CHAPTER 2
Background

This chapter inventories and describes the habitat found on the Kulm WMD.

2.1 District Location and Description

The District is located in south-central North Dakota and provides administration of lands within a 4-county area (Figure 2-1). The District boundary coincides with the peripheral extent of Dickey, LaMoure, Logan and McIntosh; total area for Dickey, LaMoure, Logan and McIntosh Counties is 298,095 ha (736,610 ac), 295,841 ha (731,038 ac), 261,921 ha (647,222 ac), and 257,576 ha (636,484 ac), respectively.

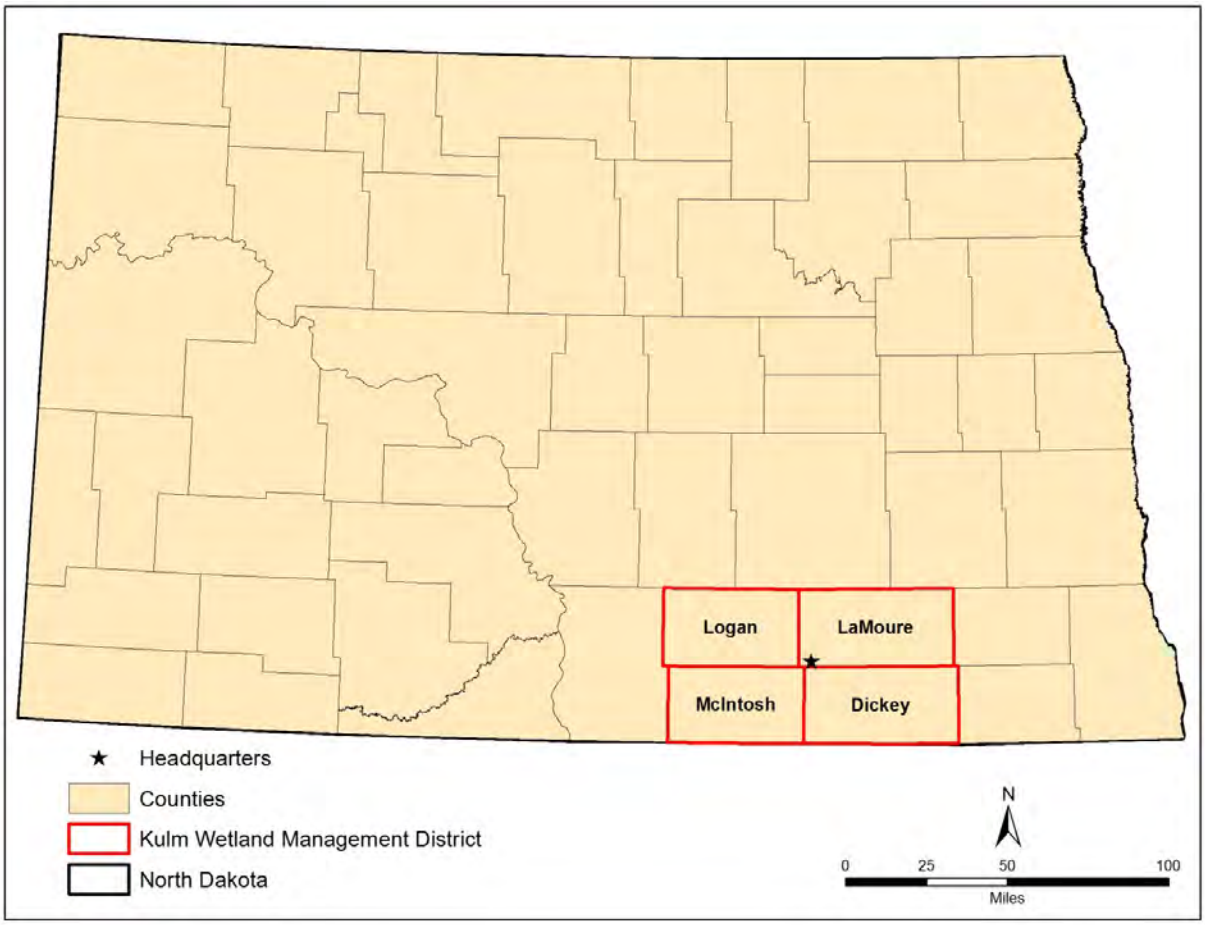

Figure 2-1. Location of Kulm Wetland Management District in North Dakota.

Similar to most of eastern North Dakota, the District is located in a rural, agriculturally based region with a low human population density that generally does not exceed five people per square mile (U.S. Census Bureau 2010). The nearest metropolitan centers from the District headquarters located in Kulm, North Dakota (Figure 2-1), include Bismarck, North Dakota (130 mi), Fargo, North Dakota (150 mi), Sioux Falls, South Dakota (285 mi), and Minneapolis, Minnesota (330 mi).

The District protects wetland and grassland habitat on 187,548 acres of conservation easements (USFWS North Dakota Wetland Acquisition Office, data current to February 27, 2014) and 45,402 acres of fee title land (200 WPAs & 1 WDA; WPAs hereafter) for the benefit of waterfowl and other migratory birds (Figure 2-2).

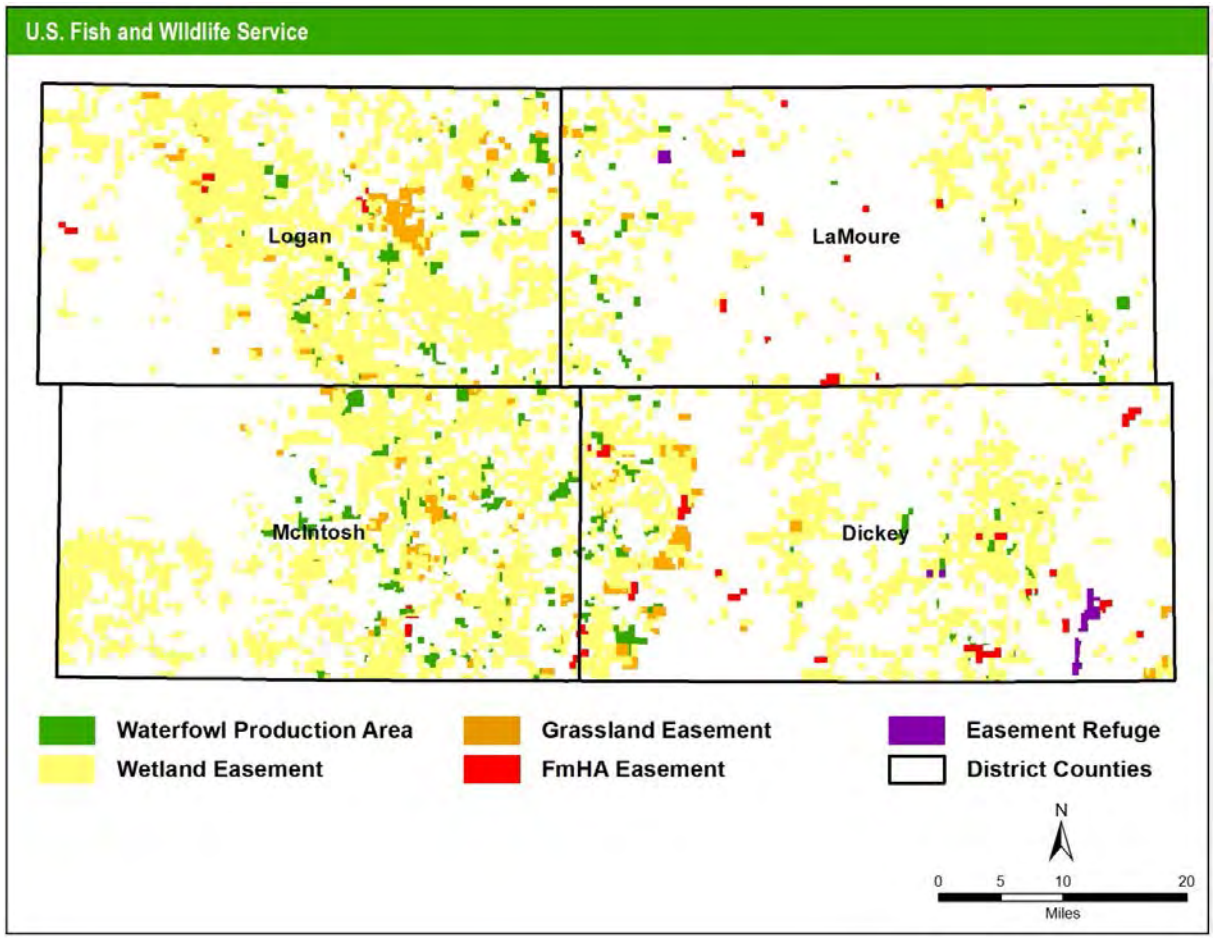

Figure 2-2. Lands administered by Kulm Wetland Management District, North Dakota.

Wetland, grassland, and FmHA conservation easement data was current through 2013. The USFWS makes no claim as to the accuracy or completeness of the displayed information. Shaded areas depicting USFWS conservation easements and WPAs are for illustrative purposes only and do not represent legal boundaries or in the case of easements, acreage of wetland or grassland resources included in the easement contract. For more detailed information on the boundaries of conservation easement or WPA lands, contact the USFWS Realty Office located in Bismarck, North Dakota.

2.2 Management Units

There are several management units found on the Kulm WMD.

Conservation Easements

The District administers 126,519 acres of wetland easements and 61,029 acres of grassland easements. The Service purchases limited-interest conservation easements from willing private landowners that have voluntarily sold a portion of their property rights to allow for perpetual protection of wetland and/or grassland habitat. All land remains in private ownership. Property tax and land management, including control of noxious weeds and other invasive plants and trees, remains the responsibility of the landowner. Landowners maintain complete control of public access to the land under easement. The Service actively enforces conservation easements to ensure that their integrity is not compromised.

While the easement contract specifies perpetual protection, it does not eliminate all activities. Wetland easements generally prohibit draining, burning, filling, or leveling and grassland easements generally prohibit the plowing, breaking sod, or permanent alteration of grassland habitat or alteration of natural topography. However, protected wetland basins may be hayed or grazed without restriction and farmed during natural dry cycles. Grassland easements prohibit conversion to cropland or alteration of natural topography, but do not restrict grazing or seed harvesting in any way and haying is permitted after July 15 each year.

The District has 30 FmHA easements which are administered by the Service primarily to protect wetlands. However, FmHA easements can vary from easement to easement based on the provisions outlined in the quitclaim deed for each property. Generally, most FmHA easements were acquired for conservation, recreation, or wildlife purposes, but some included provisions for historical and cultural resources as well.

Limited-interest Easement National Wildlife Refuges

The District also administers a total of 4,152 acres on the following limited-interest easements NWRs: Bone Hill NWR, Maple River NWR, and Dakota Lake NWR. These limited-interest easement NWRs permanently protect wetland habitat for migratory birds. Wetlands on these NWRs are generally permanent wetland types (e.g., lakes, riverine) that waterfowl and other wetland-dependent birds use during migration and to a lesser extent for breeding and nesting purposes. The Service utilizes management of these NWRs following the goals and objectives outlined in the North Dakota limited-interest CCP to manage these NWRs (USFWS 2006). The Service's water management capability on these NWRs is limited to an earthen/sheet pile dam with stop log on Dakota Lake NWR and an earthen dam and sheet pile weir on Maple River NWR.

Waterfowl Production Areas

The District manages 45,402 acres held in fee title ownership on 201 WPAs (WPA range = 0.3 – 1756 acres) comprised of 24,810 acres of natural wetlands and 20,592 acres of grasslands that are

actively managed in the District. The Service actively manages native sod prairie, low- and high-diversity reconstructed prairies, seeded introduced grasslands composed of dense nesting cover (DNC; intermediate wheatgrass (*Thinopyrum intermedium*), tall wheatgrass (*T. ponticum*), and alfalfa (*Medicago sativa*) or sweetclover (*Melilotus officinalis*) on individual management units within each WPA for nesting birds (Figure 2-3). Management of these grasslands aims to enhance the condition of nesting cover for waterfowl and other migratory birds using a variety of management techniques including the use of prescribed fire, grazing, haying, prairie reconstruction, tree removal and invasive species management. Wetlands on WPAs also serve as important habitat that are used by waterfowl during migration, breeding, nesting, and brood-rearing periods and as a primary source of forage, concealment from predators, and for courtship displays and social interactions. However, the Service does not have the ability to manipulate water levels on natural wetlands within WPAs. Therefore, wetlands on WPAs are likely influenced by ecosystem processes (see Euliss et al. 2008) and adjacent land use practices.

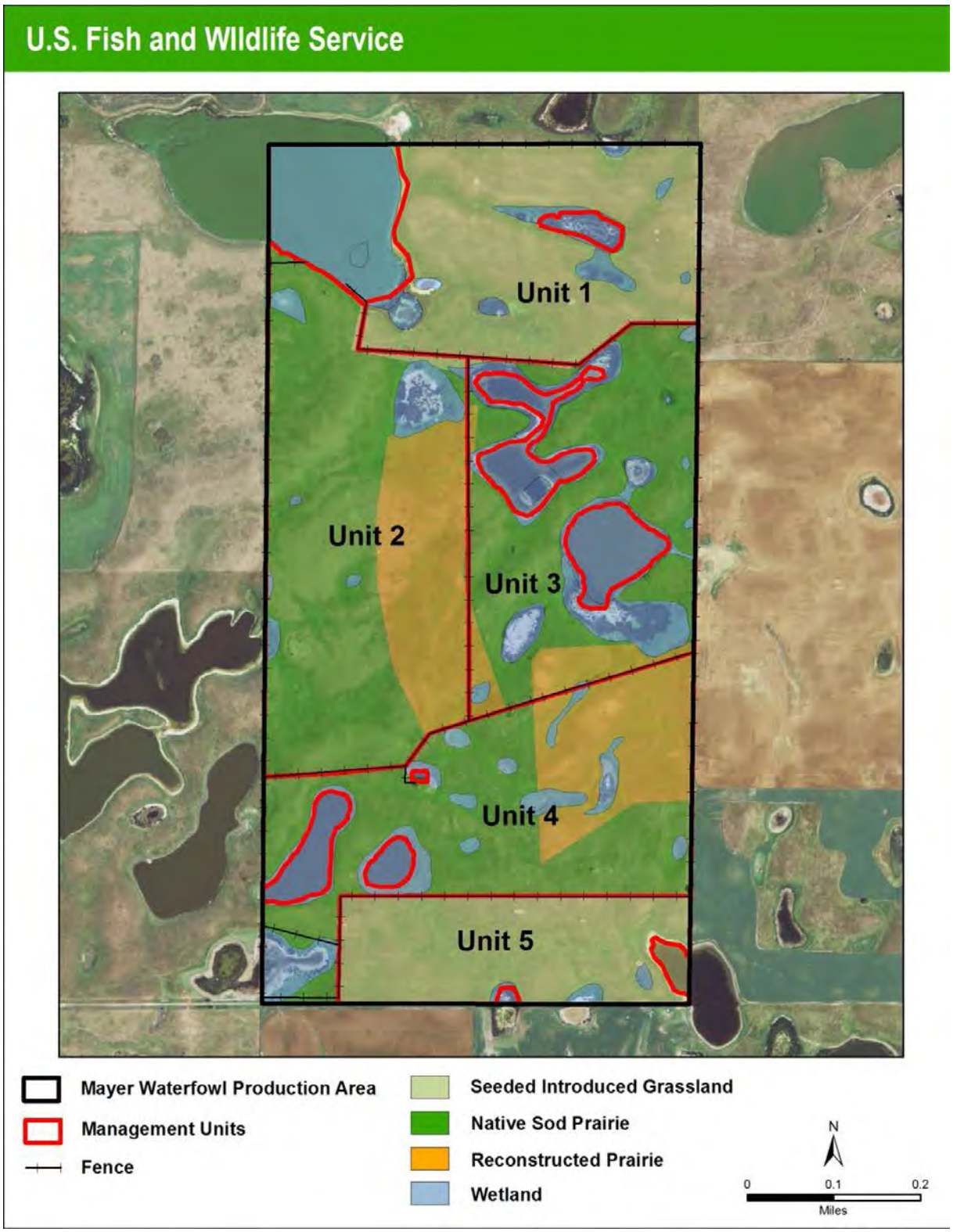

Figure 2-3. An example of individual management units and different habitat types occurring on the Mayer Waterfowl Production Area in Logan County, North Dakota.

2.3 Geographical Setting

The section describes the geographical setting of the Kulm WMD.

PRAIRIE POTHOLE REGION

The PPR encompasses approximately 900,000 km^2 and extends southeast from the provinces of Alberta, Saskatchewan, and Manitoba in Canada through portions of Montana, North Dakota, South Dakota, Minnesota, and Iowa (Gleason et al. 2005; Figure 1-1). The geographic extent of the PPR also coincides with the NABCI BCR #11, Prairie Potholes. Although much of the native grassland (70% in ND; Conner et al. 2001) and wetland habitat (49% in ND; Dahl 1990) in the PPR has been converted primarily for agricultural purposes, the remaining habitat supports approximately 50% of the breeding waterfowl (Batt et al 1989) in North America and is critically important to other migratory birds (Igl and Johnson 1997, Niemuth et al 2009). Remaining habitat also helps maintain important ecosystem services including regional and national biodiversity, attenuation of floodwater, nutrient cycling, carbon sequestration, groundwater recharge, and providing recreational opportunities (Hubbard 1988, Knutsen and Euliss 2001, Euliss et al. 2008, Gleason et al. 2011).

The District composes only 1.2% (1,113,433 ha) of the total land area within PPR, but it has a crucial role in supporting the carrying capacity and production of waterfowl and other migratory birds due to the extensive base of grassland and wetland habitat remaining in the four counties. In fact, waterfowl pair density exceeds 100 duck pairs per square mile in many parts of the District (Figure 2-4). These areas are generally associated with high wetland densities (which can exceed 100 wetland basins per square mile) that are attractive to most migratory birds in the PPR (Johnson and Grier 1988). Continued protection and management of grassland and wetland habitat within the District also contributes to the goals and objectives outlined in the aforementioned national, regional and local conservation plans.

MIXED-GRASS PRAIRIE ECOSYSTEM

The District lies within the mixed-grass prairie ecosystem which is one of the largest grassland dominated ecosystems in North America (Bragg and Steuter 1996). Historically, this ecosystem was characterized by a mosaic of mixed-grass prairie and dynamic wetlands that remained largely undisturbed until the onset of European settlement and the initial conversion of native prairie for low-intensity agriculture during the 1830's to 1880's (Samson and Knopf 1994, Severson and Hull Sieg 2006). Although approximately two-thirds of the mixed-grass prairie has been converted for agricultural purposes (National Wildlife Federation 2001), the remaining grasslands in this ecosystem are highly productive and support North America's largest and most diverse assemblage of breeding waterfowl (Batt et al. 1989), shorebirds (Skagen and Thompson 2000), waterbirds (Kushlan et al. 2002) and grassland songbirds (Rich et al. 2004).

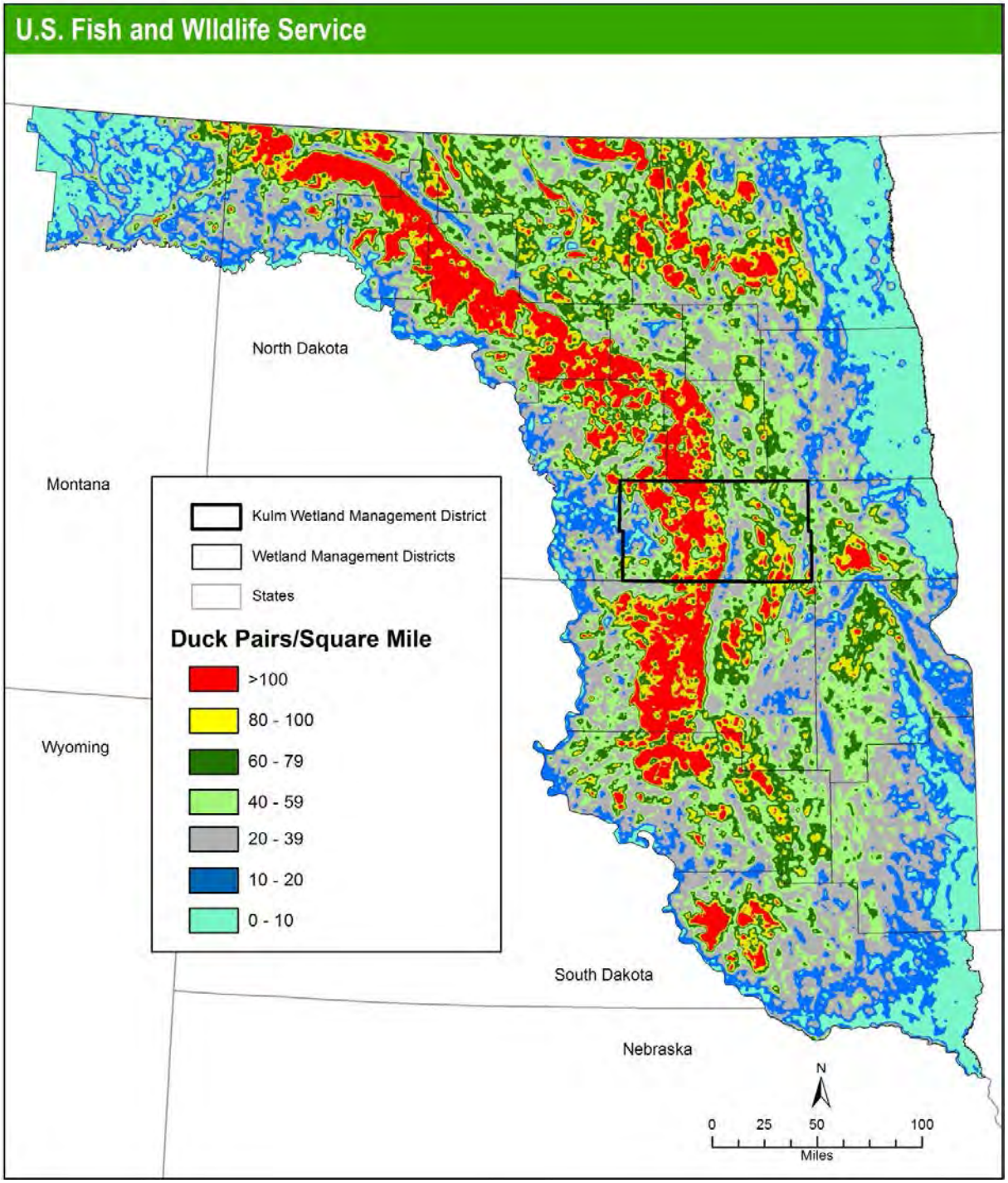

Figure 2-4. Average density and distribution of five combined dabbling ducks including mallard (*Anas platyrhynchos*), blue-winged teal (*Anas discors*), gadwall (*Anas strepera*), northern shoveler (*Anas clypeata*), northern pintail (*Anas acuta*) in the Kulm Wetland Management District and USFWS Dakotas Zone from surveys conducted from 1987-2011.

Estimates were derived from breeding waterfowl pair surveys conducted during the USFWS four square mile breeding waterfowl and habitat survey during 1987-2011.

PHYSIOGRAPHIC REGIONS WITHIN THE DISTRICT

Major physiographic regions that formed through glacial processes in the District from west to east include the Missouri Coteau Slope, Missouri Coteau, and Glaciated Plains, also known as the Drift Prairie (Figure 2-5). Dissecting the District from north to south is the Missouri Coteau, a terminal moraine created during Wisconsin glaciation ca. 10,000 years ago. Elevation increases nearly 305 m (1,000 ft) above the James River Valley which transcends the Glaciated Plain physiographic unit. The Missouri Coteau is characterized by rough and hilly terrain intermixed with abundant depressional wetlands exceeding >100 wetlands per square mile. This area also supports most of the remaining intact native mixed-grass prairie grasslands in the District because the dissected topography and highly erodible soils are less desirable for row crop agriculture. The combination of wetland/grassland habitat in relatively large blocks makes the Missouri Coteau an important physiographic area in the District for waterfowl production (Stewart and Kantrud 1973, Cowardin et al. 1995, Reynolds et al. 2001, Reynolds et al. 2007). The Drift Prairie lies east of the Missouri Coteau and also contains areas where wetland density exceeds 100 wetlands per square mile. The highly fertile soils of the Drift Prairie along with the flatter terrain are more amenable to row crop agriculture. Finally, the Missouri Slope descends from the Missouri Coteau to the west and is bordered along its western margin by the Missouri River. Numerous draws and coulees naturally drain the area and though wetlands are still prevalent, they are less numerous than in the Missouri Coteau or Drift Prairie.

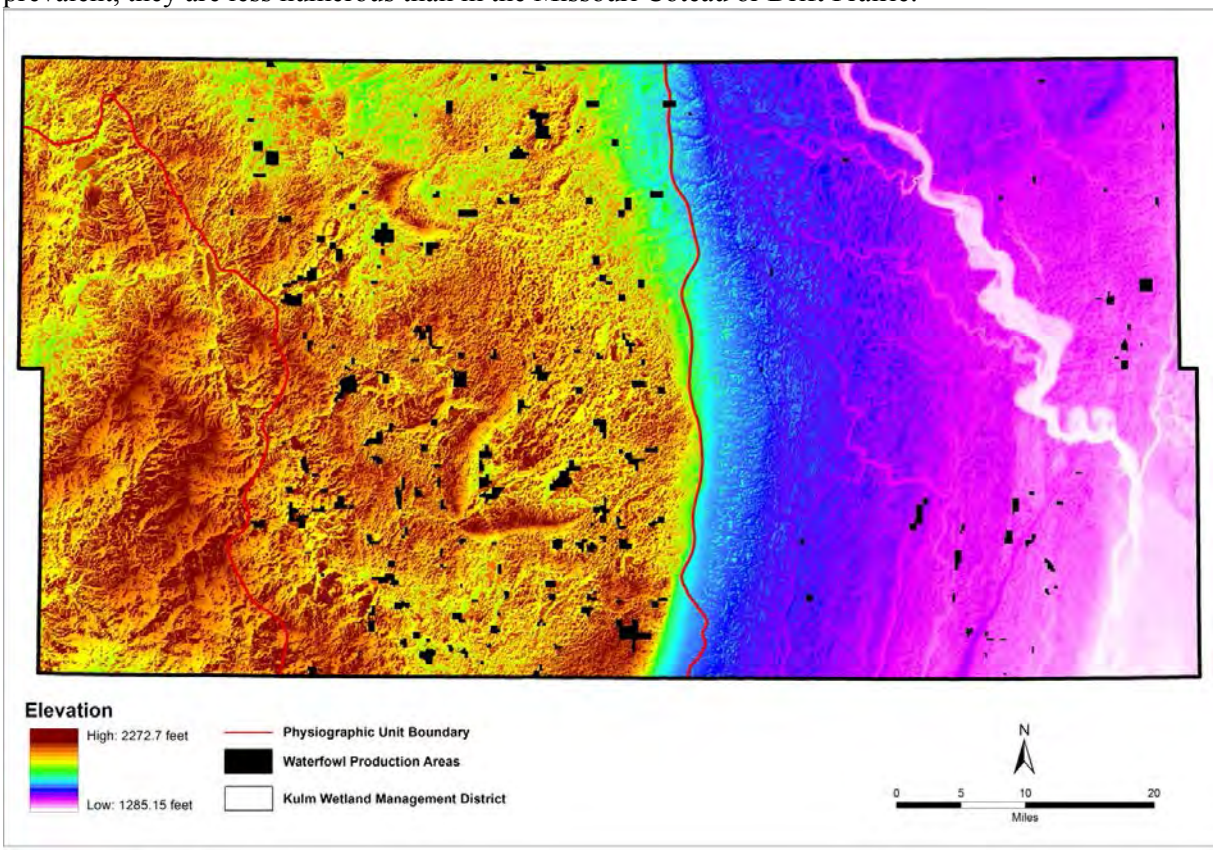

Figure 2-5. Major physiographic units representing level 3 ecoregions from east to west including the Missouri Coteau Slope, Missouri Coteau, and Glaciated Plains within Kulm Wetland Management District.

ECOREGIONS WITHIN KULM WETLAND MANAGEMENT DISTRICT

There are several ecoregions within the Kulm WMD.

LEVEL 3 ECOREGIONS

The District occurs within 3 primary ecoregions (Omernik 1987, 1995, U.S. Environmental Protection Agency 2003) from west to east: Northwestern Glaciated Plains Ecoregion 42, Northwestern Great Plains Ecoregion 43, and Northern Glaciated Plains Ecoregion 46.

The Northwestern Glaciated Plains level 3 ecoregion 42 marks the westernmost extent of continental glaciations. This moraine landscape has significant surface irregularity and high concentrations of wetlands. The rise in elevation along the eastern boundary defines the beginning of the Great Plains. Land use is transitional between the intensive row crop farming in Drift Plains ecoregion 46i (level 4 ecoregion) to the east and the predominance of cattle ranching and farming to the west in Northwestern Great Plains ecoregion 43 (level 3).

The Northwestern Great Plains level 3 ecoregion 43 is limited to the extreme southwest corner of Logan County within the District. It is a semiarid rolling plain of shale, siltstone, and sandstone punctuated by occasional buttes and badlands. Native grasslands persist in areas of steep or broken topography, but they have been largely replaced by spring wheat and alfalfa over most of the ecoregion.

The Northern Glaciated Plains Ecoregion 46, commonly referred to as the Drift Prairie, formed from prolonged glacial activity between 70,000 and 10,000 years ago. This ecoregion is characterized by flat to gently rolling topography and sub-humid conditions that historically fostered a grassland transition between the tall- and short-grass prairies in North America. The remaining seasonal and temporary wetland basins in this ecoregion provides important breeding habitat used by waterfowl and other migratory birds.

LEVEL 4 ECOREGIONS

The District also lies within 8 level 4 ecoregions (Omernik 1987, 1995; Figure 2-6). The Missouri Coteau Ecoregion 42a is characterized by rolling topography and abundant depressional wetlands. This ecoregion formed during the prolonged retreat of the Wisconsin glaciation that stalled at the Missouri escarpment for thousands of years and slowly melted beneath a mantle of sediment to create the characteristic pothole topography found throughout the Missouri Coteau. Land use is a mixture of tilled agriculture in flatter areas and grazing land on steeper slopes. Remaining wetland and grassland habitat represents one of the most productive areas for breeding waterfowl in North America.

The Collapsed Glacial Outwash Ecoregion 42b formed from gravel and sand that was deposited by glacial meltwater and precipitation runoff over stagnant ice. Many large shallow wetlands and lakes are found in this ecoregion that tend to be slightly to very alkaline depending upon the flow path of groundwater moving through the permeable outwash deposits. They attract birds preferring large areas of open water such as American white pelican, black tern, and Forster's tern, as well as those living in brackish water such as American avocet and tundra swan.

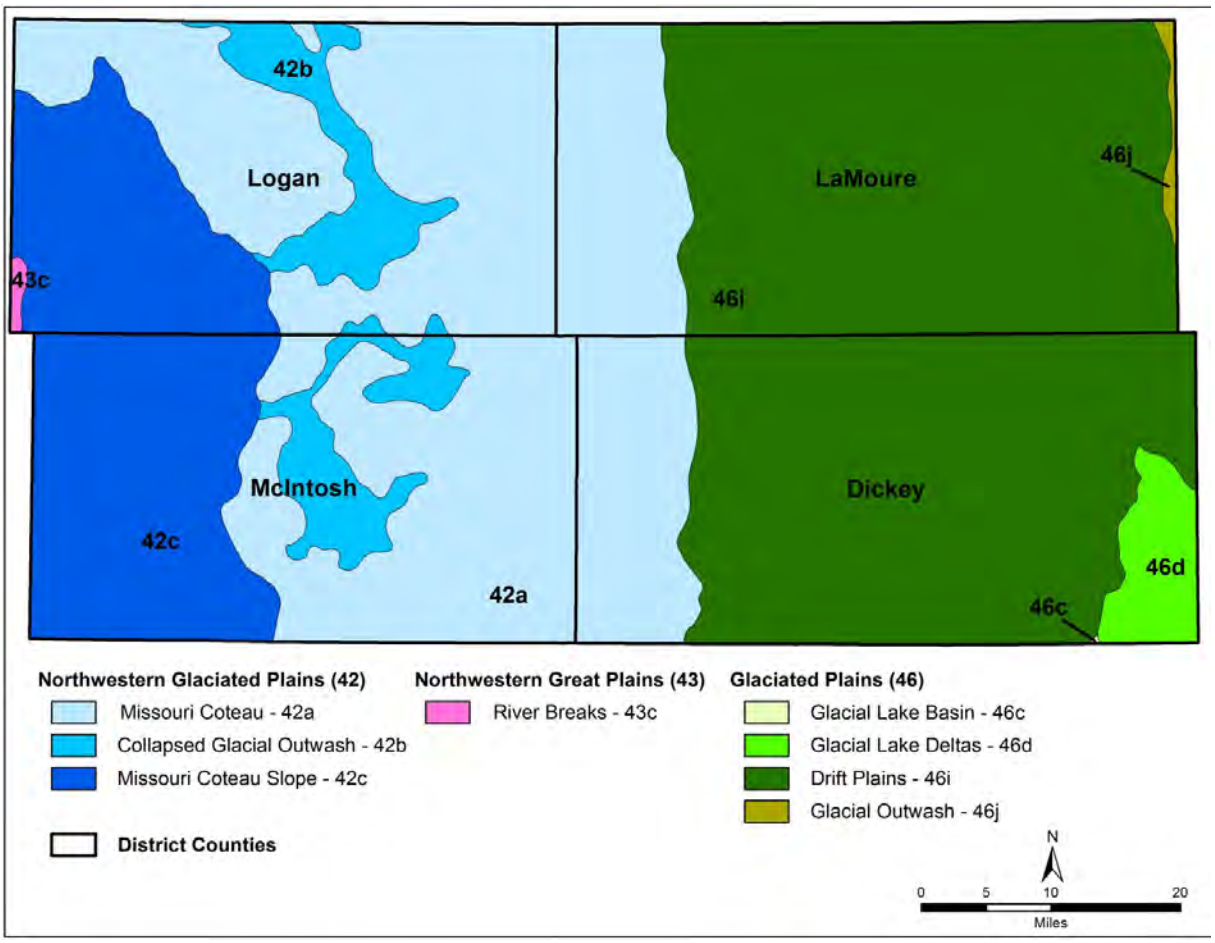

Figure 2-6. Level 3 and 4 ecoregions (Omernik 1987, 1995, U.S. Environmental Protection Agency 2003) within Kulm Wetland Management District.

The Missouri Coteau Slope Ecoregion 42c declines in elevation from the Missouri Coteau Ecoregion 42a to the Missouri River. Unlike Missouri Coteau Ecoregion 42a, the Missouri Coteau Slope has a simple drainage pattern and fewer wetland depressions. Due to the level to gently rolling topography, there is more cropland than the Missouri Coteau Ecoregion 42a. Cattle ranching also occurs on the steeper land along drainages.

The River Breaks Ecoregion 43c is characterized by broken terraces and uplands that descend to the Missouri River and its tributaries. The dissected topography, wooded draws, and uncultivated areas are conducive for wildlife.

The Glacial Lake Basin Ecoregion 46c was formed when major stream or river drainages were blocked by glacial ice during the Pleistocene. It is heavily tilled and is limited to a small area in the southeast corner of Dickey County in the historical Lake Dakota basin.

The Glacial Lake Deltas Ecoregion 46d was formed from river deposits entering glacial lake basins. The heaviest sediments, mostly sand and gravel, formed delta fans at the river inlets. As lake floors were exposed during glacial ice withdrawal, wind reworked the sand in some areas into dunes. Unlike the highly productive glacial lake plains, the dunes in the delta areas have a thin vegetative cover and a high risk for wind erosion. These are used mainly for grazing or irrigating agriculture.

The Drift Plains Ecoregion 46i generally has level to rolling topography formed by the retreating Wisconsin glaciation. Because of the productive soil and level topography, it is almost entirely cultivated, with many wetlands drained or simply tilled and planted. However, abundant temporary and seasonal wetlands are found throughout this ecoregion which are highly attractive to waterfowl.

The Glacial Outwash Ecoregion 46j generally has smooth topography, highly permeable soils with low water-holding capacity, and is poor to fair for crop production that is used for irrigated agriculture. This ecoregion is limited to the extreme eastern portion of LaMoure County in the District.

WATERSHEDS

The District lies almost entirely within the Missouri Main Stem region, which is the primary drainage area for the Missouri River (USFWS 2008). There are also six eight-digit hydrologic units (called cataloging units or watersheds) within the District that are included in the drainage area: Apple, Beaver, Elm, Upper James, Upper Lake Oahe, and West Missouri Coteau; the Western Wild Rice eight-digit hydrologic unit is part of the Hudson Bay drainage area (Figure 2-7). These units are considered watersheds that typically drain more than 700 square miles (USDA NRCS 2011a).

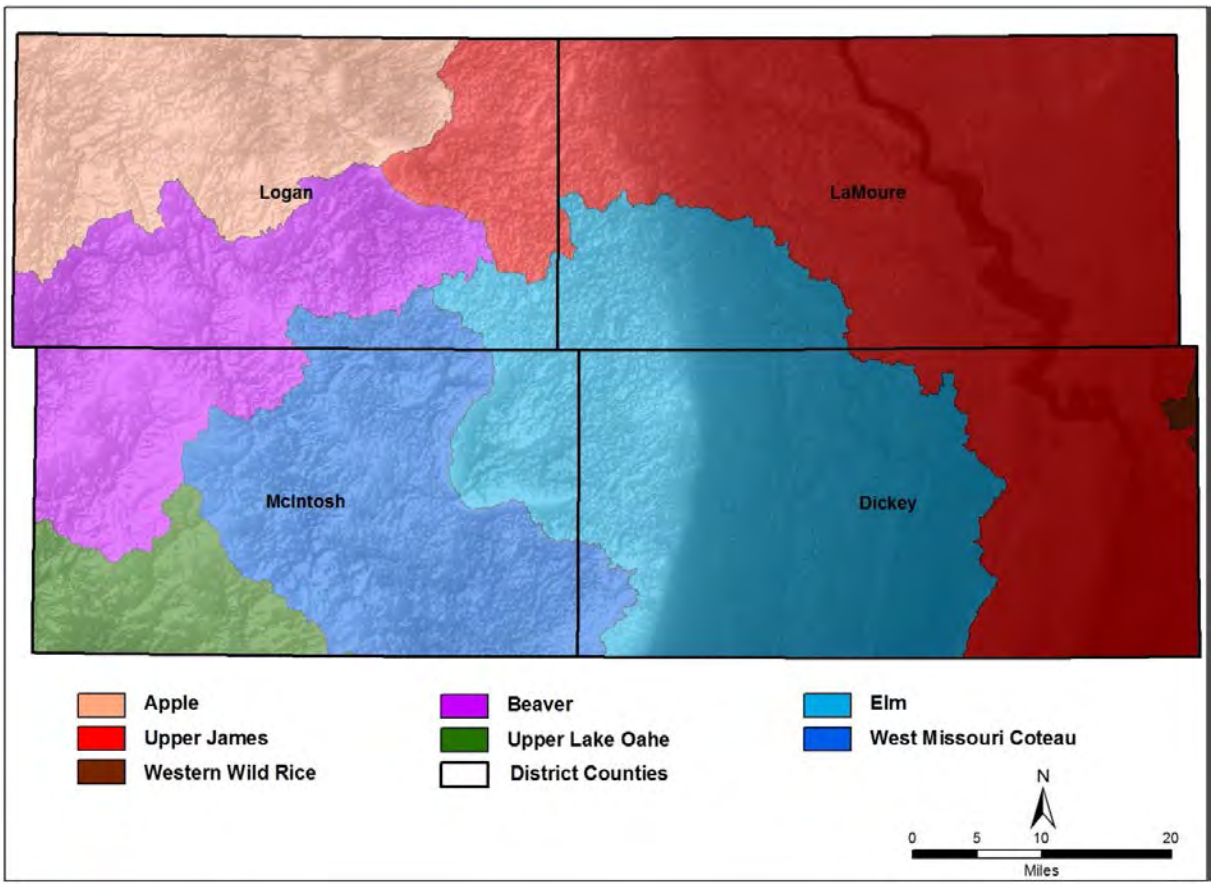

Figure 2-7. Eight-digit watersheds within Kulm Wetland Management District.

(USDA NRCS 2011a).

2.4 Physical Environment

This section describes the physical environment of the Kulm WMD.

CLIMATE

North Dakota is characterized as a continental climate with large daily and seasonal variation in temperatures. The climate has been relatively stable for the last 2,500 years compared to the period between 2,500 to 7,000 years ago when south-central North Dakota transitioned from a forest-dominated landscape to the mixed-prairie grassland-dominated landscape that occurs today (Bluemle 1975). Mean monthly temperatures from 1901–2010 in Edgeley, North Dakota, located approximately 15 miles northeast of Kulm (the approximate center of the District), during January are 8.7° F and 69.6° F in July with mean monthly low temperatures of -1.6 °F in January and monthly highs that average 83.4 °F in July (High Plains Regional Climate Center 2011). The last freezing temperature below 28 °F in the spring typically occurs by May 5 and the first killing frost (≤28° F) typically occurs around October 5 at Edgeley (USDA NRCS 2011b). On average, there are 127 growing days in the District where the temperature exceeds 28° F (USDA NRCS 2011b).

Mean annual precipitation received from 1901-2010 at Edgeley was 18.09 inches (range = 9.74–28.75 in) with May (2.67 in) and June (3.57 in) being the wettest months and January (0.44 in) and December (0.37 in) receiving the least precipitation. Mean annual snowfall during this period was 25.4 inches in Edgeley (High Plains Regional Climate Center 2011). However, annual snowfall can approach 70 inches during extreme winters. Annual precipitation generally increases from west to east in the District with portions of Dickey County receiving the highest amount of annual precipitation (Figure 2-8). The bulk of the precipitation that the District receives can be attributed to thunderstorms that occur from May through July. Winds are generally moderate (less than 20 mph) though it is not uncommon for winds to exceed 30 mph with periodic gusts over 40 mph.

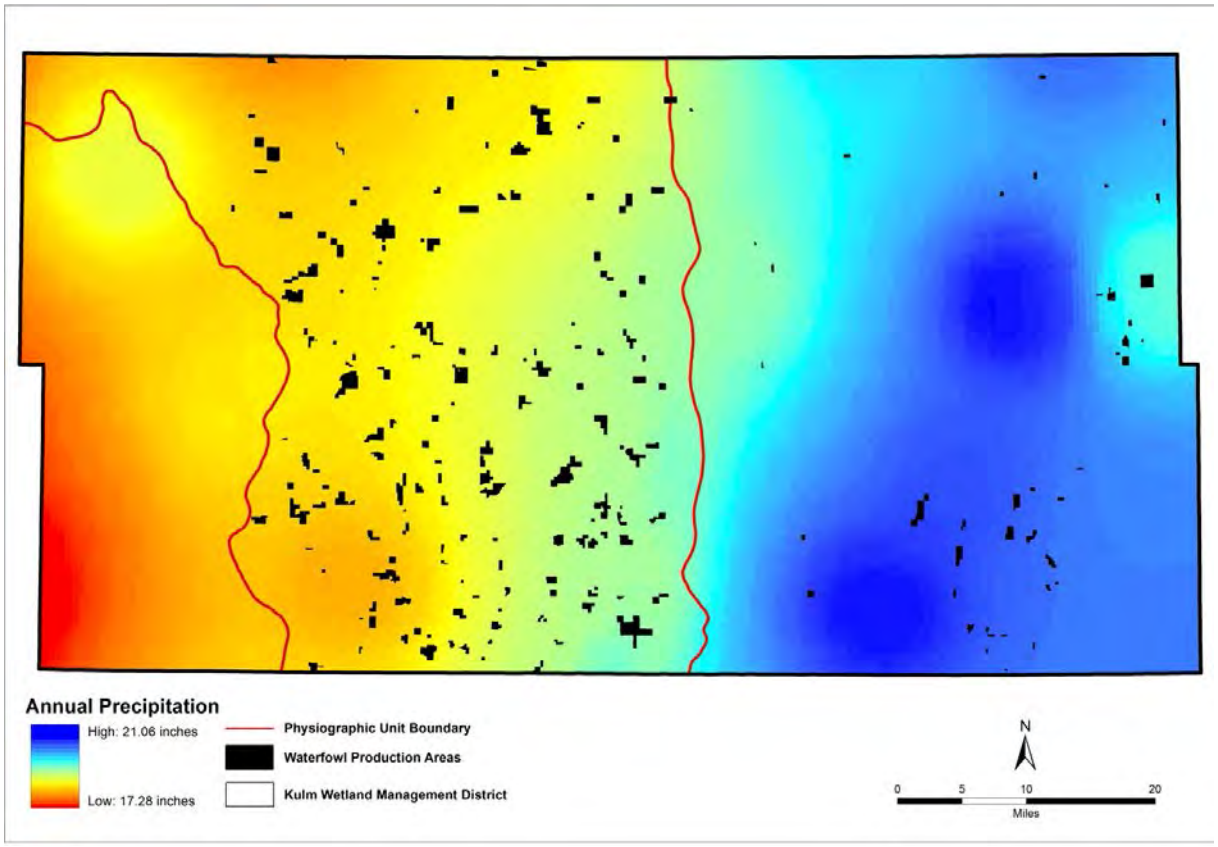

Figure 2-8. Mean annual precipitation from 1971–2000 for Kulm Wetland Management District.

Map data were developed using Parameter-elevation Regressions on Independent Slopes Model (PRISM) climate data derived from fine-scale grid-based estimates of climatic parameters such as precipitation, temperature, and dew point. (USDA NRCS 2011c).

TOPOGRAPHY

Topographic variation within the District can be attributed to three distinct physiographic ecoregions spanning the District from west to east including the Missouri Coteau Slope, Missouri Coteau, and Glaciated Plains (Figure 2-5). Glacial stagnation formed the rolling hummocks, abundant "pothole" wetland basins, and large expanses of grasslands in the Missouri Coteau. The greatest topographic relief (up to 500 ft) occurs along the escarpment in the Missouri Coteau. Constant movement of thick glacial ice in the Glaciated Plains created a nearly flat to undulating (≤20 ft of topographic relief) surface that is characterized by extremely productive soils that resulted from the disintegration of glacial drift sedimentary rock and numerous wetlands (exceeding 100 basins per square mile in some portions of the District) that are important to breeding waterfowl. The Missouri Coteau Slope physiographic unit is located in the westernmost extent of continental glaciation and its easternmost boundary is the start of the Great Plains (Bryce et al. 1998). This ecoregion contains significantly less wetland basins than in the Missouri Coteau and Glaciated Plains ecoregions and the gradual decline in elevation towards the Missouri River makes the area conducive for row crop agriculture. Because of the low wetland density and abundant row crop agriculture in the Missouri

Coteau Slope, this area has lower habitat value to breeding migratory bird populations than the Missouri Coteau or Glaciated Plains.

GEOLOGY

The geologic character (soils and topography) of the District was constructed by several glaciers that occupied south-central North Dakota during the Pleistocene Epoch. Prior to several glaciated periods, the last ending approximately 12,000 years ago, south-central North Dakota resembled areas west of Mandan, North Dakota, with buttes, and large-scale, wind- and water-sculpted scenery (Bluemle 1975). Today, the landscape reflects several glaciation periods that deposited various materials comprised of sand, silt, clay, gravel, boulders, and mineral rich soils created by glaciers grinding rock and constant bacterial action and weathering of the sedimentary glacial drift layer (Bluemle 1975). Two types of sedimentary rock are found in the District: glacial drift and bedrock. The shallow glacial drift layer occurs above a much more extensive layer of sedimentary bedrock consisting of sandstone, shale, and lignite created 50–80 million years ago during the late Cretaceous to Tertiary periods (Bluemle 1975).

SOILS

Data obtained from the Natural Resources Conservation Service (NRCS) indicate a diversity of soils types on the District. Number of soil types identified includes 96, 84, 78, and 76 for LaMoure, Dickey, Logan, and McIntosh Counties, respectively. The top 10 soil types account for 79.7%, 54.6%, 54.7%, and 56.7% of the totals within each of the respective counties. LaMoure County is primarily dominated by Barnes-Svea and Svea-Barnes loams. Dickey County is dominated by Barnes-Svea, Hamerly-Tonka-Parnell, and Barnes-Cavour loams. Logan County is dominated Zahl-Williams and Buse-Barnes loams. McIntosh County is also dominated by loams, primarily Zahl-Williams, Bearpaw-Zeeland, and Wabek-Appam sandy loams. In general, intensity of row crop agriculture follows an east–west gradient with cropping intensity highest in the east (LaMoure and Dickey Counties) with fields planted primarily to corn (*Zea mays*), soybeans (*Glycine max*), and wheat (*Triticum aestivum*). In comparison, in the west (Logan and McIntosh counties) small grain farming [i.e., wheat, barley (*Hordeum vulgare*), sunflowers (*Helianthus annuus*)] and livestock production are more prevalent.

LANDSCAPE COMPOSITION

In 2013, land use in the District was comprised of 53.2% agricultural crops (19% corn [*Zea maize*], 23% soybeans [*Glycine max*], 5.4% wheat [*Triticum* spp.], and other cropland (5.8%), 32.8% grassland, 9.6% wetland, 0.6% forest, and 3.8% developed (low to high intensity human modification) (Figure 2-9; NASS 2013).

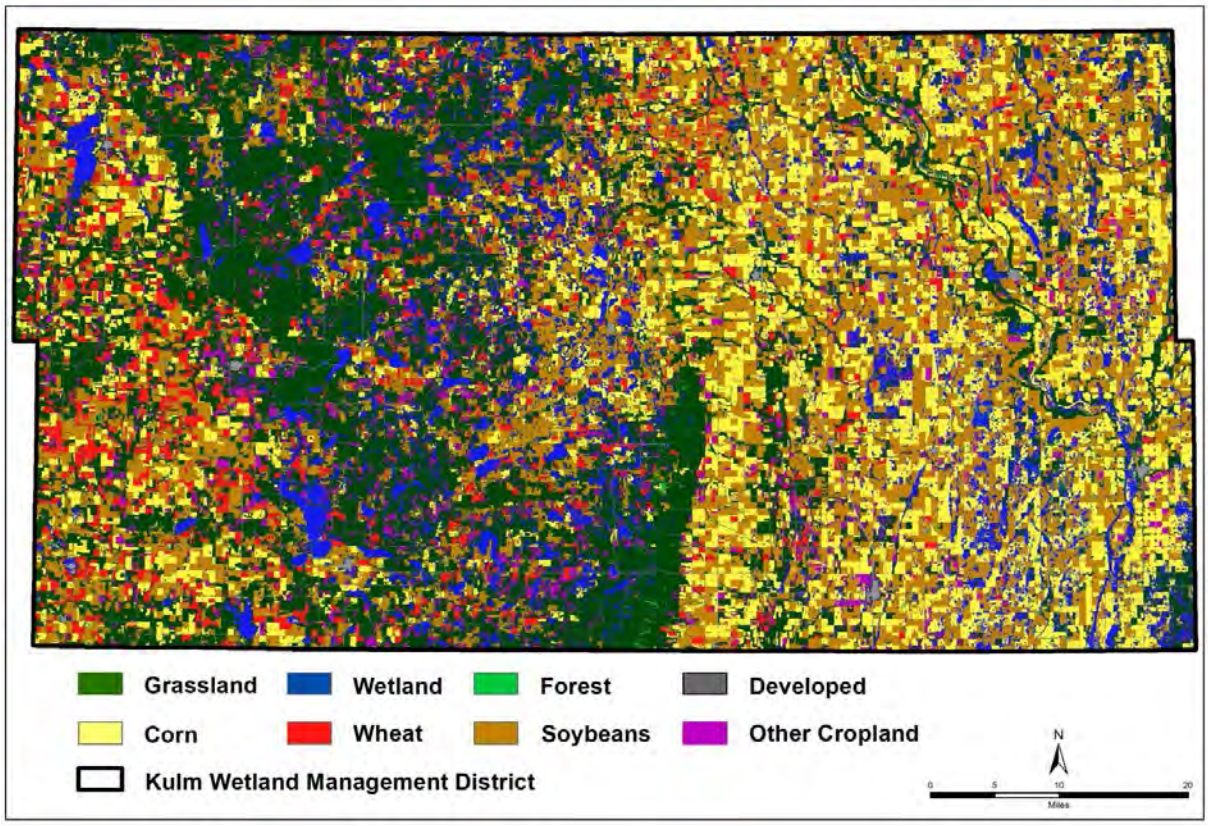

Figure 2-9 Variation in land use at Kulm Wetland Management District based on the 2013 National Agricultural Statistics Service, North Dakota Cropland Data Layer.

Other cropland included all non-corn/wheat/soybean agricultural crops and fallow/idle cropland. Grassland was classified using grassland/pasture, switchgrass, and barren categories.

National Wetlands Inventory data identified 163,704 wetland basins covering 125,717.1 ha in the District (Figure 2-10). Wetland area was comprised of temporary (15,758 ha), seasonal (47,055 ha), semipermanent (44,114 ha), lake (16,309 ha) and riverine (2,479 ha) types (Cowardin et al. 1979), respectively. Approximately 47.9% and 44.3% of all wetlands are temporary and seasonal basins.

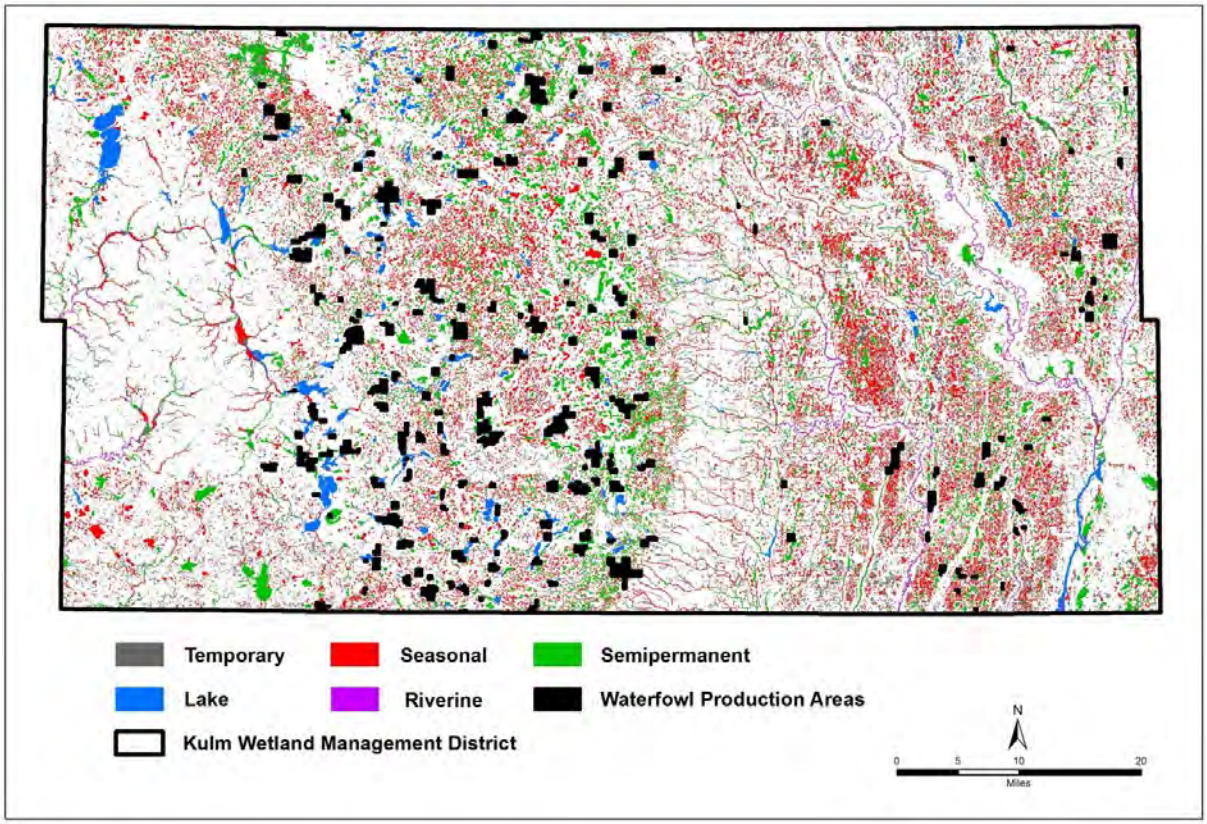

Figure 2-10. Distribution and classification (Cowardin et al. 1979) of wetland basins based on National Wetland Inventory data in Kulm Wetland Management District.

VEGETATION

Native Sod Prairie – Historically, the composition and function of mixed-grass native prairie communities was shaped by weather, precipitation, fire, and grazing by free-roaming herbivores (Sedivec and Printz 2012). The potential composition and ecological function of these native sod prairies have been characterized using ecological site descriptions (ESDs) for North Dakota (Sedivec and Printz 2012). The potential plant community on ecological sites is influenced by surface soil depth, soil texture, available soil moisture, land slope and exposure, precipitation, and soil fertility and salinity.

The District currently has some native sod prairie on 139 of 201 WPAs (69%). The observed plant community is strongly influenced by the timing, frequency, intensity, and duration of previous defoliation treatments implemented at appropriate levels to stimulate native plants and limit invasion by exotic cool-season grasses (Murphy and Grant 2005, Grant et al. 2009, Ellis-Felege et al. 2013). The majority of native sod prairie on Service-owned WPAs in the District is highly invaded by smooth brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*) due to either decades of rest and/or infrequent defoliation (Kirsch et al. 1978, Kirby et al. 1992). Thus, the Service is engaged in an adaptive management study (USFWS 2011c) aimed at restoring these prairies. Specific restoration goals, objectives and strategies are described in Chapter 4 of this HMP.

Because the District is dominated by loamy soils, staff selected the loamy ESD to characterize the potential plant communities that exist on native sod mixed-grass prairies on WPAs. Vegetation for loamy ESDs for the Central Brown Glaciated Plains major land resource area (MLRA) #053B (Printz et al. 2012a) and Central Black Glaciated Plains MLRA #055B (Printz et al. 2012b) is as described:

> *Central Brown Glaciated Plains #053B*—The historic climax plant community (HCPC) evolved with grazing by large herbivores and occasional fire. The HCPC can be maintained or can return on degraded ecological sites using favorable management treatments such as prescribed grazing that allow for adequate recovery periods (Printz et al. 2012a). Potential vegetation in the HCPC is approximately 85% grasses or grass-like plants, 10% forbs, and 5% shrubs. The HCPC is dominated by western wheatgrass (*Pascopyrum smithii*) and green needlegrass (*Nassella viridula*) and includes other grasses and grass-like plants including needle-and-thread (*Hesperostipa comata* ssp. *comata*), blue grama (*Bouteloua gracilis*), porcupine grass (*Hesperostipa spartea*), bearded wheatgrass (*Elymus trachycaulus* spp. *subsecundus*), and sedges (needleleaf sedge [*Carex duriuscula*] and thread-leaved sedge [*Carex filifolia*]). Common forbs include American vetch (*Vicia Americana*), green sagewort (*Artemisia dracunculus*), silverleaf scurfpea (*Pediomelum argophyllum*), and Missouri goldenrod (*Solidago missouriensis*). Common shrubs include prairie rose (*Rosa arkansana*), leadplant (*Amorpha canescens*), winterfat (*Krascheninnikovia lanata*), and fringed sagewort (*Artemisia frigida*).
>
> The plant community shifts away from the HCPC under adverse management (e.g., continuous season-long grazing or annual early spring grazing) or during extended periods of rest (Printz et al. 2012a). The resulting plant community states include community phases 2.2 – western wheatgrass/green needlegrass/Kentucky bluegrass, 3.3 – blue grama/sedge, and 4.4 – Kentucky bluegrass.
>
> *Central Black Glaciated Plains #055B*—The HCPC also evolved through disturbance by periods of intense, short-duration grazing and frequent fire. When properly managed, ecological sites resemble the HCPC (Printz et al. 2012b). The HCPC is dominated by cool-season grasses including green needlegrass and western wheatgrass and includes other grasses such as slender wheatgrass (*Elymus trachycaulus*), bearded wheatgrass, needle-and-thread, and porcupine grass and big bluestem (*Andropogon gerardii*), blue grama, and sideoats grama (*Bouteloua curtipendula*) warm-season grasses. A variety of leguminous and non-leguminous perennial forbs can occur, but in small amounts (Printz et al. 2012b).
>
> Heavy continuous grazing and/or continuous spring grazing that do not allow ecological sites to recover or extended periods of rest will cause these sites to shift away from the HCPC (Printz et al. 2012b). The resulting plant community states include community phases 1.2 – big bluestem/sideoats grama/western wheatgrass, 1.3 – snowberry/chokecherry/grasses, 2.1 – green needlegrass/western wheatgrass/Kentucky bluegrass, 2.2 – Kentucky bluegrass/blue grama/sedge, 3.1 – invaded by Kentucky bluegrass or smooth brome, 3.2 – Kentucky bluegrass sod/forbs, 3.3 – annual/pioneer perennial, 4.1 – green ash/bur oak/shrubs, 4.2 – bur oak/green ask/ironwood/Sprengel sedge, 5.1 – oak/sedge, 5.2 – mature oak/Kentucky bluegrass,

5.3 – buckthorn/oak, 5.4 – oak/eastern redcedar, and 5.5 – buckthorn/Kentucky bluegrass.

Additional ESDs for the District including a full description of each HCPC and other community phases can be located online at https://esis.sc.egov.usda.gov/.

Seeded Introduced Grassland—These grasslands known as dense nesting cover (DNC; intermediate wheatgrass, tall wheatgrass, and alfalfa or sweetclover) provides a cost-effective seed mix that produces tall, dense vegetation for nesting waterfowl (Duebbert et al. 1981, Higgins and Barker 1982). The District does not currently seed DNC on WPAs. The majority of existing seeded introduced grasslands occur on WPAs having former cropland (cropland present prior to acquisition by the Service) that were seeded during the 1970's and 1980's. These grasslands are highly degraded by smooth brome due to prolonged rest. Density and extent of noxious weeds such as Canada thistle (*Cirsium arvense*), yellow toadflax (*Linaria vulgaris*), absinth wormwood (*Artemisia absinthium*), and leafy spurge (*Euphorbia esula*) also is typically higher in these grasslands than native sod or reconstructed prairies. The District reconstructs these seeded introduced grasslands using diverse native grass and forb seed mixes. However, this process is expected to take 40-50 years if the District reconstructs an average of 200 acres per year.

Reconstructed Prairie—Reconstructing prairie on formerly cultivated land on WPAs provides an opportunity for the District to create heterogeneous nesting habitat for migratory birds (see Salo et al. 2004, Fuhlendorf et al. 2006, Bloom et al. 2013) that is more sustainable and resistant to invasion by exotic grasses and noxious weeds (Berger 1993, Cramer 1991, Jacobs and Sheley 1999, Norland et al. 2013). Currently, low-diversity reconstructed prairie occurs on 48 of 201 WPAs (24%) in the District. The majority of these grasslands were seeded over 20 years ago using low-diversity native grass-dominated mixes that are now invaded by smooth brome and/or Kentucky bluegrass. To restore plant community diversity to these low-diversity reconstructions, the District plants species-rich seed mixes that are representative of the HCPC on ecological sites to improve the likelihood of successful establishment. Specific ESDs contain the best available information that describes potential species dominance and community composition targets that managers can use to create site-appropriate seed mixes (Sedivec and Printz 2012).

2.5 Habitat Condition of the District

This section described the habitat conditions found on the Kulm WMD.

PRE-SETTLEMENT

Historically, the mixed-grass prairie ecosystem was composed of vast expanses of intact grasslands and high densities of wetlands which exceeded 40 basins/km^2 in some areas (Kantrud et al. 1989) and covered 20 to 60% of the PPR (Seabloom and van der Valk 2003). Lands now administered by the Service in the U.S. PPR would have been unaltered, consisting of highly functional native plant communities that allowed natural ecological processes to persist for nearly 10,000 years following the retreat of the Wisconsin glaciation. Native prairies consisted a mix of tallgrass and shortgrass species

including both cool- and warm-season species (Dekeyser et al. 2013) that were maintained by periodic grazing by millions of bison (*Bison bison*) and other native herbivores and burning as a result of natural fires. Bison are thought to have created a mosaic of seral stages and different vegetation heights and species composition across the landscape by grazing new plant growth on recently burned sites.

INFLUENCE OF EUROPEAN SETTLEMENT

The onset of European settlement and the initial conversion of native prairie for low-intensity agriculture in the PPR occurred from the 1830's to 1880's (Samson and Knopf 1994, Severson and Hull Sieg 2006). In North Dakota, the number of Euro-American settlers increased from 1,200 in 1870 to 290,000 by 1900 (Severson and Hull Sieg 2006). During this period, humans wantonly and indiscriminately killed the millions of bison that once grazed the grasslands of North Dakota; the last herd (≈300 animals) was sighted near Carrington, North Dakota in 1874 (Wilcox 1907). The extirpation of bison and conversion of grasslands for agriculture permanently altered the form and function of remaining grasslands in this region. Wetlands remained largely undrained prior to the 1950's when advances in machinery and technology provided the means to drain large areas (Severson and Hull Sieg 2006).

CURRENT CONDITION OF THE DISTRICT

Landscape-scale—Losses in grassland and wetland habitat have recently accelerated in the PPR due to conversion and drainage for crop production (Stephens et al. 2008, Oslund et al. 2010, Rashford et al. 2011, Doherty et al. 2013, Johnston 2013a,b, Wright and Wimberly 2013). Consequently grassland-dependent birds have substantially declined in the PPR and they are now considered one of the most imperiled guilds of birds in North America (Brennan and Kuvlesky 2005, Askins et al. 2007). The carrying capacity of waterfowl and other wetland-dependent birds in the PPR also has been and will continue to be reduced as wetlands are drained in the future. Yet, over 50% of the breeding waterfowl population is supported by remaining wetland and grassland habitat in the PPR (Batt et al. 1989). If habitat losses continue at rates at or above those estimated by Rashford et al. (2011) and C. R. Loesch (USFWS Habitat and Populations Evaluation Team [HAPET], Bismarck, North Dakota, unpublished data), conservation agencies (e.g., USFWS and its partners) will only have until 2082 and 2111, respectively, to conserve grasslands and wetlands when these habitats are either converted or protected; only 37 and 55% of the 2006 grassland and wetland extent would be protected in perpetuity (Doherty et al. 2013). If habitat loss rates accelerate beyond these rates, even greater levels of Migratory Bird Conservation Funds (i.e., Duck Stamp dollars) than those allocated to the Region 6 portion of the U.S. PPR in fiscal years 2013 and 2014 will be needed to protect grasslands and wetlands before they are permanently converted or drained. The rate of future conservation easement acquisition by the Service will likely depend on: 1) obtaining increased funding levels, 2) maintaining landowner interest and acceptance of the easement program(s), and 3) rate of land-use change influenced by demand for commodities and public policy. If habitat protection does not outpace

habitat losses in the future, then habitat protection goals of the PPJV may need to be refined to reflect what can actually be achieved (Doherty et al. 2013).

Local-scale —Currently, a large proportion of privately owned native grasslands in the District are continuously grazed from May through October each year. Although some grassland birds such as chestnut-collared longspur (*Calcarius ornatus*), upland sandpiper (*Bartramia longicauda*), marbled godwit (*Limosa fedoa*), and willet (*Tringa semipalmata*) respond positively to these season-long grazing systems, breeding bird densities are highest in light to moderately grazed pastures in the Missouri Coteau (Salo et al. 2004). Overgrazing pastures on private lands also negatively affects waterfowl nest success (Bloom et al. 2013), attractiveness to waterfowl (Gilbert et al. 1996, Fondell and Ball 2004), and the production of most upland nesting migratory birds (Kirsch et al. 1978). Consequently, local-scale operating decisions result in landscape-level effects when intense grazing is conducted by the majority of private landowners in the District.

On fee-title WPAs, the District primarily has management capability on upland habitat types consisting of native sod prairie, low- and high-diversity reconstructed prairie, and seeded introduced grassland (i.e., dense nesting cover [DNC] consisting of intermediate wheatgrass, tall wheatgrass, and alfalfa and/or sweetclover). These grasslands are managed to provide moderate to tall vegetation structure preferred by nesting waterfowl (Kantrud and Higgins 1992, Devries and Armstrong 2011, Bloom et al. 2013) and the majority of other migratory birds (Salo et al. 2004). However, a high proportion of these grasslands are highly degraded by exotic cool-season grasses (smooth brome and Kentucky bluegrass; see Ellis-Felege et al. 2013 for a complete summary on the effects of exotic cool-season grasses on terrestrial plant and wildlife communities) that create monotypic stands of vegetation structure.

The District provides heterogeneous nesting cover on these grasslands for waterfowl and other migratory birds by restoring native sod using active management or reconstructing old (>15 years) DNC using species-rich native mixes. However, native prairie plant community composition on WPAs has been severely degraded due to decades of rest which promote invasion by exotic cool-season grasses (Murphy and Grant 2005, Grant et al. 2009). Because smooth brome and Kentucky bluegrass exotic grasses tend to dominate native sod grasslands, managers will target individual exotic cool-season grasses using specific management treatments described in this HMP that reduce these invaders and stimulate native plants to improve habitat condition. Although the District is actively grazing grasslands on WPAs to maintain stand vigor and restore plant community composition, the District has limited ability to conduct prescribed fires on native sod and reconstructed prairies that mimic historic fire intervals. Therefore, managers utilize grazing treatments and conduct prescribed fires as resources allow to attempt to achieve the goals, objectives, and strategies for grassland management on WPAs outlined in this HMP.