholes varies dramatically through time and space and is closely related to current wetland conditions.

The PPR has been dramatically altered since settlement. Agricultural fields have replaced the once vast grassland/wetland complexes that supported huge flocks of shorebirds. This is especially true in Iowa. As the landscape was transformed to agriculture, wetlands, especially seasonal and ephemeral wetlands, and grasslands have been reduced to the point where the Iowa PPR struggles to consistently provide for the needs of shorebirds.

Current Management

The district is managed primarily to produce a mosaic of wetland and upland habitats that are attractive to waterfowl and other migratory birds. Shorebirds are directly impacted by these management actions. Most of the district properties are managed as part of a bigger complex of habitat with various ownerships. Managing the district within a bigger complex of wildlife habitat increases the potential to provide a variety of wetland types in one area. This allows a greater diversity of shorebird species to find suitable habitat to meet their current life requirements.

Wetland drawdowns, prescribed fire, haying, and grazing are all management tools used to manipulate water levels and/or vegetation. Wetland drawdowns produce shallow water and exposed mudflats that are critical to many species of shorebirds. Prescribed fire, haying, and grazing are all used to manipulate vegetation with the goal of altering the current habitat in a way that will be beneficial to one or more groups of migratory birds.

Water Birds

Water birds are a diverse group of birds that are closely tied to water bodies for a large portion of their life history. The group includes loons, grebes, pelicans, cormorants, herons, night-herons, bitterns, egrets, ibises, rails, coots, moorhens, cranes, gulls, and terns. This diverse group uses nearly every type of wetland habitat available, from large deep lakes to ephemeral, shallow marshes (Beyersbergen et al., 2004). Some of the more common water birds found throughout the district include; Great Blue Heron (*Ardea hoerodias*), Least Bittern (*Ixobrychus exilis*), Pied-billed Grebe (*Podilymbus podiceps*), Virginia Rail (*Rallus limicola*), Sora (*Porzana Carolina*), American Coot (*Fulica americana*), Double-crested Cormorant (*Phalacrocorax auritus*), and American White Pelican (*Pelecanus erythrorhynchos*).

As previously mentioned, Iowa has lost 99 percent of its pre-settlement wetlands (Noss et al., 1995). Wetland loss of this magnitude has greatly hampered the ability to provide sufficient wetland habitat for water birds in the district. The remaining wetlands are frequently influenced by adjacent agricultural practices. Water clarity, vegetation characteristics, and prey base can all be impacted in wetlands located in an agricultural landscape. Water birds benefit from preservation and restoration of wetlands and uplands. Grassland preservation and restoration in uplands directly maintains or improves water quality in the wetlands and provides sites for foraging and nesting.

Current Management

The district is managed primarily to produce a mosaic of wetland and upland habitats that are attractive to waterfowl and other migratory birds. Most of the district properties are managed as part of a bigger complex of habitat with various ownerships. Managing the district within a bigger complex of wildlife habitat increases the potential to provide a variety of wetland types in one area. Larger blocks of habitat also help mitigate the influences from adjacent agricultural lands.

Generally, management actions in the district are intended to improve the habitat for migratory birds. The water birds mentioned above are considered migratory birds and are directly impacted by these management actions. Restoring wetlands and grasslands provides vital habitat. After restoration, the goal of management is to maintain high quality habitat conditions that can help sustain healthy populations of migratory birds. Management tools used to accomplish this include water level management, prescribed fire, haying, mowing, and grazing.

Grassland Birds

Although agriculture has been an important feature in this area for over 100 years, it has been particularly intensive during the last several decades. Conversion from small, diverse, family farms to large agricultural operations specializing in monocultures of small grain and row crops has greatly reduced habitat on private lands such as pasture, hayed areas, and wetlands. Grassland birds are forced to nest in ever-dwindling fragments of remaining cover. Often the only nesting sites available are small isolated areas such as roadside ditches, abandoned farmsteads, rock piles, or other isolated patches of habitat. In North America, grassland birds have exhibited steeper declines than any other avian group. Their decline has a number of causes including loss of breeding and wintering habitat from agriculture, urbanization, habitat degradation from fire suppression, inappropriate grazing regimes, woody plantings, pesticides, nest predation, and Brown-headed Cowbird (*Molothrus ater*) parasitism.

Within the category of "grassland birds," individual species show a variety of habitat preferences based on vegetation height, cover density, grass/forb ratio, soil moisture, litter depth, degree of woody vegetation, and plant species composition. A mosaic of grassland habitats is needed to meet the varying needs of grassland birds. Some of the species of concern found in the district are area-sensitive, which means they require large, contiguous blocks of habitat to reproduce successfully. Area-sensitive species include the Short-eared Owl (*Asio flammeus*), Northern Harrier (*Circus cyaneus*), Upland Sandpiper (*Bartramia longicauda*), Bobolink (*Dolichonyx oryzivorus*), Henslow's Sparrow (*Ammodramus henslowii*), and Savannah Sparrow (*Passerculus sandwichensis*).

Current Management

The district is managed primarily to produce a mosaic of wetland and upland habitats that are attractive to waterfowl and other migratory birds. Most of the district properties are managed as part of a bigger complex of habitat with various ownerships. Managing the district within a bigger complex of wildlife habitat increases the potential to provide a variety of wetland and grassland types in one area. Larger blocks of habitat also help mitigate the influences from adjacent agricultural lands.

District grasslands are managed to produce vigorous stands that will be attractive nesting sites for waterfowl and other migratory birds. Generally, new seedings are diverse mixes of native grasses and forbs that provide enough structural diversity to be attractive to a wide variety of birds. Since natural processes such as wildfire and grazing by free roaming ungulates have been virtually eliminated from the landscape, grasslands require management to keep them healthy and free from woody and other invasive plants. Prescribed fire is the primary management tool used on district grasslands. Haying, grazing, and invasive plant control/removal are also used to maintain healthy grasslands throughout the district.

Invasive Species

Noxious weeds are a continuing problem both ecologically and socially/politically. Invasive species present a daunting challenge to land managers. Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), crown vetch (*Coronilla varia*), sweet clover (*Melilotus sp.*), leafy spurge (*Euphorbia esula*), sericea lespedeza (*Lespedeza cuneata*), and spotted knapweed (*Centaurea biebersteinii*) can displace native vegetation over large areas and are a serious concern to neighboring farmers and county officials. Purple loosestrife (*Lythrum salicaria*) can effectively displace cattails and other native wetland vegetation and turn productive marshes into a sea of purple flowers. Carp can destroy native submergent vegetation, which provides the base for invertebrates. Minnows, often from past stockings by bait dealers, can cause serious damage to wetland food chains by reducing invertebrate populations needed by breeding waterfowl and ducklings.

Control of these problem species is often costly, both in terms of chemicals, equipment, and staff time. Managers strive to use a balanced approach in controlling these species. Direct control, such as chemical application or mowing, is often needed on serious problem areas. Once healthy native plant communities are reestablished, they can often compete successfully against non-native and invasive species. Water level control, including complete drawdowns, can eliminate carp and minnow populations on wetlands where this capability is present.

Current Management

Many district resources in the form of time and money are spent attempting to control invasive species. Mowing, applying chemicals, and properly timed prescribed burning are all methods used to control invasive species. In cases where diverse prairie mixes are planted, frequently the best management tool is patience. As the seeding develops and matures during the first five to ten years, it will often crowd out mild infestations of Canada thistle with only a few well timed prescribed fires. Heavy infestations of Canada thistle and more persistent weeds like crown vetch, leafy spurge and sericea lespedeza often require more active management like mowing or chemical treatment. At times, chemical treatment is the only practical way to get control of some invasive species. Although carefully directed chemical use can be effective in controlling invasive plants, care needs to be taken to avoid killing the desirable plants that provide the long-term competition for the invasive plants. Killing non-target plants may create openings in the seeding that are susceptible to reinvasion by more invasive plants. Invasive species management is a balancing act of minimizing collateral damage while achieving effective control.

People

According to the 2010 U.S. Census (U.S. Census Bureau, 2010), the population of all 35 counties in the district is estimated to be 1.1 million while the population base of the largest cities combined is nearly 800,000. Few counties had population growth in the last two decades, and few are projected to have growth in the next five years. Pocahontas County has the biggest declines for the past and future while Dallas County has the biggest increases for the past and future. Changes in population from 1990–2000 varied across the district ranging from a decrease of 1 percent to an increase of 3.2 percent with an average 0.04 percent increase for the decade. The change in population from 2000–2010 ranged from a decrease of 1.18 percent to an increase of 4.34 percent with an average 0.2 percent decrease for the decade. The predicted change in population from 2010–2015 ranges from a 1.13 percent decrease to a 3.51 percent increase with an average 0.25 percent decrease for the five years.

Socioeconomic Setting

Current Situation

Demographics

The average household size across the district ranges from two to three people with a median age of 40–46 years old. Buena Vista, Webster, Dallas, and Polk Counties have median ages of 36–39 while Story County has a median age of 28, likely due to it being home to Iowa State University. The majority of the district has a median household income between 41,000 and 70,000 dollars per year with Palo Alto, Pocahontas, and Sac Counties at 40,000 dollars per year. However, the unemployment rate across most of the district in 2010 was between four and eight percent, with six counties between eight and 15 percent (U.S. Census Bureau, 2010).

In general most employment across the district is in manufacturing, educational, health or social services, and retail trade. Agriculture employment is higher in some counties while finance, real estate, and insurance are higher in others. Thirty-two to 40 percent of the population has a high school diploma while 11–20 percent of the population has a bachelor's degree (U.S. Census Bureau, 2010).

Agriculture, Commodity Prices and Land Valuation

According to Iowa State University's *2011 Farmland Value Survey*, 2011 was "one of the most remarkable years in Iowa land value history" (Duffy, 2011). The percentage increase reported for 2011 (32.5 percent) was the highest ever recorded by the survey. The previous high was 31.7 percent increase recorded in 1973. In addition, the 2011 survey value ($6,708/acre), when adjusted for inflation, was at an all-time high. The previous inflation adjusted high was in 1979. The average land value per acre in 2011 for the four reporting districts that encompass the Iowa WMD: north central, northwest, west central, and central Iowa was $7,356, $8,338, $7,419, and $7781 respectively. These were the four highest values across the entire state.

High commodity prices were the most frequently mentioned positive factor influencing the agricultural real estate market, mentioned by 86 percent of survey respondents. According to Duffy,

> "Farmland values are highly correlated with gross farm income. As gross farm income increases so will land values. In 2005, corn prices averaged $1.94 per bushel in Iowa. The preliminary estimated price for November 2011 is $6.05. Soybean prices changed from $5.54 to $11.40 over the same time period."

Even though there has been "considerable variation" in commodity prices over the past few years, net farm income has increased substantially and is expected to continue. This increased income has been the primary cause for the increased farmland values along with historic low interest rates for loans to purchase farmland and a dismally performing stock market, where investing in land appears safer and wiser than investing in traditional stocks (Duffy, 2011). These trends pose a challenge to management of existing and continued acquisition of new public land in Iowa. Available funds will not buy as much land, desirable land may not be for sale, and even marginal land will likely be farmed. Increased agriculture in the PPR of Iowa may lead to increased drainage and decreased habitat for many grassland and wetland-dependent species.

Land Use Patterns

Croplands

The majority of the land in the district is farmed. Corn and soybeans are major crops grown in the area. Iowa had a record corn crop in 2010 and once again led the Nation in soybean production. Over the past fifty years, the state has seen a steady reduction in the overall land in farms and net income from farming, while farm size and crop yields have grown (USDA, 2011). With farm size expanding and commodity prices rising, agriculture threatens remaining wetlands and prairie now more than ever.

Grasslands

In Iowa, less than one-tenth of one percent of the remaining prairie is permanently protected. Much of this land is in public ownership. Recreational access is different for different sites, and there are varying degrees of protection and management on native prairie tracts. Natural prairie diversity is dependent upon intermittent grazing and burning. Prescribed burns are often used by government and private conservation organizations, but some protected tracts, such as those in easements, may not receive as much attention.

Hay fields, pastures, and fields in CRP are also grasslands. More quantifiable and less diverse, these areas may be restorable to some extent, but these areas cannot be restored to virgin prairie. Monoculture stands of alfalfa are obviously less diverse than the prairie they have displaced. Fenced pastures grazed by cattle are quite different from the prairie once grazed by wandering bison. Cattle are often permitted to overgraze, weakening native grasses, eliminating native flowers, and encouraging colonization by non-native weedy forbs and trees.

Wetlands

In Iowa, nearly 99 percent of all natural wetlands have disappeared from the landscape. Most have been tiled, drained, and converted to agriculture. Across the district, some wetlands have been preserved or restored and are primarily in public ownership while others have been enrolled in the Wetlands Reserves Program, remaining in private ownership but protected by permanent easement. Recreational access to these sites varies.

Urban Development

The largest urban center within the district is Des Moines, Iowa, with over one-half of a million people residing in the five-county metropolitan area. Other cities include Fort Dodge, Spencer, Mason City, Boone, Ames, Ankeny, and Marshalltown. All of these areas require manufacturing, retail services, government, education services, transportation, utilities, and other commercial services. Urban spread into rural areas is resulting in the conversion of additional agricultural lands and prairie and grassland areas. According to the 2010 U.S. Census, the major area of anticipated growth within the district is around the Des Moines metropolitan area. The Waterloo-Cedar Falls metropolitan area just outside of the district is expected to grow as well, which would affect the eastern edge of the district.

Aggregate Resources

Nearly every county within the district contains underlying materials that could be utilized for crushed stone or construction sand and gravel. Concentrated operations of these minerals exist in Cerro Gordo and Polk Counties, while Webster County contains a gypsum deposit with an active gypsum plant. Numerous rock quarries exist throughout the district providing materials for building and maintaining roads, construction, and concrete. In 2008, the production of such operations across the entire state was valued at $680 million. This was nearly a two percent decrease from 2007 and an additional nearly two percent decrease from 2006 (U.S. Geological Survey, 2008).

Rural Development

Rural development also threatens district lands in counties with growing populations. Lands adjoining WPAs are often seen as highly desirable rural building lots that are purchased as small hobby farms or rural homesites. This can result in the WPA being "ringed" by homes, with a series of negative impacts on the WPA. This development can limit the use of prescribed fire for future management and can lead to the following:

- Increased trespass on district lands by neighbors using ATVs, horses, or vehicles
- Increased threats to wildlife from stray pets such as cats and dogs
- Increased use of district land by neighbors for illegal uses such as dumping, gardening, equipment storage, etc.
- Hunter and neighbor discrepancies about safety during the hunting seasons;
- Increased noise
- Increased storm water runoff

Alternative Energy Developments


Waterfowl and Wind Turbines

Iowa is the leading state in wind power generation of electricity. The north and west portion of the state has, on average, stronger winds, making that area best suited for wind turbines. Numerous wind farms exist within or near the district, and other new ones are planned. While finding alternatives to fossil fuel consumption is important, turbines are potential threats to wildlife. Collision mortality, negative visual stimulus (similar to trees) and construction and access disturbance are all problematic. The Service, working with the Wind Turbine Guidelines Advisory Committee, developed voluntary land-based wind energy guidelines in 2012 to provide a structured, scientific process for addressing wildlife conservation concerns at all stages of land-based wind energy development. They also promote effective communication among wind energy developers and federal, state, and local conservation agencies and tribes. When used in concert with appropriate regulatory tools, the guidelines form the best practical approach for conserving species of concern (FWS, 2012b).

Visitor Services

The main office for the Iowa WMD is located at Union Slough NWR, located approximately two and one-half hours southwest of Minneapolis, MN and northwest of Des Moines. Driving from Algona, Iowa take Highway 169 north to Bancroft; turn right (east) on A-42, and proceed six miles to the office. From Interstate 90, take the Blue Earth, MN exit, and follow Rt. 169 south into Iowa. At Lakota, follow P60 south to A-42, then west 0.25 miles on A-42 to the office. Interpretive displays, wetland district public use regulations, and other information are available 7:30 a.m.–4:00 p.m., Monday–Friday (excluding federal holidays). The Iowa DNR has six wildlife field offices that serve as points of contact for district visitors as well.

The Union Slough NWR office provides a visitor contact station for the Iowa WMD. The office is staffed with an administrative technician that also serves as a visitor contact liaison. The refuge office maintains a wildlife display interpreting both the district and the refuge. Both indoor and outdoor kiosks orient visitors to the area. District public use information and regulations are current and available both indoors and outdoors at the office.

Current Management

Waterfowl Production Areas differ from NWRs in that they are open to hunting, fishing, and trapping in accordance with state law. Therefore, WPAs are "open until closed" by state or federal law for hunting, fishing, and trapping. National Wildlife Refuges on the other hand are "closed until opened" to these uses. However, WPAs can be opened to other uses if determined to be appropriate and compatible with the mission of the National Wildlife Refuge System and the purposes of the district.

Hunting, in particular, has a long history with WPAs. When Congress amended the Duck Stamp Act (formally known as the Migratory Bird Hunting Stamp Act) in 1958, it authorized the acquisition of wetlands and uplands as WPAs and waived the usual "inviolate sanctuary" provisions. Thus, WPAs were intended to be open to waterfowl hunting, in part because waterfowl hunters, through the purchase of federal Duck Stamps and support for price increases of the stamp, played a major role in acquisition of these areas. Hunting, for both waterfowl and resident game species accounts for more than half of the visits to WPAs.

However, state regulations classify some WPAs as “waterfowl refuges.” According to Iowa Code 52.1(3):

> “Waterfowl refuges: The following areas under the jurisdiction of the department of natural resources are established as waterfowl refuges where posted. It shall be unlawful to hunt ducks and geese on the following areas, where posted, at any time during the year. It shall be unlawful to trespass in any manner on the following areas, where posted, during the dates posted, both dates inclusive . . . “

For Iowa WMD these regulations apply to at least some portion of the following WPAs: Jemmerson Slough (Dickinson County), Elk Creek Marsh (Worth County), and Rice Lake (Winnebago and Worth Counties). The Service’s Memorandum of Understanding (MOU) with the Iowa DNR states, “. . . other wildlife-dependent uses (wildlife observation, wildlife photography, environmental education, and interpretation) are generally allowed."


Upland Interpretation for Children

Since the district is overseen by staff from Union Slough NWR, environmental education and interpretation programs are nearly always hosted at the refuge rather than the district. A recently rekindled partnership with the Kossuth County Conservation Board (KCCB) has also led to KCCB naturalists conducting environmental education and interpretation programs at the refuge particularly on prairie/wetland habitats and their dependent wildlife. However, other education, interpretation and outreach happens through the partnership. The Iowa DNR provides these services at the county and WPA level via the staff at each wildlife unit (biologist and technicians) as well as through their private lands program.

Historic and Cultural Resources

Native American History and Early Settlement

Archeological evidence in northwestern Iowa indicates people have occupied this area for approximately the past 12,000 years. As the glaciers retreated to the north in the warming period known as the Holocene, small bands of hunters moved into the tundra and boreal forest and hunted Pleistocene megafauna. The Clovis and Folsom fluted lanceolate spear points and other tools of these PaleoIndians have been found in several locations near the district in Minnesota and Iowa. Folsom materials seem to be found in diverse settings, often associated with kill-sites although none of these sites have been identified in the district.

By 7,000 B.C. the glacial ice was north of Iowa, even north of Minnesota. Glacial Lake Agassiz in northwest Minnesota drained for the final time around 7,600 B.C. An oak and pine forest and early prairie replaced the boreal forest in western Iowa and Minnesota. The megafauna were extinct, and late PaleoIndian people adapted to reliance upon hunting bison and smaller game. Their representative artifact is the unfluted lanceolate spear point. Plano materials have been found in Iowa and across Minnesota except in Lake Agassiz. Dalton materials have been found in Iowa and southern Minnesota.

The long Archaic Period commenced just prior to the hot and dry Altithermal that peaked at approximately 6,000–4,000 B.C. Apparently the prairie-forest line moved east of the Mississippi River, surface waters reduced in size or disappeared, and many water courses changed their locations. Bison herds were much reduced in size, and the archeological record would indicate a decrease in human populations as well. The people developed a diverse array of stone tools, also bone and copper tools, and broadened their hunting and gathering to include many plant and animal species in addition to bison. Archeological sites indicate that after the Altithermal Period the human population expanded significantly. Due to the changing climate, Archaic sites are situated in areas that might appear to be unlikely based on modern topography, including within wetland basins. They would also be expected in alluvial fan deposits and other burial conditions.

Human populations continued to expand in the Woodland (or Ceramic/Mound) Period. With some exceptions, climate and vegetation patterns were similar to the modern era. The people adopted pottery and mound building from the Woodland cultures to the east but not horticulture to the same extent. Plains Woodland peoples continued reliance upon bison hunting. Sites are found on the margins of lakes, rivers, and streams.

Increasingly complex human cultures of the Late Prehistoric Period, beginning about A.D. 900, in western Iowa contended with fluctuating climatic conditions and shifting vegetation patterns. Initially during this period temperatures were warm. Agriculture became a large component of subsistence, although bison remained important when available. The bow and arrow came into use. Some groups lived in large, often fortified, villages composed of earth lodges. Exotic items indicate trade and some influence by the Mississippian culture from the southeast.

Arrival of Europeans and their Western civilization had a greater impact on Native American cultures. During the Proto-historic Period, tribes migrated from their prehistoric locations and gave up their prehistoric material culture. This change was so momentous that modern Native American tribes often cannot be identified with prehistoric antecedents. In the district, however, archeologists have identified some continuity from the Late Prehistoric through the contact period to modern tribes. The Late Prehistoric Oneota culture of northwestern Iowa was likely the antecedent for the Ioway, Oto, and perhaps Omaha tribes.

First the French, then the British, and last the Americans entered Iowa. Fur trading and early exploration had little apparent impact on the prairie. Fur traders built their fur trade posts at the confluence of rivers or on the shores of larger lakes, usually near a Native American village. In the second half of the 19th century during the Historical Period, American and European immigrants settled the prairie and started to transform Iowa into an agricultural state. The

Native Americans were largely removed through treaty and war. Frontier trails and government roads, followed by railroads, improved accessibility and markets. Homesteader dugouts and sod houses were replaced with frame houses and larger farmsteads. Highway construction and farm consolidation marked the 20th century.

A review of the National Register of Historic Places showed that, as of August 1, 1996, the 35 Iowa WMD counties contained 397 properties listed on the National Register. The vast majority of these properties are buildings in towns and cities. However, a number of the properties are located in rural areas and are indicative of the kinds of historic properties that could be found in the district: farmsteads and farm buildings, especially barns; bridges, segments of the Red River Oxcart trail, mill sites, battle sites, and prehistoric archeological sites such as mounds, villages, camps, and rock art.

Cultural Resource Management

Cultural resources—such as archaeological sites, historic structures, and Native American traditional cultural properties—are important parts of the Nation's heritage. The Service strives to preserve evidence of these human occupations, which can provide valuable information regarding not only human interactions with each other, but also with the natural environment. Protection of cultural resources is accomplished in conjunction with the Service's mandate to protect fish, wildlife, and plant resources.

The Service is charged with the responsibility, under Section 106 of the National Historic Preservation Act of 1966, of identifying historic properties—cultural resources that are potentially eligible for listing on the National Register of Historic Places—that may be affected by our actions. The Service is also required to coordinate these actions with the State Historic Preservation Office, Native American tribal governments, local governments, and other interested parties. Cultural resource management in the Service is the responsibility of the regional director and is not delegated for the Section 106 process when historic properties could be affected by Service undertakings, for issuing archaeological permits, and for Indian tribal involvement.

The Archaeological Resources Protection Act of 1979 (ARPA), Section 14 requires plans to survey lands and a schedule for surveying lands with "the most scientifically valuable archaeological resources." This act also affords protection to all archeological and historic sites more than 100 years old on federal land, not just sites meeting the criteria for the National Register. It requires archeological investigations on federal land be performed in the public interest by qualified persons.

The Regional Historic Preservation Officer (RHPO) advises the regional director (RD) about procedures, compliance, and implementation of these and other cultural resource laws. The actual determinations relating to cultural resources are to be made by the RHPO for the RD for undertakings on Service fee title lands and for undertakings funded in whole or in part under the direct or indirect jurisdiction of the Service. This includes those carried out by or on behalf of the Service, those carried out with federal financial assistance, and those requiring a federal permit, license, or approval.

The responsibility of the refuge/district manager is to identify undertakings that could affect cultural resources and coordinate the subsequent review process as early as possible with the RHPO and state, tribal, and local officials. In addition, the refuge/district manager assists the RHPO by protecting archeological sites and historic properties on Service managed and administered lands, by monitoring archaeological investigations by contractors and permittees and by reporting ARPA violations.

District Administration

Current Situation

An MOU with the Iowa DNR establishes the working relationship and how staffs are shared in the district. Through this partnership, the vast majority of the WPAs are maintained and managed by six Iowa DNR offices: Prairie Lakes, Clear Lake, Black Hawk, Great Lakes, Saylorville, and Red Rock. Current staffing at most of these units include a wildlife biologist, wildlife technician II and wildlife technician I. Some of these units also staff seasonal employees at times. These positions are not reflected in the current district budget, because they are funded by the state.

The Service does not currently pay any staff member’s salary out of district funds; however, all Union Slough NWR staff as well as zoned fire and law enforcement resources are utilized and available to work in the district. Current Service staff, funded through Union Slough NWR and performing work in the district, includes project leader, deputy project leader, wildlife biologist, prescribed fire specialist, administrative technician, maintenance worker, and private lands biologist. Zone fire resources are also utilized almost entirely in the district including a Wildland Urban Interface Coordinator and Prescribed Fire Technician, located in Milford, Iowa. This staff plans and implements prescribed fire on all the WMD properties and also coordinates with partners to accomplish management goals. Funding for the fire program for both the refuge and WMD is administered through the refuge. Currently, the district receives $250,000 to fund restoration projects on district land managed by the Iowa DNR. In addition, the district receives $15,000 for management capability. Union Slough NWR funds are also regularly used for projects in the district.

Currently the MOU describes law enforcement as a shared responsibility of the Iowa DNR and the Service. According to the MOU, the Iowa DNR assumes primary law enforcement responsibility on WPAs necessary to protect the resource. The Service has the responsibility to control use for the protection of the resource and prosecute all possible violations in federal court. The Service also assumes the responsibility for enforcing Service conservation/wetland easements. The Iowa WMD currently does not have a law enforcement officer; however, the zoned law enforcement officer located in Prairie City, Iowa and others have provided assistance as available. Therefore, the district often has difficulty dealing with easement violations in a timely manner as required by the *Region 3 Easement Manual*.

District Support

Current Situation

The Service and the Iowa DNR have a long developed partnership in the district. This partnership was established in 1978 and has been effective in facilitating goals outlined in the Prairie Pothole Joint Venture. Currently, an MOU between the two agencies codifies the partnership. In this agreement, the Service requests two million dollars annually from the Migratory Bird Commission for land acquisition and the Iowa DNR finds properties for sale, negotiates with landowners, and completes inspections. Iowa DNR also provides on the ground restoration and day-to-day management of most WPAs within the district. Properties in Kossuth

County, one in Pocahontas County, and the WPA and FSA easements are managed by Union Slough NWR staff. All other district properties are managed by the Iowa DNR. Wildlife management biologists from six different Iowa DNR units manage these WPAs in their respective areas similar to state WMAs. One of the many advantages to this partnership is that properties can be targeted within priority complexes, providing excellent opportunities for public hunting and recreation.

While the Iowa WMD does not have its own Friends group, the Friends of Union Slough NWR also support the district. They support the district in many ways including financial assistance, volunteer labor, and educational outreach about the district.