

Chapter 3: The District Environment and Management

Introduction

Wetland Management District

The St. Croix Wetland Management District (WMD) covers eight counties in west-central Wisconsin. (See Figure 2 to Figure 9.) The staff also administers an eight-county Partners for Fish and Wildlife (PFFW) private lands district and an eight-county Wetland Management District, which involves management and enforcement of U.S. Department of Agriculture's Farm Service Agency Conservation Easements (CEs). Currently there are 41 fee-titled WPAs and 15 CEs.

Geographic/Ecosystem Setting

Historic Vegetation

The nature and distribution of vegetation types in Wisconsin are described by Curtis in his 1959 book *Vegetation of Wisconsin*. The southern forests covered the southern half and western third of the state. Dominant species were primarily oak on the drier sites; sugar maple, basswood, slippery elm, red oak and ironwood on the mesic sites; and silver maple and American elm dominating the lowland sites. In pre-settlement times these forests covered approximately 5.2 million acres with another 7.3 million acres of what is considered oak savanna also falling into this category. In this region the closed woodlands and oak savannas provided no distinct boundaries but blended together. Forests dominated the northern half of Wisconsin. These northern forests supported jack, red, and white pine with red maple and red oak on the dry sites. The more mesic stands of the northern forests were dominated by sugar maple but hemlock and/or beech may have been co-dominant. Finally, the northern lowland (swamp) for-



Oak Ridge WPA, St. Croix Wetland Management District. USFWS photo.

ests of Wisconsin are split into the tamarack-black spruce bog forests, the white cedar-balsam fir conifer swamps, and the black ash-yellow birch-hemlock hardwood swamps. Prairie and oak savanna covered about 9.5 million acres of Wisconsin. These areas were dominated by many species, including big bluestem, little bluestem, needlegrass and many other grass and forb species. Burr, black, Hill's and white oak dominated the oak savannas. The detail of historic vegetation for the District is depicted in Figure 10 on page 18.

Land Use/Cover

Of the approximately 9.5 million acres of prairie and oak savanna that Wisconsin hosted just 150 short years ago, only one-half of 1 percent (less than 10,000 acres) of the prairies and less than one-tenth of 1 percent (less than 1,000 acres) of the savanna remains. Farming, urban sprawl, fire suppression, and other developments continue to threaten the few acres of prairie and savanna that remain. A quote

Figure 2: Barron County, Wisconsin, St. Croix Wetland Management District

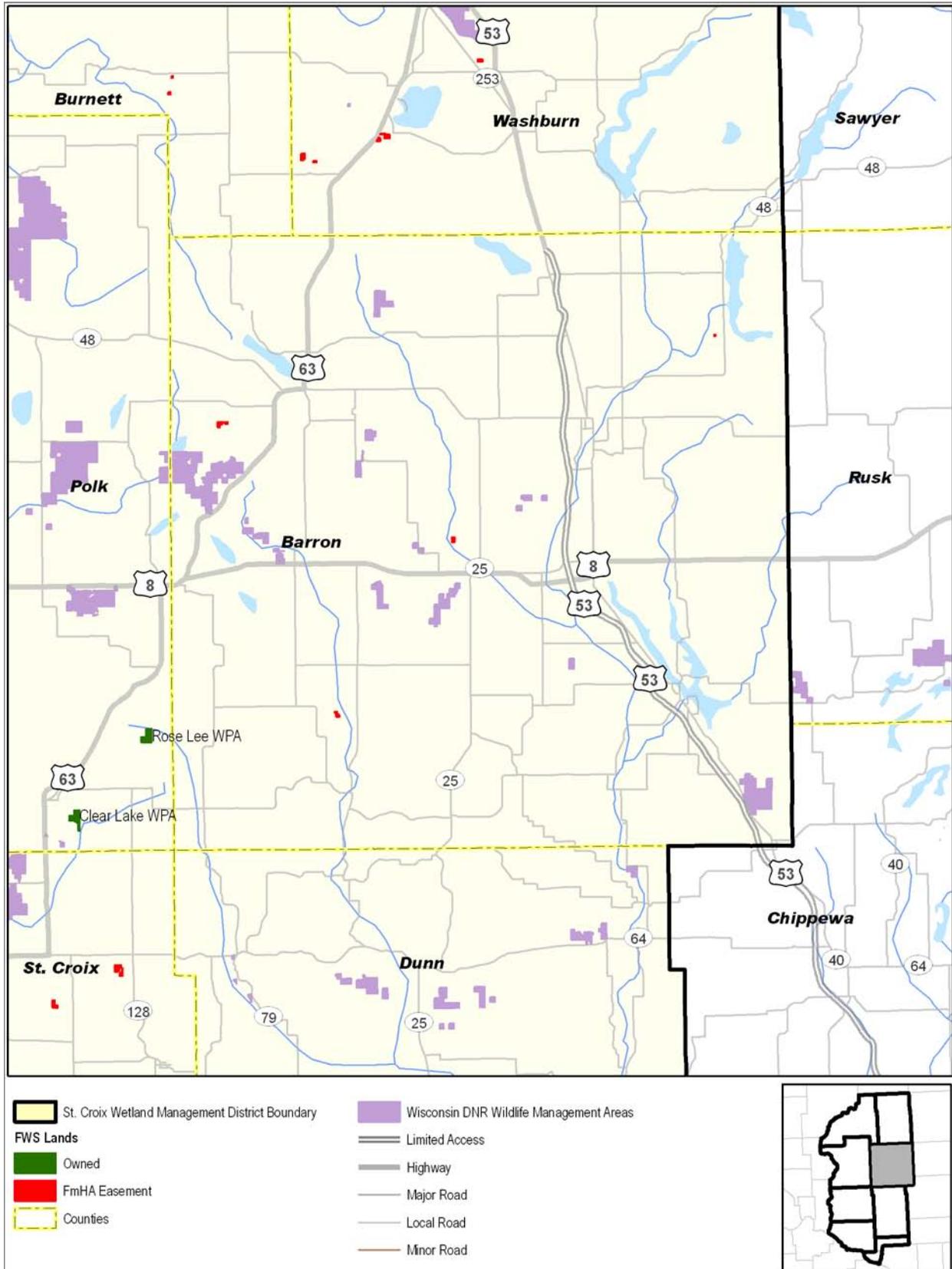


Figure 3: Burnett County, Wisconsin, St. Croix Wetland Management District

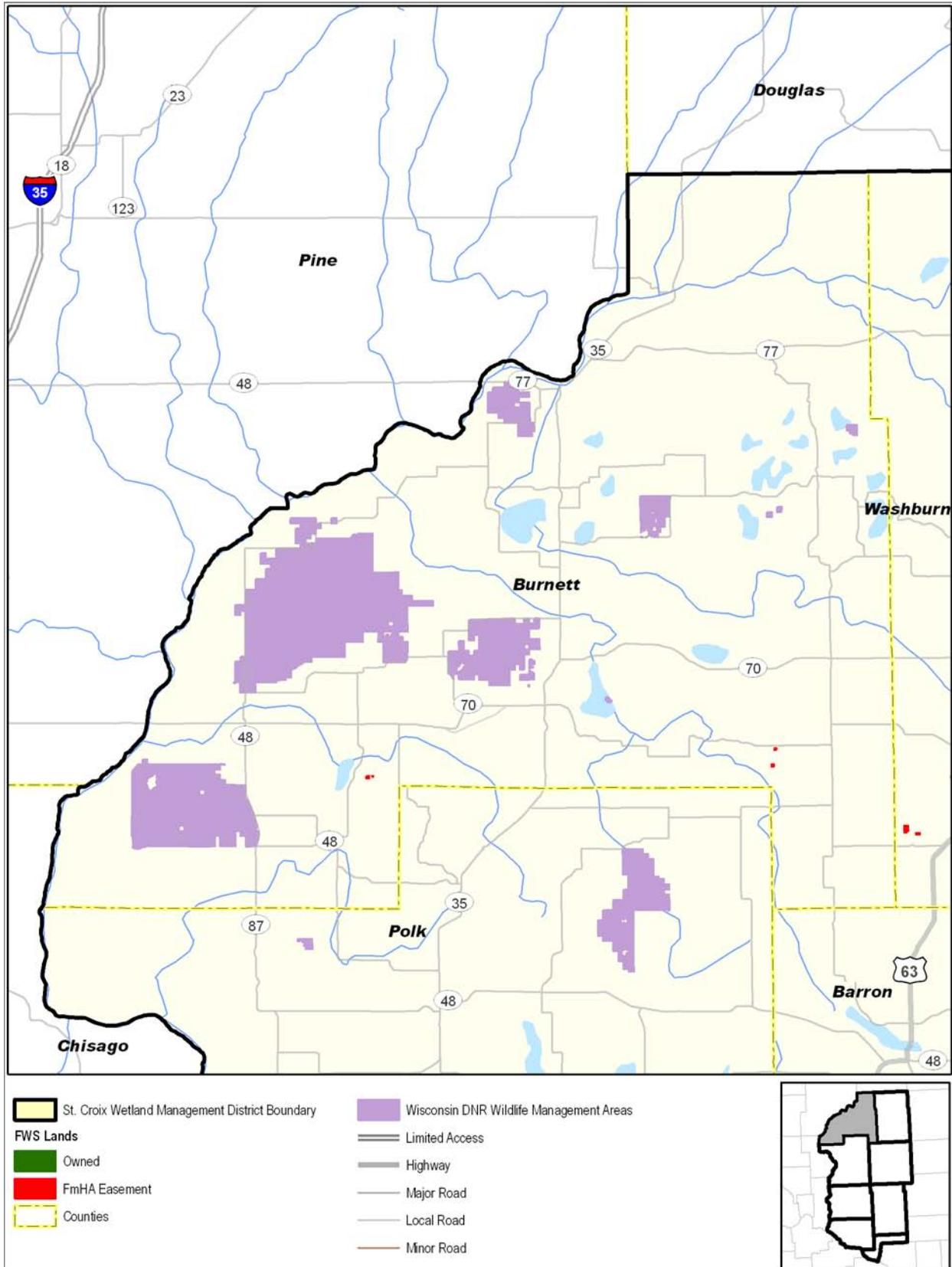


Figure 4: Dunn County, Wisconsin, St. Croix Wetland Management District

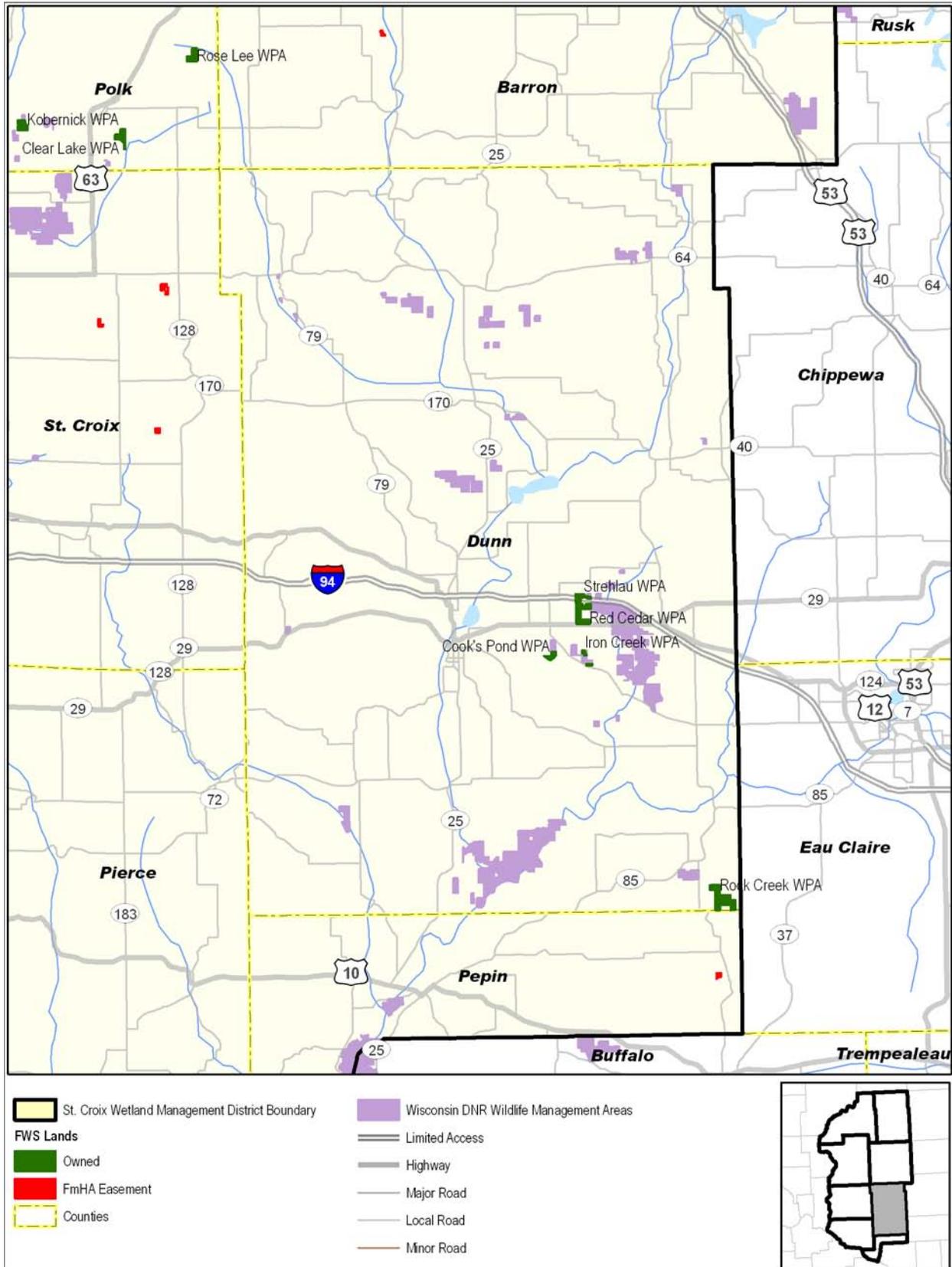


Figure 5: Pepin County, Wisconsin, St. Croix Wetland Management District

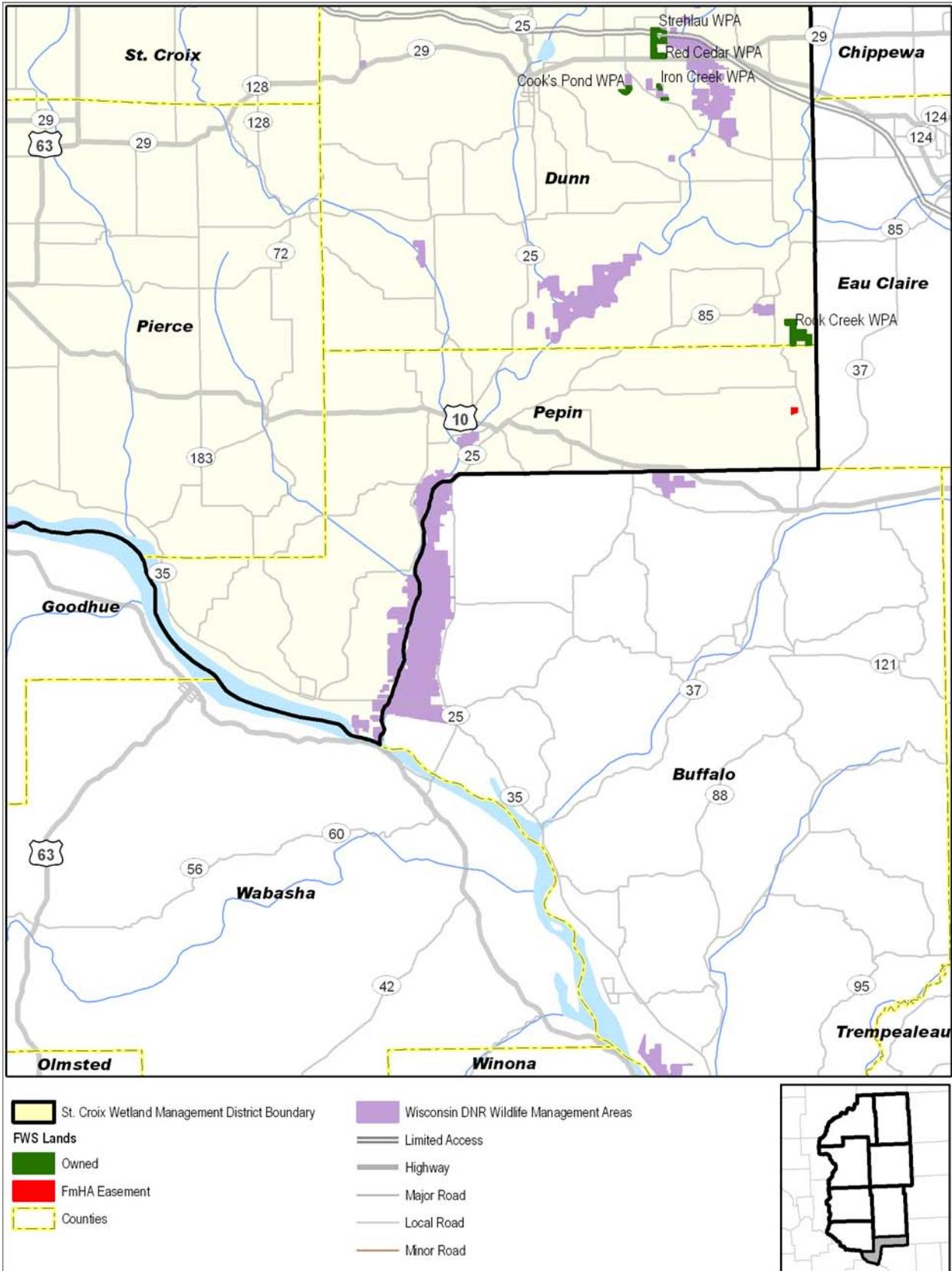


Figure 6: Pierce County, Wisconsin, St. Croix Wetland Management District

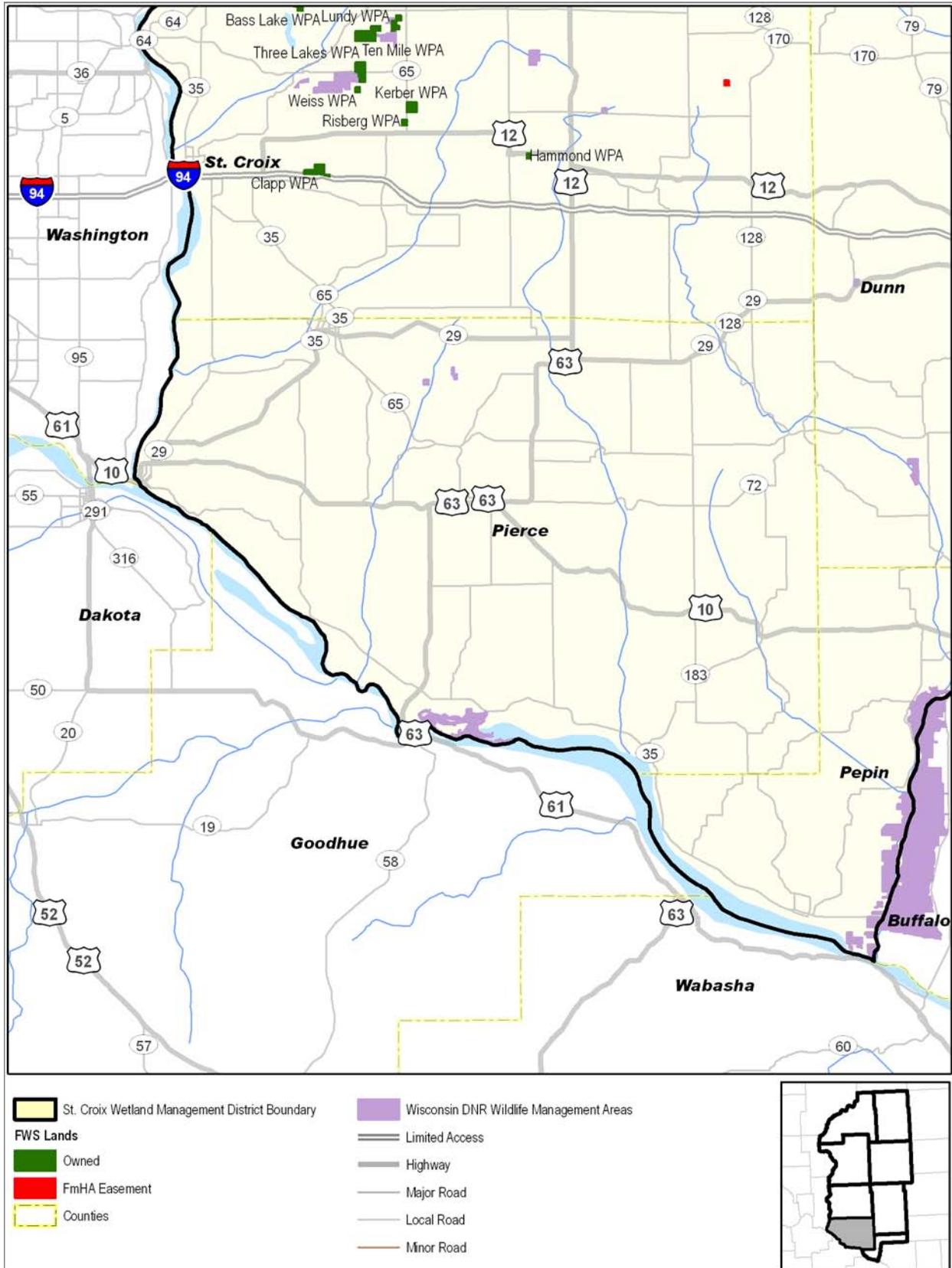


Figure 7: Polk County, Wisconsin, St. Croix Wetland Management District

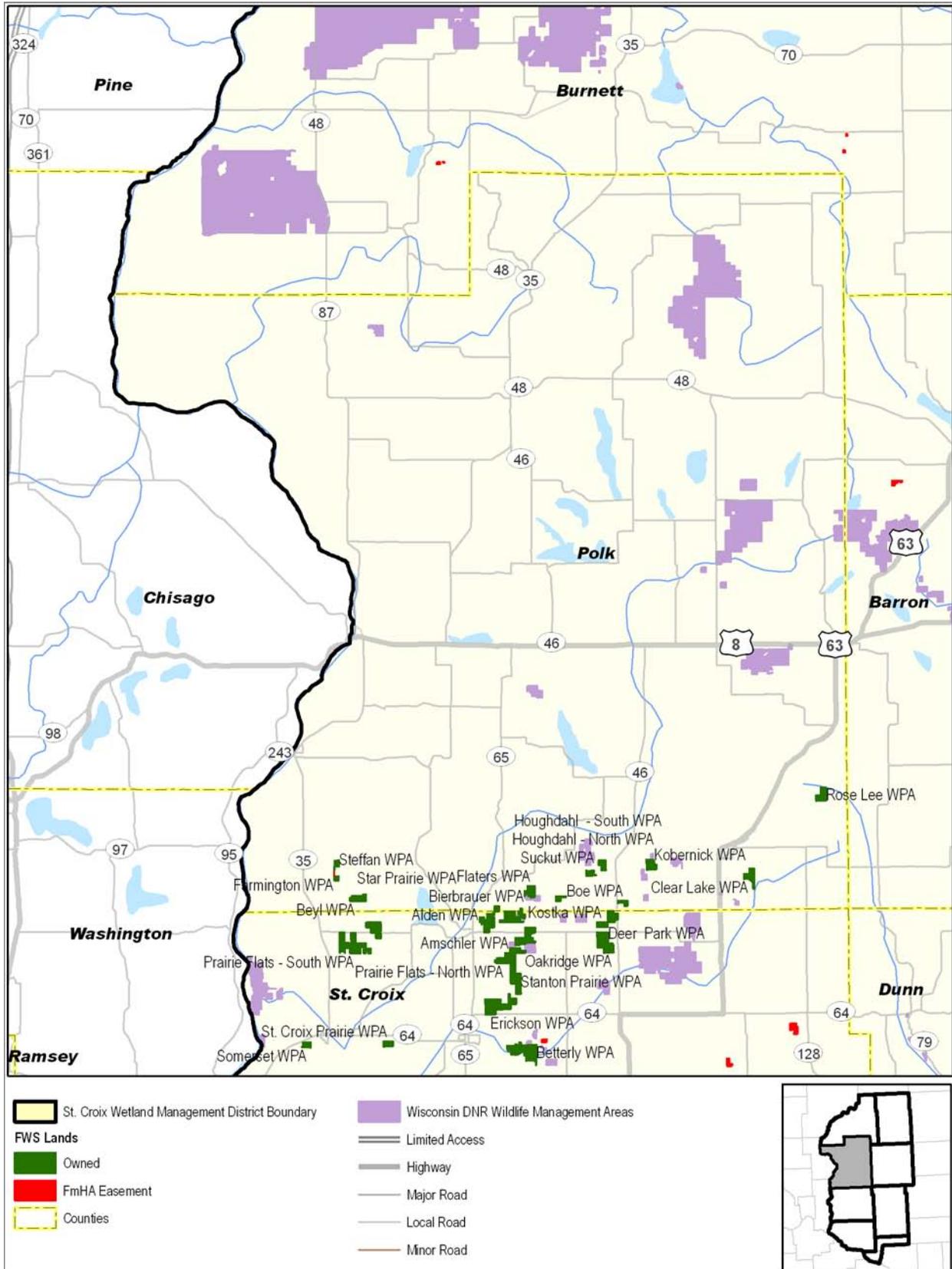


Figure 8: St. Croix County, Wisconsin, St. Croix Wetland Management District

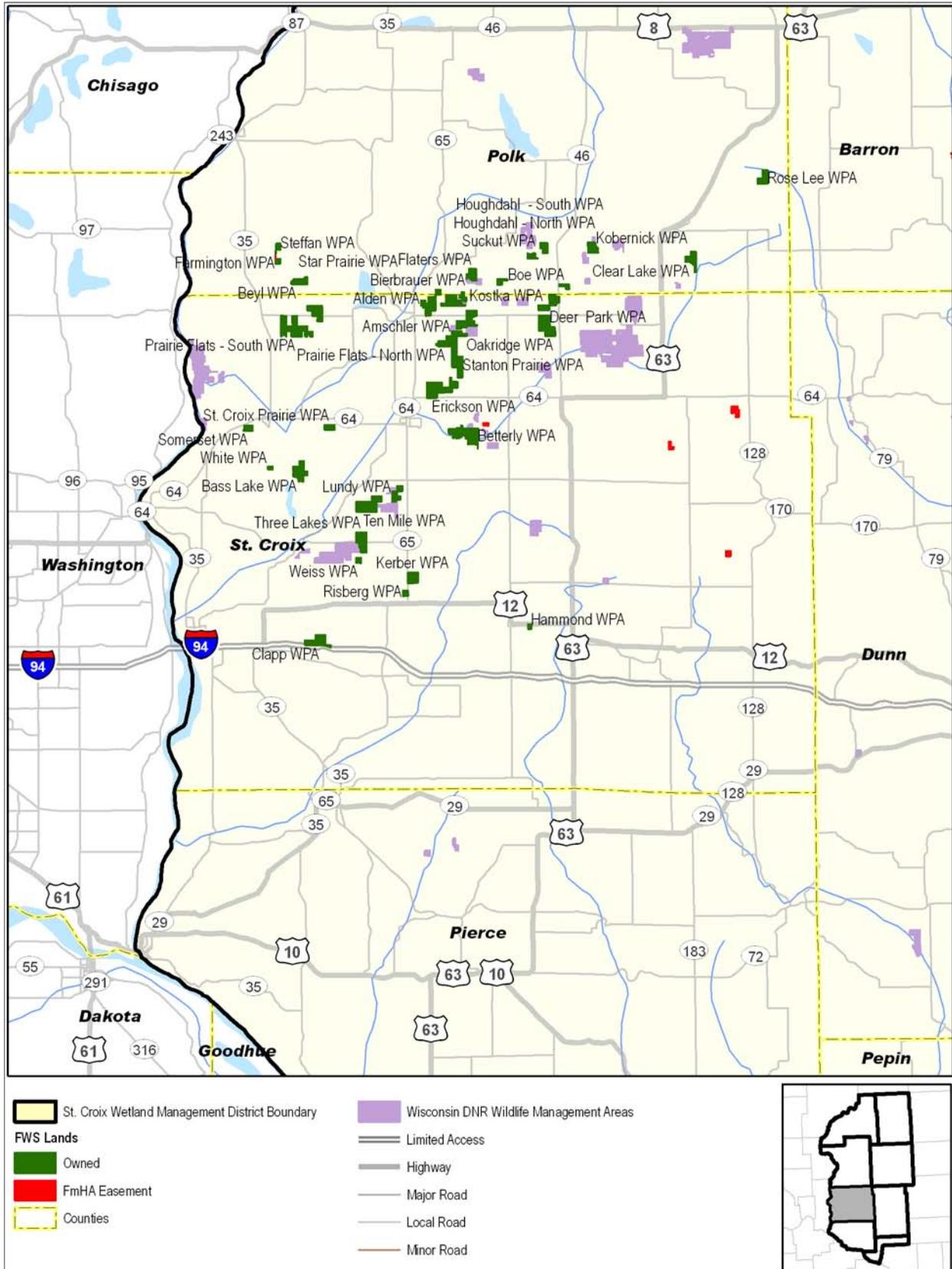


Figure 9: Washburn County, Wisconsin, St. Croix Wetland Management District

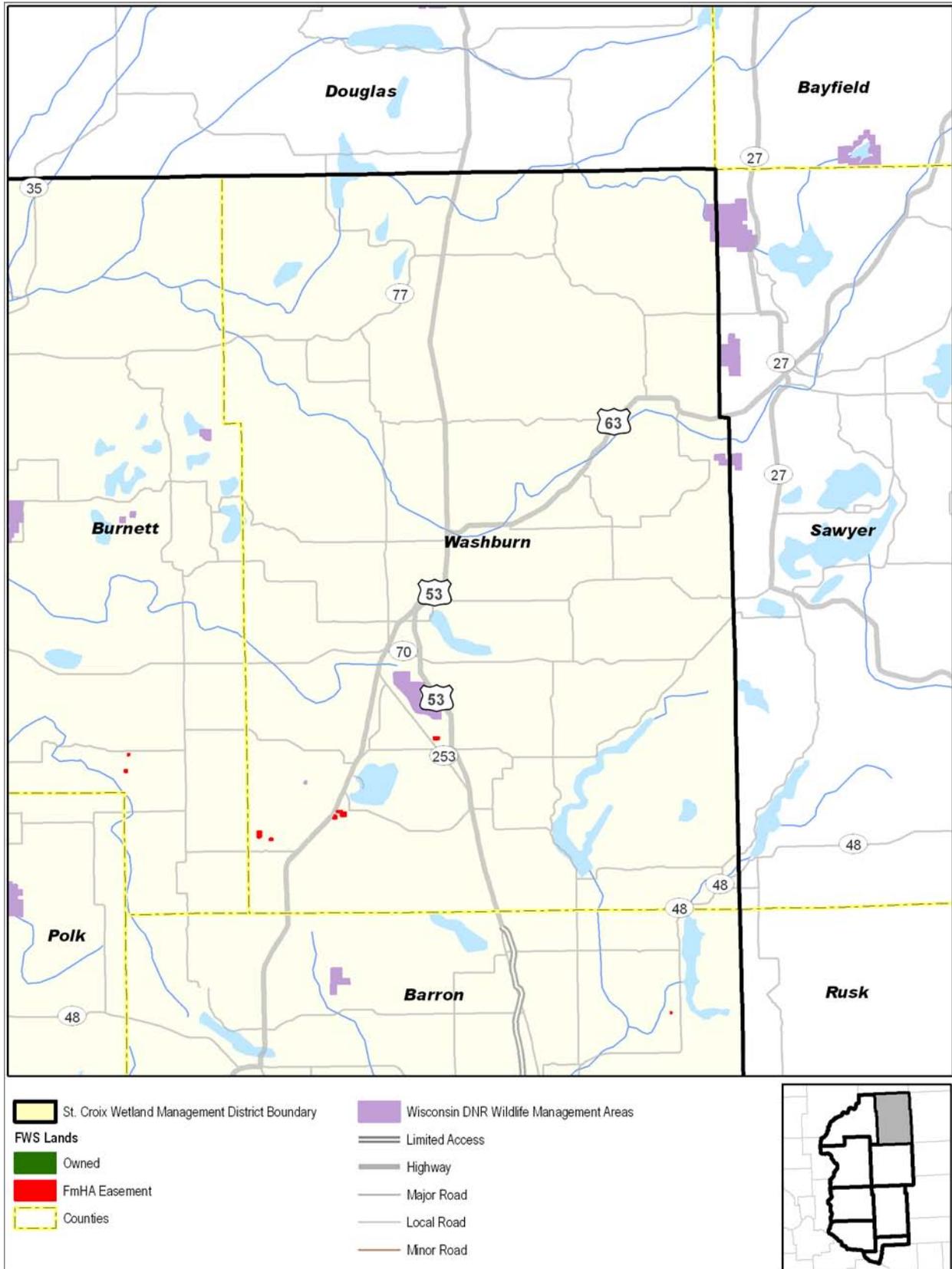


Figure 10: Historic Vegetation for the St. Croix Wetland Management District

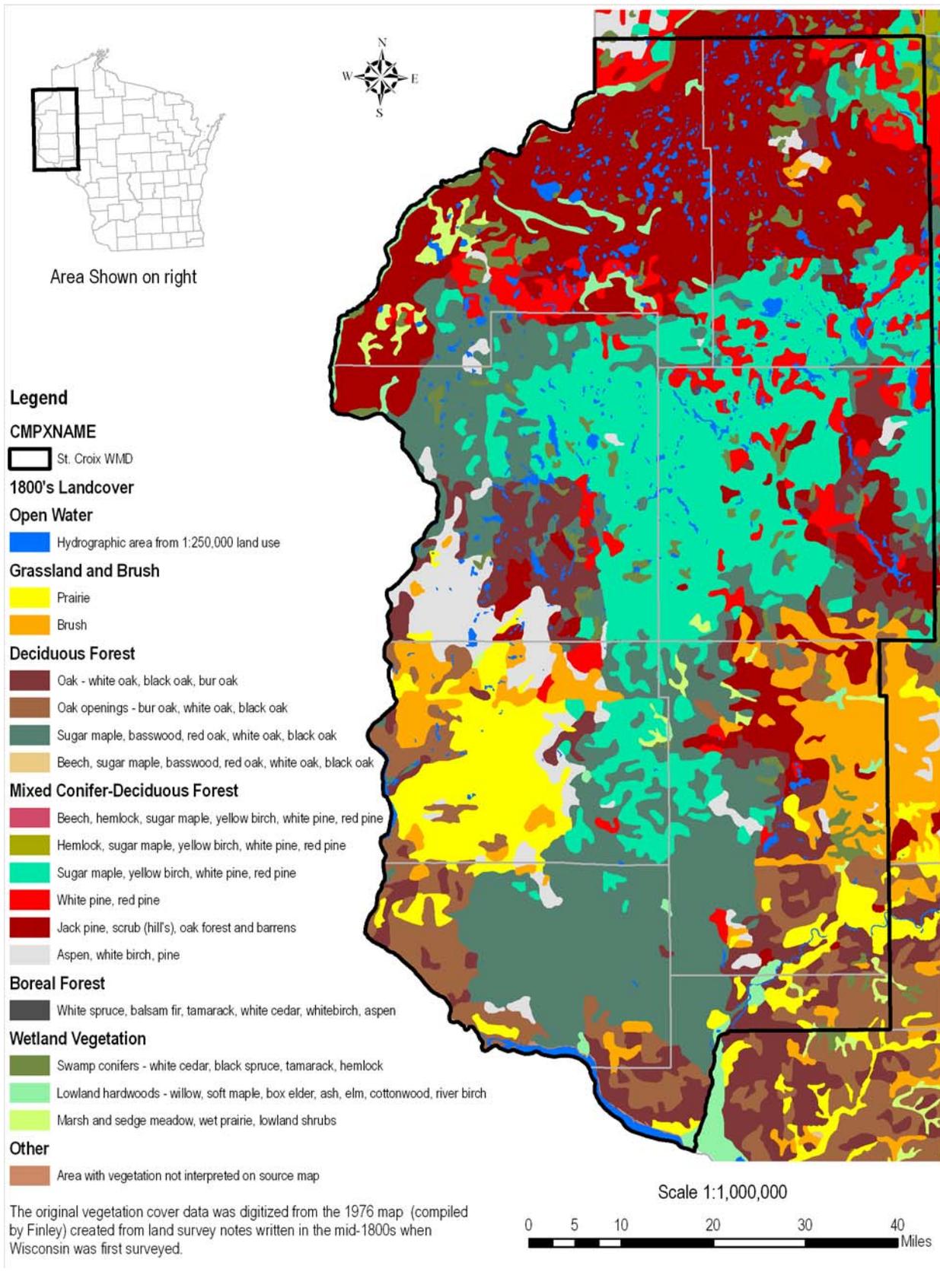


Table 1: Landcover in the St. Croix Wetland Management District

	Urban	Agricultural	Grassland	Forest	Water	Wetland	Barren	Shrubland
Barron County	0.6%	38.7%	12.2%	34.2%	3.3%	7.0%	3.2%	0.8%
Burnett County	0.2%	3.4%	15.5%	48.9%	5.9%	20.2%	0.3%	5.7%
Dunn County	0.5%	35.5%	17.4%	37.4%	1.4%	7.5%	0.0%	0.2%
Pepin County	0.4%	33.4%	15.0%	40.4%	6.1%	4.6%	0.0%	0.1%
Pierce County	0.7%	43.1%	24.4%	27.5%	2.6%	1.5%	0.1%	0.0%
Polk County	0.5%	21.2%	25.7%	37.8%	4.4%	9.3%	0.3%	0.7%
St. Croix County	1.0%	45.0%	30.8%	18.2%	2.0%	2.6%	0.3%	0.0%
Washburn County	0.2%	4.7%	11.8%	60.6%	5.7%	14.0%	0.4%	2.5%
Wisconsin State	1.6%	30.8%	10.7%	37.5%	3.4%	14.1%	1.1%	0.9%

Source: Wisconsin DNR Wisland 1998 as cited in Wisconsin SCORP

that appears in Curtis's book provides a view of what we have lost in the last 150 years. This quote is through the eyes of a Lieutenant D. Ruggles (1835) in writing about the prairies around Fort Winnebago in Columbia County:

“In some instances, the prairies are found stretching for miles around, without a tree or shrub, so level as scarcely to present a single undulation; in others, those called the “rolling prairies,” appears in undulation upon undulation, as far as the eye can reach presenting a view of peculiar sublimity, especially to the beholder for the first time. It seems when in verdure, a real troubled ocean, wave upon wave, rolls before you, ever varying, ever swelling; even the breezes play around to heighten the illusion; so that here at near two thousand miles from the ocean, we have a facsimile of sublimity, which no miniature imitation can approach.”

The northern forests, much like the southern forests and prairies, have been altered through logging, farming, fire prevention, and urbanization. Because of this, few stands of “virgin” timber exist outside of those protected by conservation organizations, some Forest Service and State Forest areas, lands within the WIDNR State Natural Areas program, or through conservation easements.

In 2002 about 52 percent of the land area in the District was in farms. (Table 1) For the State of Wisconsin about 45 percent of the land is in farms. The counties with the highest proportion of farm land in the District are Dunn, Pepin, and Pierce with over 70 percent of their lands in farms. The counties with the least proportion of farm land are Burnett, which has about 49 percent of the county in forest, and Washburn, which has about 61 percent of the county in forest. Both of these counties have about 20 percent of their land in farms. Within the District 97,031 acres of land were enrolled in Conservation Reserve or Wetlands Reserve Programs in 2002. This represents 5.0 percent of the farm land or 2.6 percent of the total land area of the District.

In 1999 a land cover map was completed for Wisconsin. The map was created through automated computer interpretation of satellite images. The work was completed by the partnership WIS-CLAND. The land cover for the District is depicted in Figure 11. Percent land cover for each county are shown in Table 1.

Migratory Bird Conservation Initiatives

Several migratory bird conservation plans have been published over the last decade that can be used to help guide management decisions for the Districts. Bird conservation planning efforts have evolved from a largely local, site-based orientation to a more regional, even inter-continental, land-

Figure 11: Current Landcover for the St. Croix Wetland Management District

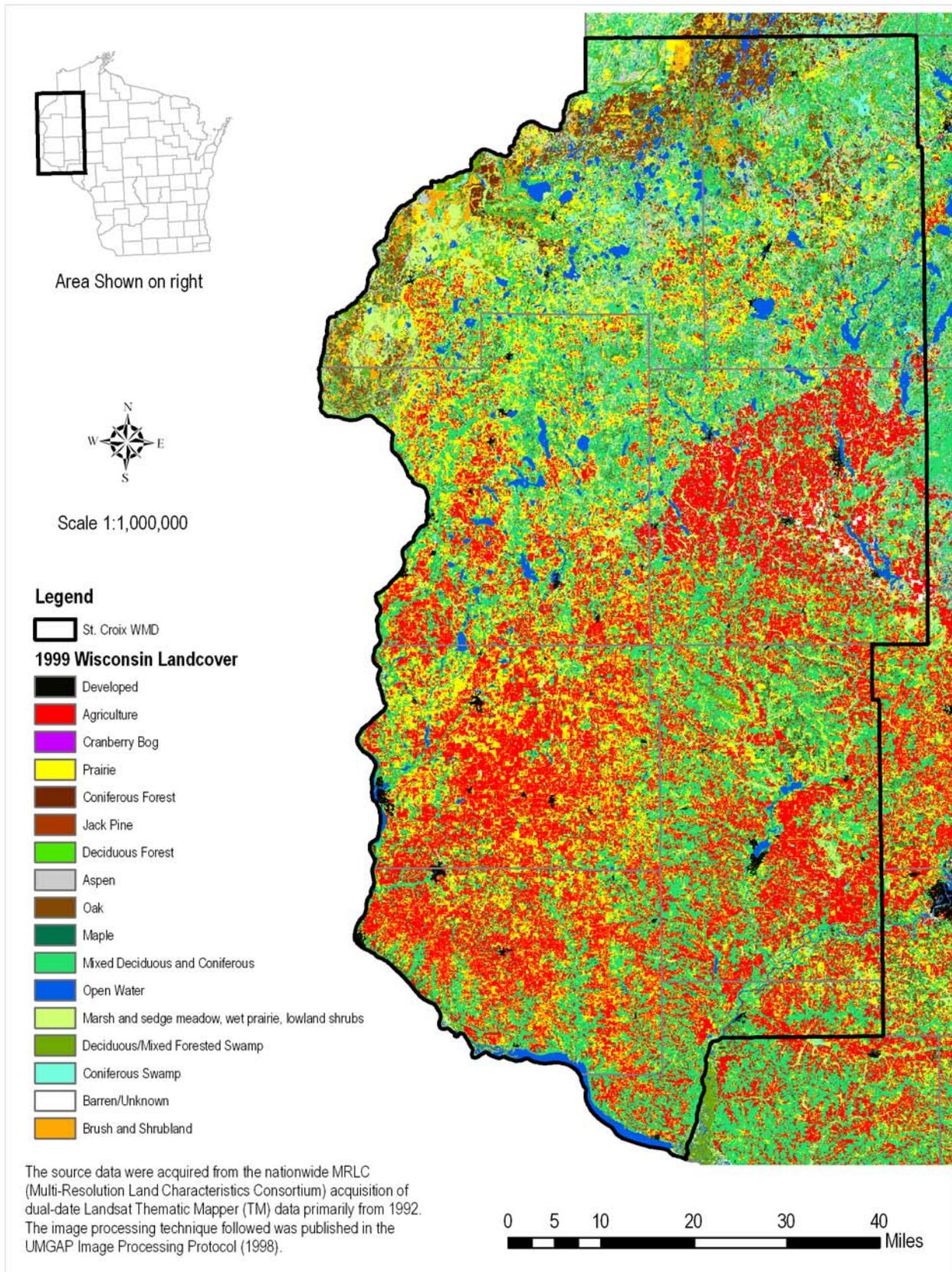
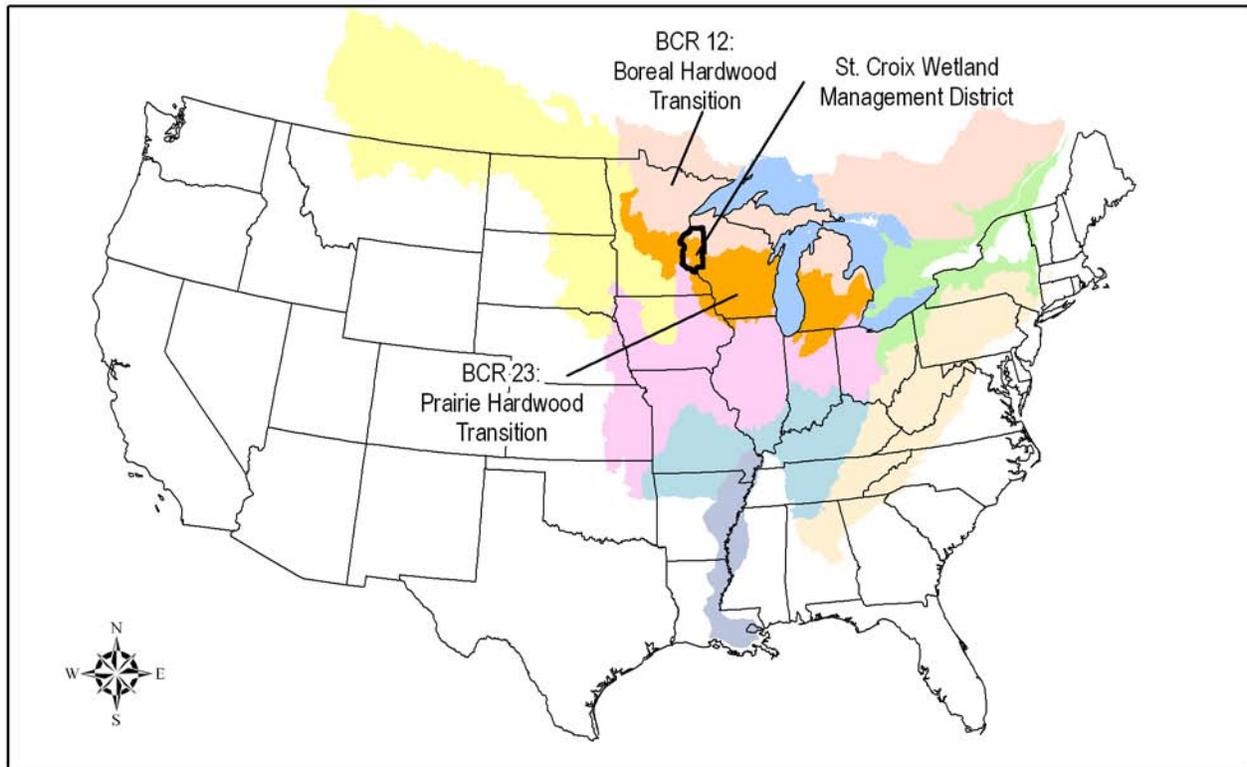


Figure 12: Prairie Potholes, Eastern Tallgrass and Prairie Hardwood Transition Bird Conservation Regions



scape-oriented perspective. Several transnational migratory bird conservation initiatives have emerged to help guide the planning and implementation process. The regional plans relevant to St. Croix Wetland Management District are:

- The Upper Mississippi River/Great Lakes Joint Venture Implementation Plan of the North American Waterfowl Management Plan;
- The Partners in Flight Boreal Hardwood Transition [land] Bird Conservation Plan;
- The Upper Mississippi Valley/Great Lakes Regional Shorebird Conservation Plan; and
- The Upper Mississippi Valley/Great Lakes Regional Waterbird Conservation Plan.

All four conservation plans will be integrated under the umbrella of the North American Bird Conservation Initiative (NABCI) in the Prairie Potholes, Eastern Tallgrass and Prairie Hardwood Transition Bird Conservation Regions (BCR 11, 22 and 23) (Figure 12). Each of the bird conservation

initiatives has a process for designating priority species, modeled to a large extent on the Partners in Flight method of computing scores based on independent assessments of global relative abundance, breeding and wintering distribution, vulnerability to threats, area importance, and population trend. These scores are often used by agencies in developing lists of priority bird species. The Service based its 2001 list of Non-game Birds of Conservation Concern primarily on the Partners in Flight, shorebird, and waterbird status assessment scores.

Wildlife Species of Management Concern

As described in the Biological Integrity, Diversity, and Environmental Health policy (601 FW 3), the goal of habitat management on units of the National Wildlife Refuge System is to ensure the long-term maintenance and, where possible, restoration of healthy populations of native fish, wildlife, plants, and their habitats. Resources of concern include species, species groups, and/or communities that

support District purposes as well as Service trust resource responsibilities (including threatened and endangered species and migratory birds). Resources of concern are also native species and natural, functional communities such as those found under historic conditions that are to be maintained and, where appropriate, restored on a refuge (601 FW 3.10B[1]). Resources of concern take into account the conservation needs identified within international, national, regional, or ecosystem goals/plans; state fish and wildlife conservation plans; recovery plans for threatened and endangered species; regional fisheries management plans; and previously approved resource management plans.

Appendix D summarizes information on the status and current habitat use of important wildlife species found on lands administered by the District. Individual species, or species groups, were chosen because they are listed as Regional Resource Conservation Priorities or State-listed threatened or endangered species. Other species are listed due to their importance for economic or recreational reasons, because the District or its partners monitor or survey them, or for their status as an overabundant or invasive species.

Other Conservation and Recreation Lands in the Area

Wisconsin Department of Natural Resources manages over 138,000 acres of conservation and recreation lands within the District (Figure 13). The DNR lands include 22 State Wildlife Areas with a total acreage over 83,000 acres. The largest Wildlife Area, Crex Meadows, is over 27,000 acres. The DNR manages nearly 4,000 acres of natural areas, 8,600 acres of parks and trails, and 8,200 acres of other wildlife habitat within the District. Most of the lands managed for wildlife and some other state lands are open to wildlife-dependent recreation.

County forests are also a part of the conservation and recreation landscape of the District. Burnett, Washburn, Polk, and Barron Counties administer approximately 275,000 acres to address ecological and socioeconomic needs. These forests provide benefits to fish, wildlife, and endangered species and recreation opportunities, while being managed for a sustaining timber harvest.

The 252 miles of the St. Croix and Lower St. Croix National Scenic Riverways occur along much of the western boundary of the District. The River-

ways include the St. Croix and Namekogan Rivers and their biologically diverse habitats. “The St. Croix Valley is an important route for migrating birds. It connects the western Great Lakes basin and much of central Canada with the Mississippi Flyway. Millions of birds annually pass along the Riverway during spring and fall migrations. Many of these migrants depend upon the contiguous forested corridor that the Riverway protects.” (www.nps.gov/sacn/management/natural_res.html)

Wisconsin Strategy for Wildlife Species of Greatest Conservation Need

Wisconsin has developed a State Wildlife Action Plan that has analyzed the animal species of Wisconsin, identified those most in need of attention because they are declining or are dependent on habitat or places that are declining, and suggests conservation measures to ensure their survival. The document describing their analysis and findings is filled with information that helps identify conservation needs. For each Ecological Landscape of Wisconsin (see Figure 14), it provides information on the overarching needs and opportunities in the landscape as well as lists of those natural communities that are major and important management opportunities. It also lists those Species of Greatest Conservation Need with high, moderate, or low degrees of probability of occurring in the landscape. The State’s analysis provides a good basis for coordination of District activities with the State and other conservation organizations. This information is available in the State Wildlife Action Plan (<http://dnr.wi.gov/org/land/er/wwap/>).

The State of Wisconsin has designated the Western Prairie Habitat Restoration Area (WPHRA) as one of two important conservation focus areas within the state. When the first European settlers arrived in west central Wisconsin, in what is now St. Croix and Polk Counties, they found over 200,000 acres of tallgrass prairie and oak savanna. This complex of prairie, wetlands and oak savanna was very productive, both for wildlife and farming. Many of the local communities, such as Star Prairie and Erin Prairie, have names reflecting the surrounding prairie landscape. Only a small percentage of the original tallgrass prairie still exists, making it one of the rarest and most fragmented ecosystems in America. The goal of the WPHRA is to restore and protect 20,000 acres of wetland and grassland habitat in St. Croix and southwestern Polk counties.

Figure 13: Other Conservation Lands in the Area of St. Croix WMD

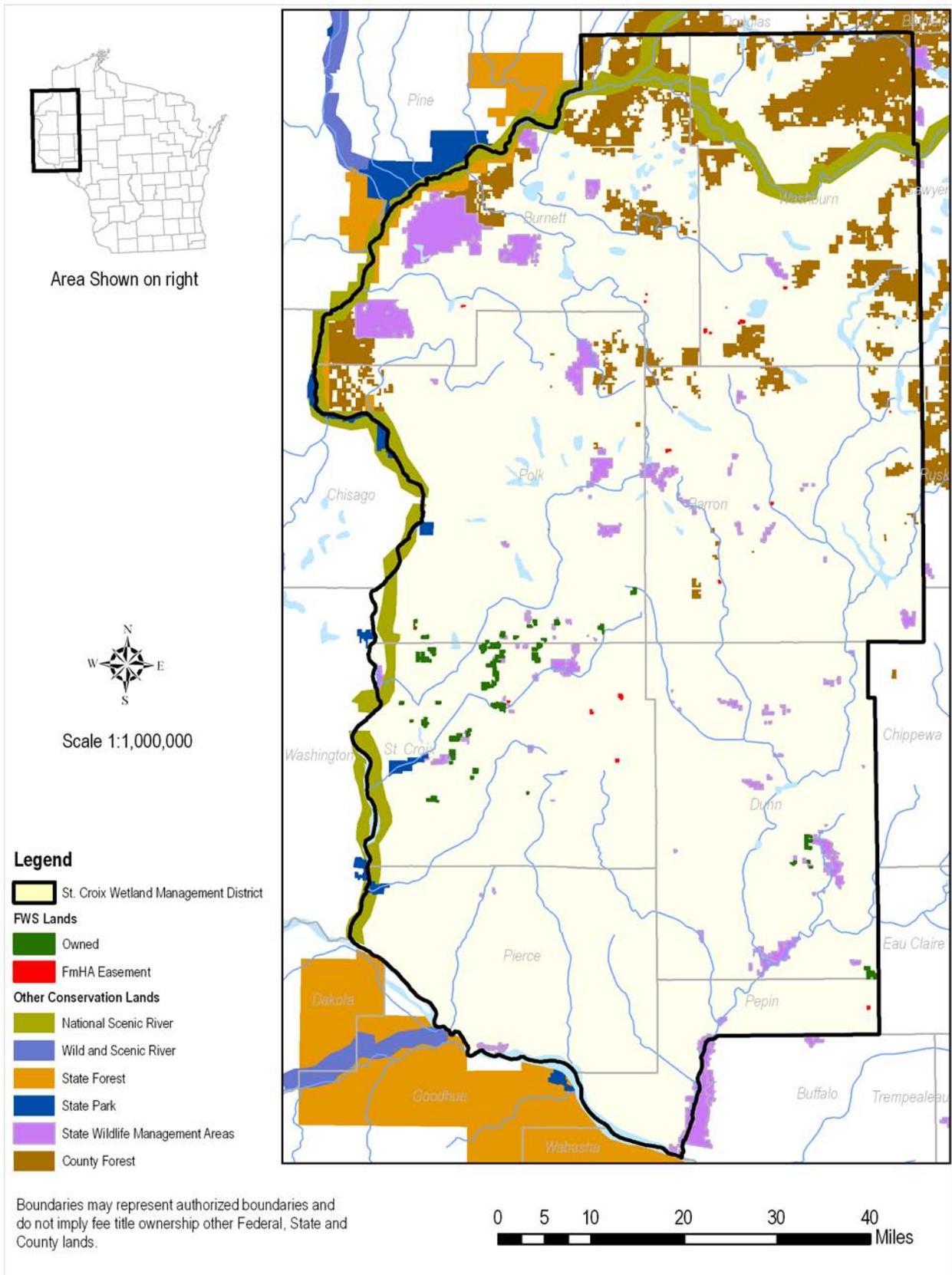


Figure 14: Wisconsin Ecological Landscapes

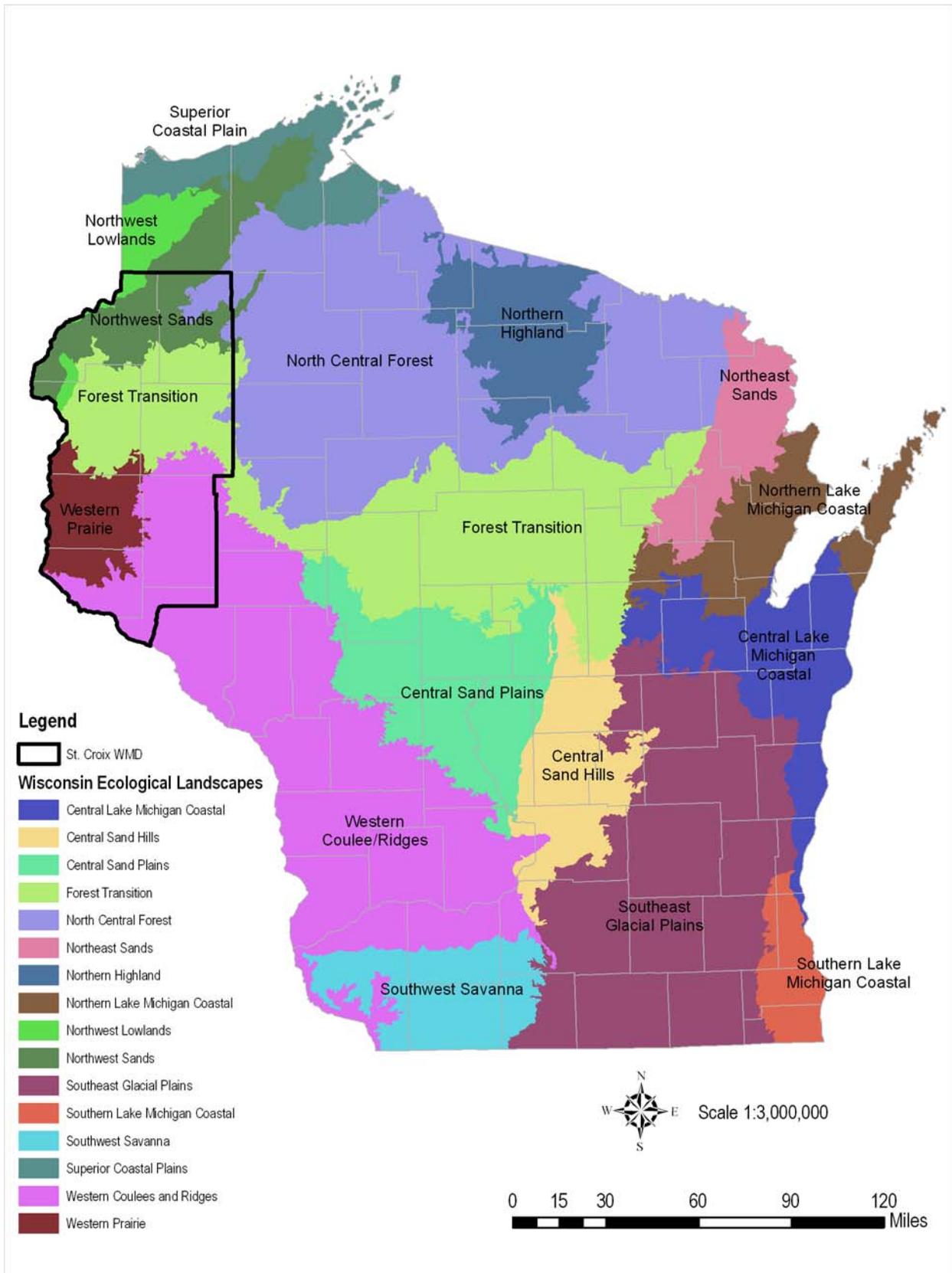


Table 2: Socioeconomic Characteristics, St. Croix Wetland Management District

	Total Population	Percent Urban	Median Age	Female	College Educated	Asian	American Indian	Median HH Income	Median Housing Value
Barron County	44,963	27.9%	38.8	50.5%	15%	n/a	0.8%	\$37,275	\$78,000
Burnett County	15,674	0.0%	44.1	49.6%	14%	n/a	4.5%	\$34,218	\$87,500
Dunn County	39,858	41.5%	30.6	49.6%	21%	2.1%	n/a	\$38,753	\$92,900
Pepin County	7,213	0.0%	38.7	49.7%	13%	0.2%	n/a	\$37,609	\$79,200
Pierce County	36,804	38.4%	32.1	50.7%	25%	0.4%	n/a	\$49,551	\$123,100
Polk County	41,319	6.9%	38.7	50.0%	16%	n/a	1.1%	\$41,183	\$100,200
St. Croix County	63,155	43.2%	35.0	50.0%	26%	0.6%	n/a	\$54,930	\$139,500
Washburn County	16,036	16.5%	42.1	49.7%	15%	n/a	1.0%	\$33,716	\$85,700
State of Wisconsin		68.3%	36	50.6%	22%	1.6%	0.8%	\$43,791	\$112,200

Source: Census 2000 as reported in Wisconsin SCORP

Percent college educated calculated for persons age 25 and older. Housing value is calculated for owner occupied housing units. n/a is not available.

Socioeconomic Setting

Just as the environmental characteristics vary across the District, so, too, do the socioeconomic characteristics. (Table 2) The Minneapolis/Saint Paul Metropolitan Area influences St. Croix County. St. Croix County has the highest total population, percent urban population, percent college educated, median household income, and median housing value in the District. The District has a low minority population much like the State of Wisconsin. In comparison to the rest of the District and the State of Wisconsin, Barron, Burnett, Pepin and Washburn Counties are well below median household income, housing value, and percent college educated. Polk and Dunn Counties are nearer the state averages in these characteristics.

The population of the District is expected to grow about 1 percent per year over the next 20 years. (Table 3) The county projected to grow at the highest average annual rate is St. Croix. The District is projected to increase in population about 57,000 from 2005 to 2025. For additional detailed descriptions of the characteristics and projections for the counties and their implications for recreation see the regional demographic profiles prepared by

the Applied Population Lab and Wisconsin Department of Natural Resources for the Wisconsin SCORP 2005-2010 planning process.

Potential District Visitors

We used block group data from the 2000 census to estimate how many people lived near WPAs. For the WPAs managed by the District, we learned that about 53,000 people lived within 5 miles of a WPA in 2000; 158,000 within 10 miles; and 262,000 within 15 miles.

In order to refine our understanding and estimate the potential market for visitors to the WPAs, we looked at 1998 consumer behavior data for an area within an approximate 15-mile distance from WPAs. The data were organized by zip code areas, which made the buffers around the WPAs irregular and not equidistant at all boundary points. We thought the distance was a good approximation for a reasonable drive to a WPA for an outing.

The consumer behavior data used in the analysis is derived from Mediamark Research Inc. data. The company collects and analyzes data on consumer demographics, product and brand usage, and exposure to all forms of advertising media. The consumer behavior data were projected by Tetrad

Table 3: Population Projections 2005-2025 in St. Croix WMD Counties

	Historical				Projections				Average Annual Percent Increases	
	1980	1990	2000	2005	2010	2015	2020	2025	2005-2020	2005-2025
Barron County	38,730	40,750	44,963	46,067	47,401	48,493	49,386	50,004	0.60	0.43
Burnett County	12,340	13,084	15,674	16,375	16,993	17,329	17,415	17,390	0.53	0.31
Dunn County	34,314	35,909	39,858	42,046	43,771	45,165	47,061	49,105	0.99	0.84
Pepin County	7,477	7,107	7,213	7,631	8,121	8,418	8,737	8,862	1.21	0.81
Pierce County	31,149	32,765	36,804	38,194	39,818	41,190	42,655	44,368	0.97	0.81
Polk County	32,351	34,773	41,319	43,621	45,901	47,842	49,592	51,152	1.14	0.86
St. Croix County	43,262	50,251	63,155	72,377	80,779	87,967	95,202	100,806	2.63	1.96
Washburn County	13,174	13,772	16,036	16,671	17,250	17,634	17,869	18,023	0.60	0.41
St. Croix WMD	214,777	230,401	267,022	284,987	302,044	316,053	329,937	341,735	1.31	1.00
Wisconsin Department of Administration Official Population Projections, June 2002										

Computer Applications Inc. to new populations using Mosaic data. Mosaic is a methodology that classifies neighborhoods into segments based on their demographic and socioeconomic composition. The basic assumption in the analysis is that people in demographically similar neighborhoods will tend to have similar consumption, ownership, and lifestyle preferences. Because of the assumptions made in the analysis, the data should be considered as relative indicators of potential, not actual participation.

We looked at potential participants in birdwatching, photography, freshwater fishing, hunting, and hiking. The consumer behavior data apply to persons more than 18 years old. For the area that we included in our analysis, the estimated maximum participants for each activity are: birdwatching (34,882), photography (56,898), hunting (32,715), freshwater fishing (64,909), and hiking (50,539). We interpret the estimates to represent the core audience for repeated trips to a WPA. It is important to recognize that each WPA offers different opportunities for these wildlife dependent types of recreation based on habitat types and wildlife use.

Climate and Climate Change Impacts

The District’s climate is continental with cold winters and warm summers. The normal temperatures and annual precipitation averages for the period 1971-2000 for a region that includes Dunn, Pepin, Pierce, and St. Croix Counties and other southern counties present an adequate indication of the climate of the District. The region has an average annual temperature of 44.1 degrees Fahrenheit. July is the warmest month with an average temperature of 70.8 degrees Fahrenheit. The coldest month is January with an average temperature of 12.7 degrees Fahrenheit. Annual precipitation is 33.34 inches. The average monthly precipitation exceeds 3 inches for April, May, and September. The average monthly precipitation exceeds 4 inches for June, July, and August. (Source: State of Wisconsin Blue Book 2005-2006)

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies, under its direction, that have land management responsibilities to consider potential climate change impacts as part of long range planning endeavors.



Jackrabbit. USFWS photo

The increase of carbon dioxide (CO₂) within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as global warming. In relation to comprehensive conservation planning for wetland management districts, carbon sequestration constitutes the primary climate-related impact to be considered in planning. The U.S. Department of Energy's "*Carbon Sequestration Research and Development*" defines carbon sequestration as "...the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

Vegetated land is a tremendous factor in carbon sequestration. Terrestrial biomes of all sorts – grasslands, forests, wetlands, tundra, and desert – are effective both in preventing carbon emission and acting as a biological "scrubber" of atmospheric CO₂. The Department of Energy report's conclusions noted that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere.

Conserving natural habitat for wildlife is the heart of any long-range plan for national wildlife refuges. The actions proposed in this CCP would conserve or restore land and habitat, and would thus retain existing carbon sequestration on the Wetland Management District. This in turn contributes positively to efforts to mitigate human-induced global climate change.

One Service activity in particular – prescribed burning – releases CO₂ directly to the atmosphere from the biomass consumed during combustion. However, there is actually no net loss of carbon, since new vegetation quickly germinates and sprouts to replace the burned-up biomass and sequesters or assimilates an approximately equal amount of carbon as was lost to the air (Boutton et al. 2006).

Several impacts of climate change have been identified that may need to be considered and addressed in the future:

- Habitat available for cold water fish such as trout and salmon in lakes and streams could be reduced.
- Forests may change, with some species shifting their range northward or dying out, and other trees moving in to take their place.
- Ducks and other waterfowl could lose breeding habitat due to stronger and more frequent droughts.
- Changes in the timing of migration and nesting could put some birds out of sync with the life cycles of their prey species.
- Animal and insect species historically found farther south may colonize new areas to the north as winter climatic conditions moderate.

The managers and resource specialists on the Wetland Management District need to be aware of the possibility of change due to global warming. When feasible, documenting long-term vegetation, species, and hydrologic changes should become a part of research and monitoring programs on the District. Adjustments in District management direction may be necessary over the course of time to adapt to a changing climate.

The following is an excerpt from the 2000 report, *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change*, produced by the National Assessment Synthesis Team, an advisory committee chartered under the Federal Advisory Committee Act to help the US Global Change Research Program fulfill its mandate under the Global Change Research Act of 1990. These excerpts are from the section of the report focused upon the eight-state Midwest region.

Observed Climate Trends

Over the 20th century, the northern portion of the Midwest, including the upper Great Lakes, has warmed by almost 4 degree Fahrenheit (F) (2 degrees Celsius (C)), while the southern portion, along the Ohio River valley, has cooled by about 1 degree F (0.5 degree C). Annual precipitation has increased, with many of the changes quite substantial, including as much as 10 to 20 percent increases over the 20th century. Much of the precipitation has resulted from an increased rise in the number of days with heavy and very heavy precipitation events. There have been moderate to very large increases in the number of days with excessive moisture in the eastern portion of the basin.

Scenarios of Future Climate

During the 21st century, models project that temperatures will increase throughout the Midwest, and at a greater rate than has been observed in the 20th century. Even over the northern portion of the region, where warming has been the largest, an accelerated warming trend is projected for the 21st century, with temperatures increasing by 5 to 10 degrees F (3 to 6 degrees C). The average minimum temperature is likely to increase as much as 1 to 2 degrees F (0.5 to 1 degree C) more than the maximum temperature. Precipitation is likely to continue its upward trend, at a slightly accelerated rate; 10 to 30 percent increases are projected across much of the region. Despite the increases in precipitation, increases in temperature and other meteorological factors are likely to lead to a substantial increase in evaporation, causing a soil moisture deficit, reduction in lake and river levels, and more drought-like conditions in much of the region. In addition, increases in the proportion of precipitation coming from heavy and extreme precipitation are very likely.

Key Issues in the Midwest

Reduction in Lake and River Levels

Water levels, supply, quality, and water-based transportation and recreation are all climate-sensitive issues affecting the region. Despite the projected increase in precipitation, increased evaporation due to higher summer air temperatures is likely to lead to reduced levels in the Great Lakes. Of 12 models used to assess this question, 11 suggest significant decreases in lake levels while one suggests a small increase. The total range of the 11

models' projections is less than a 1-foot increase to more than a 5-foot decrease. A 5-foot (1.5-meter) reduction would lead to a 20 to 40 percent reduction in outflow to the St. Lawrence Seaway. Lower lake levels cause reduced hydropower generation downstream, with reductions of up to 15 percent by 2050. An increase in demand for water across the region at the same time as net flows decrease is of particular concern. There is a possibility of increased national and international tension related to increased pressure for water diversions from the Lakes as demands for water increase. For smaller lakes and rivers, reduced flows are likely to cause water quality issues to become more acute. In addition, the projected increase in very heavy precipitation events will likely lead to increased flash flooding and worsen agricultural and other non-point source pollution as more frequent heavy rains wash pollutants into rivers and lakes. Lower water levels are likely to make water-based transportation more difficult with increases in the costs of navigation of 5 to 40 percent. Some of this increase will likely be offset as reduced ice cover extends the navigation season. Shoreline damage due to high lake levels is likely to decrease 40 to 80 percent due to reduced water levels.

Adaptations: A reduction in lake and river levels would require adaptations such as re-engineering of ship docks and locks for transportation and recreation. If flows decrease while demand increases, international commissions focusing on Great Lakes water issues are likely to become even more important in the future. Improved forecasts and warnings of extreme precipitation events could help reduce some related impacts.

Agricultural Shifts

Agriculture is of vital importance to this region, the nation, and the world. It has exhibited a capacity to adapt to moderate differences in growing season climate, and it is likely that agriculture would be able to continue to adapt. With an increase in the length of the growing season, double cropping, the practice of planting a second crop after the first is harvested, is likely to become more prevalent. The CO₂ fertilization effect is likely to enhance plant growth and contribute to generally higher yields. The largest increases are projected to occur in the northern areas of the region, where crop yields are currently temperature limited. However, yields are not likely to increase in all parts of the region. For example, in the southern portions of Indiana and Illinois, corn yields are likely to decline, with 10-20



Big bluestem, St. Croix Wetland Management District. USFWS photo.

percent decreases projected in some locations. Consumers are likely to pay lower prices due to generally increased yields, while most producers are likely to suffer reduced profits due to declining prices. Increased use of pesticides and herbicides are very likely to be required and to present new challenges.

Adaptations: Plant breeding programs can use skilled climate predictions to aid in breeding new varieties for the new growing conditions. Farmers can then choose varieties that are better attuned to the expected climate. It is likely that plant breeders will need to use all the tools of plant breeding, including genetic engineering, in adapting to climate change. Changing planting and harvest dates and planting densities, and using integrated pest management, conservation tillage, and new farm technologies are additional options. There is also the potential for shifting or expanding the area where certain crops are grown if climate conditions become more favorable. Weather conditions during the growing season are the primary factor in year-to-year differences in corn and soybean yields. Droughts and floods result in large yield reductions; severe droughts, like the drought of 1988, cause yield reductions of over 30 percent. Reliable seasonal forecasts are likely to help farmers adjust their practices from year to year to respond to such events.

Changes in Semi-natural and Natural Ecosystems

The Upper Midwest has a unique combination of soil and climate that allows for abundant coniferous tree growth. Higher temperatures and increased evaporation will likely reduce boreal forest acreage, and make current forestlands more susceptible to pests and diseases. It is likely that the southern transition zone of the boreal forest will be susceptible to expansion of temperate forests, which in turn will have to compete with other land use pressures. However, warmer weather (coupled with beneficial effects of increased CO₂), are likely to lead to an increase in tree growth rates on marginal forestlands that are currently temperature-limited. Most climate models indicate that higher air temperatures will cause greater evaporation and hence reduced soil moisture, a situation conducive to forest fires. As the 21st century progresses, there will be an increased likelihood of greater environmental stress on both deciduous and coniferous trees, making them susceptible to disease and pest infestation, likely resulting in increased tree mortality.

As water temperatures in lakes increase, major changes in freshwater ecosystems will very likely occur, such as a shift from cold water fish species, such as trout, to warmer water species, such as bass and catfish. Warmer water is also likely to create an environment more susceptible to invasions by non-native species. Runoff of excess nutrients (such as nitrogen and phosphorus from fertilizer) into lakes and rivers is likely to increase due to the increase in heavy precipitation events. This, coupled with warmer lake temperatures, is likely to stimulate the growth of algae, depleting the water of oxygen to the detriment of other living things. Declining lake levels are likely to cause large impacts to the current distribution of shoreline wetlands. There is some chance that some of these wetlands could gradually migrate, but in areas where their migration is limited by the topography, they would disappear. Changes in bird populations and other native wildlife have already been linked to increasing temperatures and more changes are likely in the future. Wildlife populations are particularly susceptible to climate extremes due to the effects of drought on their food sources.

Geology and Soils

The counties that lie within the St. Croix WMD owe much of their ecology to the glacial history of Wisconsin. Glaciers most recently flowed into Wisconsin about 25,000 years ago and reached their greatest extent, covering approximately two-thirds of the state, some 14,000 to 16,000 years ago. The retreat of the ice front was interrupted a number of times by re-advances, the last one touched west-central Wisconsin about 10,000 years ago. The area that contains most of the District's WPAs lies within the Western Prairie Ecological Landscape identified by Wisconsin in their *Strategy for Wildlife Species of Greatest Conservation Need*. This area is described as containing "the only true representative prairie potholes in the state. It is characterized by its glaciated, rolling topography and primarily open landscape with rich prairie soils and pothole lakes, ponds, and wet depressions, except for forested areas along the St. Croix River. Sandstone underlies a mosaic of soils. Silty loams that can be shallow and stony cover most of the area. Alluvial sands and peats are found in stream valleys."

The northern portion of the District lies primarily in the Forest Transition Ecological Landscape whose western portion lies on the moraines of the Wisconsin glaciation (Figure 14). The soils are diverse and range from poorly drained to well drained. The southern and eastern part of the District lies within the Western Coulee and Ridges Ecological Landscape, which "is characterized by its highly eroded, Driftless topography and relatively forested landscape. Soils are silt loams (loess) and sandy loams over sandstone residuum over dolomite."

Information on soils is essential for their conservation, development, and productive use. The various soil types have characteristic properties that determine their potential and limitations for specific land uses. Knowledge of soils is important in managing the District's wildlife habitat programs.

Water and Hydrology

Hydrologic features vary across the ecological landscapes of the District, although the past draining of wetlands is consistent throughout the District. According to the Wisconsin DNR, watershed and groundwater pollution vary considerably across



Star Prairie WPA, St. Croix Wetland Management District. USFWS photo.

the District (Figure 15). From a practical perspective, the relevance of hydrology to the establishment and management of a WPA is best analyzed and discussed at a local scale.

District Resources

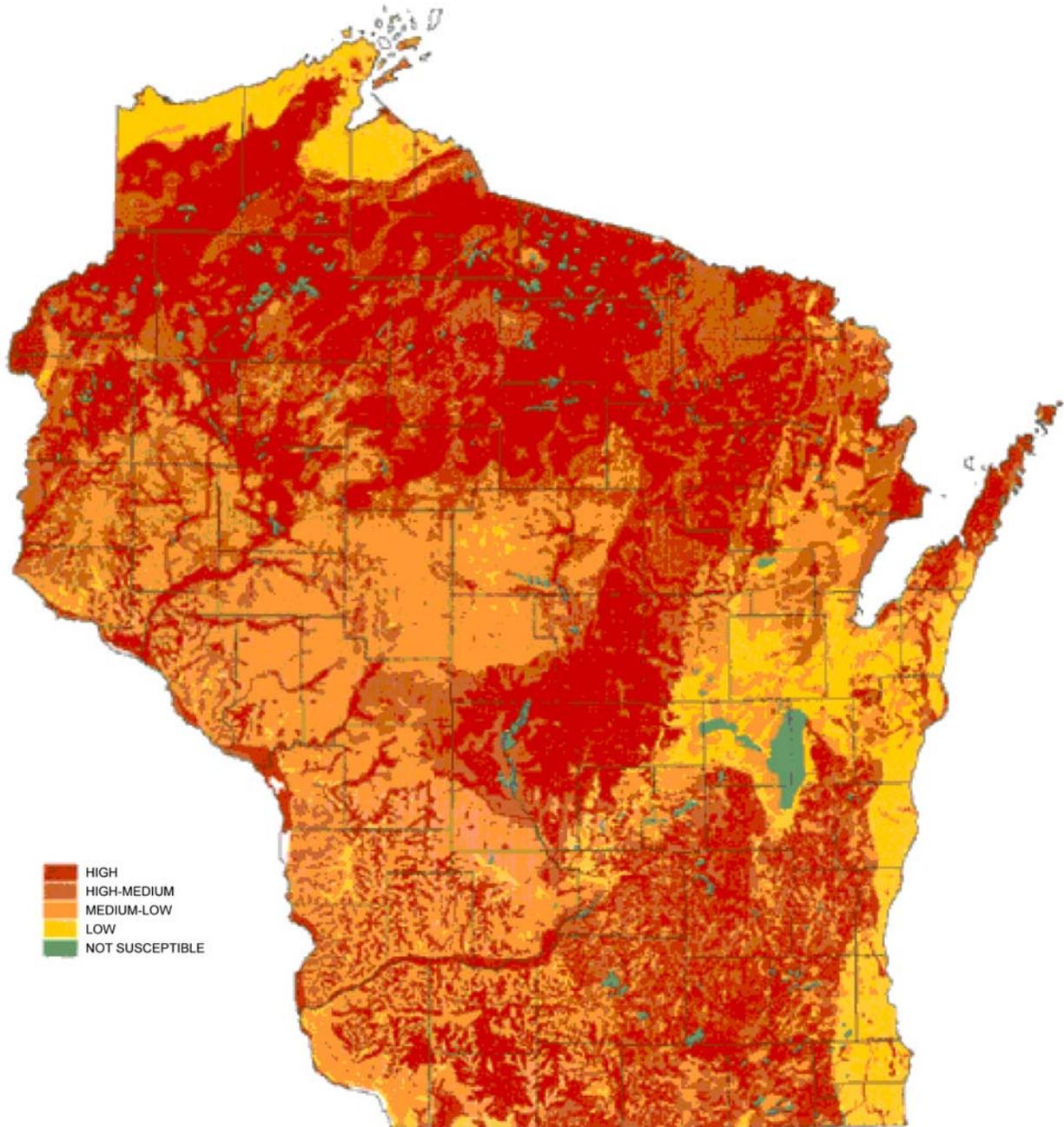
Wetlands

Wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface (Cowardin et al. 1979). It is estimated that the contiguous United States contained 221 million acres of wetlands just 200 years ago (Dahl 1990). By the mid-1970s, only 46 percent of the original acreage remained (Tiner 1984). Wetlands now cover about 5 percent of the landscape of the lower 48 states.

Wetlands are important to both migratory and resident wildlife. They serve as breeding and nesting habitat for migratory birds and as wintering habitat for many species of resident wildlife. Humans also benefit from wetlands as these habitats improve water quality and quantity, reduce flooding effects, and provide areas for recreation.

Wetlands are classified using a number of attributes including vegetation, water regimes (the length of time water occupies a specific area), and water chemistry. District wetlands are classified using the following water regime descriptions (Cowardin et al. 1979):

Figure 15: Wisconsin Groundwater Contamination Susceptibility Model



- Temporarily flooded-surface water is present for brief periods during the growing season. The water table usually lies below the soil surface most of the season, so plants that grow in both uplands and wetlands are characteristic.
- Seasonally flooded-surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. When surface water is absent, the water table is often near the surface.

- Semi-permanently flooded-surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.
- Permanently flooded-water covers the land throughout the year in nearly all years. Vegetation is composed of obligate hydrophytes, such as cattails.

The District has focused on saving and restoring small wetlands. Wetland diversity is important because wetlands change continuously; a single wetland can not be maximally productive all the time. Waterfowl use different types of wetlands at different times during the breeding season. Laying hens may forage in ephemeral, temporary, and seasonal wetlands early in the season and shift to semi-permanent and permanent wetlands after the brood is hatched. Marsh birds need a variety of wetlands in close proximity so they can shift from one wetland to another as the wetlands cycle through different phases. Wetland complexes include a variety of basins, some shallow and some deep, in close proximity. Diverse wetland complexes are rare today because most shallow ephemeral, temporary, and seasonal basins have been drained.

Freshwater wetlands like those in the District are among the most productive in the world (Weller 1982). 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 or bulrush to completely open over a period of years. In the process of transition, the cover vegetation moves through a phase, known as hemimarsch, when clumps of emergent vegetation are interspersed with open water (Weller 1982). In this phase, the structure of the vegetation itself creates habitat and stimulates the production of aquatic invertebrates. The marsh, in this phase, hosts the maximum number of marsh birds. Unfortunately, the phase is only temporary and most wetlands cycle out of it in 1 to 3 years.

Wetlands within the District occur in a diverse distribution of sizes, types, locations, and associations. The WPAs have approximately 1,452 acres of wetlands ranging in size from small seasonal basins less than half an acre in size to large, permanent marshes more than 200 acres in size.

Plant Communities

Plant Communities Associated with Wetlands

Wetlands throughout the District provide both resting cover and food resources for migratory birds. Substantial emergent and submergent aquatic vegetation occurs in freshwater wetlands. Sago pondweed, coontail, various pondweeds and duckweed occur in the deeper, more permanently flooded zones, while cattail, hardstem and softstem bulrush, burreed, arrowhead, sedges, and smartweed grow in shallow areas that may go dry during some periods.

Most palustrine basins exhibit concentric zones of vegetation that are dominated by different plant species. The terms commonly used in reference to these zones are, in decreasing order of water permanency, deep marsh, shallow marsh, and wet meadow (Kantrud et al. 1989). The water regime in a deep marsh zone is usually semipermanent. Dominant plants include cattail, hardstem and softstem bulrush, submergent or floating plants, and submergent vascular plants, but this zone also may be devoid of vegetation if bottom sediments are unconsolidated. Shallow marsh zones are usually dominated by emergent grasses, sedges, and some forbs,



Purple stemmed aster, St. Croix Wetland Management District. USFWS photo.

but submergent or floating vascular plants also may occur. Wet meadow zones also are typically dominated by grasses, rushes, and sedges, whereas submergent or floating plants are absent.

A listing of 50 plant species found on WPA wetlands during a study completed between 1983 and 1990 (Lillie, 2004) can be found in Appendix C on page 144.

A variety of wildlife species, from ducks to rails to songbirds, use this community. Common breeding bird species include Mallard, Blue-winged Teal, Wood Duck, Sandhill Crane, Canada Goose, Trumpeter Swan, Hooded Merganser, Pied-billed Grebe, Great Blue Heron, Green Heron, Killdeer, Red-winged Blackbird and Virginia Rail. Waterfowl species present during the spring and fall migration include Mallard, Wood Duck, Canada Goose, Green-winged Teal, Blue-winged Teal, Ring-necked Duck, Canvasback, Lesser and Greater Scaup and American Wigeon.

Plant Communities Associated with Uplands

Upland vegetation is essential to provide nesting habitat for migratory and resident bird species. Upland habitats also provide necessary habitat requirements for resident wildlife throughout the year. The District currently uses a variety of management techniques to maintain and enhance upland habitat conditions including prescribed fire, native grass seeding, mowing, grazing, tree cutting, and invasive species management.

Grasslands

Past habitat management emphasized the provision of dense nesting cover (DNC) for waterfowl. Several areas on the District were planted to grass species such as tall and intermediate wheatgrass, sweetclover, and alfalfa. These fields initially provided good cover for nesting birds; however, over time they deteriorated and were prone to invasion by Canada thistle and other problem species (e.g., smooth brome). In addition, many of the Waterfowl Production Areas contained fields that had been enrolled in the Conservation Reserve Program and were planted to brome by the previous owners. These monotypic stands of brome provide some habitat for wildlife but not as much as diverse native species plantings. The District has begun the process of restoring these grasslands to native grasses and forbs. The native grass restoration process generally involves cropping the field for 3 or more years to eliminate exotic cool-season grass seeds and rhi-



American Widgeon. USFWS photo.

zomes, control Canada thistle and other invasive plants, and prepare a seed bed for planting native grass seed. Fields are planted to corn for 2 years and then soybeans for 1 year. Soybean stubble provides a good seedbed for native grassland and forb species.

Some uplands in the District were historically comprised of cool-and warm-season grasses characteristic of the tall-grass prairie. Vegetation composition at local levels was determined by numerous interrelated factors, including elevation, topography, climate, soil characteristics, herbivory, and fire. Species typical of the historical mixed-grass prairie include little bluestem, Indian grass, big bluestem, switchgrass, side oats gramma and numerous forbs such as yellow coneflower, blue vervain, oxeye sunflower, blazing star, bergamont, cup plant, giant hysop and potentilla. Appendix C includes a listing of prairie plants found on the WPAs.

The District has been planting native grasses and forbs as former crop lands are converted to more favorable wildlife habitat. The District has approximately 4,192 acres of grassland in blocks that range from 1 to 400 acres in size. Approximately 2,576 acres of the grassland is brome or other introduced cool season grasses while 1,616 acres is native prairie. In addition, the District is in the process of converting 640 acres of cropland to native grass.

Grassland restoration and management is targeted to create large blocks of unbroken grassland habitat. Many species of grassland- and wetland-dependant migratory birds have declined dramatically due to the loss of habitat such as grasslands and wetlands. Most of these species evolved in a treeless landscape of prairie and wetlands with scat-

tered patches of oak savanna. There is growing evidence that the presence of trees has dire consequences for these species, often resulting in lower reproductive success.

Bird species that benefit from the District's grasslands include Henslow's Sparrow, Bobolink, Eastern and Western Meadowlark, Sandhill Crane, Mallard, Blue-winged Teal, Ring-Necked Pheasant, Wild Turkey, Dickcissel, Northern Harrier, Short-eared Owl and many other grassland-dependent species.

Shrub-Scrub

Some scrub shrub communities are found on District lands. Most are found in upland grass fields that have not been managed intensively with fire, mowing or grazing. These fields are usually going through succession and if left unmanaged would eventually turn into forest. Common plant species include willow, dogwood, box elder, prickly ash, sumac and numerous young tree saplings.

Wetland areas also support some scrub shrub habitat, mostly around the edge of wetlands or wet meadows. These areas are very important for migratory birds such as warblers or woodcock, especially during spring or fall migration. This wetland shrub habitat contains numerous species including alder, willow, red osier dogwood and numerous species of sedges. No plant or animal inventories have been completed for scrub shrub habitat.

Shrub scrub acreage is included under the heading of wetland or grassland habitat.

Forests

The District is located along a transition zone where several forest, wetland and prairie vegetation community types intersect. Several types of forests are found on the District including oak savanna, southern oak forest, southern mesic forest and northern mesic forest. Oak savannas are dominated by burr oaks, white oaks and an understory of prairie grasses and forbs. Southern oak forests are found in small sections of the District and are dominated by white, black and red oaks. Southern mesic forests contain sugar maple, elm and basswood while northern mesic forests contain maple, hemlock and yellow birch. Most of the forested habitat on WPAs are oak savannas, old farm woodlots or pine plantations with red pine or white pine.

Oak savannas are an extremely rare community with less than one-tenth of 1 percent of the original oak savanna habitat remaining. Oak savannas depend on fire to prevent the succession to deciduous forest. With the suppression of fire, many oak savannas need intensive management to bring back the understory community. Burr oaks, which have a thick fire resistant bark are the dominant tree species in oak savannas. A wide variety of prairie grass and forb species are found in the understory of a healthy oak savanna.

Numerous animal species are found in forested habitats on WPAs. Many species of neotropical migrants use the small woodland patches for migration habitat. In addition, numerous mammals use the forested habitat including white-tailed deer, Wild Turkey, coyote, red fox, gray fox and many small mammals. No surveys have been completed on the District to assess wildlife use of forested habitats. Oak savannas are important habitat for Red-headed Woodpeckers and are also used heavily by Wild Turkey and deer.

The District has approximately 1,202 acres of forest in blocks that range from less than an acre to 90 acres in size. The forest acreage includes oak savanna, pine plantations, deciduous forest and grassland areas taken over by trees.

Shrubs and Trees in Fencerows

Some WPAs contain old fencerows that are remnants from previous land owners. The fencerows contain shrubs and trees that are beneficial for some wildlife and are, generally, a detriment to grassland bird species. Many of the trees found in fencerows are invasive species such as Siberian elm, honeysuckle, black locust, box elder and buckthorn. Since these trees and shrubs have invaded grassland areas, the trees along the fencerows are typically removed. Although these trees provide habitat for edge species such as Brown-headed Cowbirds, Blue Jays and Robins, these fencerows are detrimental to grassland dependent species that require large tracts of unbroken grassland for their habitat. Because interior fencerows fragment blocks of habitat, the wire and posts are removed in addition to trees and shrubs. The removal of interior fencerows also improves our ability to manage the habitat with mowing or prescribed fire. Within the District there are over 30 miles of fencerows.

Fish and Wildlife Communities

The variety of vegetative communities on the District provides habitat for both wetland and upland associated wildlife, such as ducks, herons, songbirds, deer, and turkey. The District also hosts furbearers, marsh birds, raptors, and a variety of woodland mammals, in addition to amphibians and reptiles. Most wetlands within the District are too shallow to support fish although several basins, including Oak Ridge Lake, Bass Lake and some larger wetland basins have fish in them.

Birds

A complete inventory of bird species that use WPAs within the District has not been completed. Based on the state list and surveys completed during the 1970s, we would expect over 250 species to be found on the WPAs. (Appendix C)

Mallards, Wood Ducks, Blue-winged Teal, Hooded Mergansers, Trumpeter Swans, and Canada Geese are common nesting waterfowl species on WPAs. In addition, during migration the following waterfowl species are also common: Canvasback, Greater and Lesser Scaup, Gadwall, Northern Shoveler, Redhead, Bufflehead, Green-winged Teal, American Wigeon, Pintail, and Ring-necked Duck.

The grassland and wetland complexes in the District provide nesting habitat for many species of birds including Bobolinks, Meadowlarks, Bluebirds, Henslow's Sparrows, Killdeer, Sandhill Cranes, Northern Harrier, and Short-eared Owls. In addition, many species of waterbirds including Great Blue Herons, Great Egrets, Green Herons, Least Bitterns, rails, and American Coots use District wetlands. Numerous other species use District lands during spring and fall migration.

Mammals

Common mammal species for the District include white-tailed deer, raccoon, black bear, beaver, muskrat, mink, red squirrel, gray squirrel, eastern cottontail and numerous small mammals such as eastern chipmunks, deer mouse, meadow jumping mouse, meadow vole, shorttail shrew, white-footed mouse, thirteen lined ground squirrel and plains pocket gopher. Red fox are the most common carnivores of the area followed by coyote and gray fox. An inventory of mammal species has not been completed for the District. A checklist of mammals that are likely to occur on WPAs, although they have not all been confirmed, is included in Appendix C.

Amphibians and Reptiles

Data from state lists indicates that 19 species of amphibians and reptiles could be found on District lands. Appendix C lists the species that may occur on District lands. No surveys have been conducted on District lands to document species presence or distribution, although some species such as snapping turtle, painted turtle, and spring peepers are commonly seen or heard.

Invertebrates

Data from a study conducted from 1983 to 1992 indicated that there were 250 invertebrate taxa collected in WPA wetlands and adjacent uplands. This included 54 terrestrial taxa and 196 aquatic invertebrate species. A listing of the taxonomic orders is found in Appendix C. A complete listing of invertebrate species can be found in Evard and Lillie (1996). Freshwater invertebrates are an extremely important food source for waterfowl, especially for hens during spring migration and egg laying.

Fish

Data from surveys conducted in 1983-1992 indicated that seven species of fish were found on WPAs. These species were yellow perch, white sucker, golden shiner, pumpkinseed, fathead minnow, stickleback and mud minnow. In addition, brown trout are found in the Willow River which flows through the Betterly WPA.



Black bear. USFWS photo.

Threatened and Endangered Species

The Karner blue butterfly is listed as endangered in all but Pepin and Pierce Counties within the District. To date, no Karner blue butterflies have been identified on Service lands, nor has wild lupine, a critical component of Karner blue butterfly habitat, been found on Service lands within the District.

Threats to Resources

Invasive Species

Three categories of undesirable species (invasive, exotic, noxious) are found within the District. Invasive species are alien species whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Executive Order 13112 requires the District to monitor, prevent, and control the presence of invasive species. Exotic species are species that are not native to a particular ecosystem. Service policy directs the District to try to maintain habitats free of exotic species. Noxious weeds are designated by the U.S. Department of Agriculture or the Wisconsin Department of Agriculture as species which, when established, are destructive, competitive or difficult to control. Canada thistle and field bindweed (creeping Jenny), and leafy spurge are introduced species classified as noxious weeds in Wisconsin. Purple loosestrife and multiflora rose are introduced species classified as nuisance weeds.

Invasive, exotic and noxious weed species are relatively abundant within the District. These species are quite diverse and are found in most District habitats, although some are typically found in agricultural fields or lakes and ponds. Currently, most District control efforts focus on Canada thistle, spotted knapweed, leafy spurge, buckthorn and black locust. The principal invasive and exotic plant species within the District are reed canary grass, spotted knapweed, leafy spurge, garlic mustard, box elder, buckthorn, black locust, phragmites, hybrid cattail, brome and purple loosestrife. Exotic and invasive plant species pose one of the greatest threats to the maintenance and restoration of the diverse habitats found on WPAs. They threaten biological diversity by causing population declines of native species and by altering key ecosystem processes like hydrology, nitrogen fixation, and fire regimes. Left unchecked, these plants have come to dominate areas on some WPAs and reduced the

value of the land as wildlife habitat. There is a bountiful seed source of many of these exotic/invasive species on the lands surrounding the WPAs, thus in order to be effective in our management plans, we must bring together a complex set of interests including private landowner, commercial, and public agencies.

Drainage and Pesticides

Waterfowl Production Areas are often islands in a sea of intensive agriculture. Natural drainage patterns have been altered throughout the landscape, increasing the frequency, intensity, and duration of water flowing into many units. Siltation, nutrient loading, and contamination from point and non-point sources of pollution are a serious problem on many WPAs. Waterfowl Production Areas are also threatened by farming, trespass, dumping, wildfires, and pesticide applications on adjacent agricultural land. A study in Ontario 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 Round-up 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.

Research has shown that insecticides commonly used for sunflowers, soybeans and corn can kill wildlife directly and indirectly (e.g. by decreasing the amount of food available to ducks). For example, ducks feed on grain much of the year but in the spring they shift to aquatic invertebrates (insect larvae, amphipods, snails, etc.) and depend on this food source for reproduction and survival. Even when aerial pesticide applications are done 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 Service conducted a study of the impact of agricultural chemicals on selected wetlands in four of the Wetland Management Districts (Ensor and Smith, 1994). Herbicides from surrounding agricultural



Development near the St. Croix Wetland Management District. USFWS photo.

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 semipermanent wetlands (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 over-spray and aerial drift. Most herbicides and insecticides are applied to crops in the spring and early summer, coincident with maximum runoff and waterfowl breeding. Ensor and Smith (1994) write:

“A result of our survey... indicates that prairie pothole wetlands may involve interactions of multiple herbicides (and potentially insecticides) comprising chemical “soups” unique to individual wetlands.”

This study showed that “typical agricultural use” of pesticides on surrounding land had a significant impact in reducing the biological quality of WPA wetlands.

Rural Development

Rural development also threatens District lands in counties with growing populations, such as St. Croix County. Lands adjoining WPAs are often seen as highly desirable rural building lots that are purchased as small hobby farms or rural home sites. This can result in the WPA being “ringed” by homes, with a series of negative impacts on the WPA. Such development can limit future management such as prescribed fire; increase trespass on District lands by neighbors using ATVs, horses, or vehicles; increase threats to wildlife from stray pets (cats and dogs); increase incidents of illegal use of

District land by neighbors for purposes such as dumping, gardening, equipment storage, etc.; and can place hunters and neighbors at odds over concerns about safety during the hunting seasons. In addition to limiting future management options on the property, these rural developments adjacent to WPAs also require a large amount of staff time to deal with these issues. Large-scale rural development would also bring threats from noise and storm water runoff.

Administrative Facilities

The Service is responsible for maintaining the District headquarters building and maintenance buildings. The headquarters is located on the St. Croix Prairie WPA about 2 miles west of New Richmond. The headquarters building consists primarily of office space for the District and Private Lands Program. The building is a modified residential house that has 2,800 square feet and was built in the mid 1980s. An 880-square-foot, three-stall garage is located next to the headquarters building.

The maintenance complex is a former farmsite that was purchased with the Prairie Flats South WPA and is located about 3 miles north of Somerset. The maintenance building consists of a modified machine shed that has 1,920 square feet. Except for a small office space in the barn, the maintenance building is the only heated space in the maintenance complex. There are also several other buildings including a 6,292-square-foot pole building used to store equipment, supplies and seed. There is a 2,925-square-foot barn and a 3,894-square-foot calf barn. These two buildings are used for equipment and supply storage.

Cultural Resources and Historic Preservation

Cultural resources are important parts of the Nation’s heritage. The Service is committed to protecting valuable evidence of human interactions with each other and the landscape. Protection is accomplished in conjunction with the Service’s mandate to protect fish, wildlife, and plant resources. Responding to the requirement in the National Wildlife Refuge System Improvement Act of 1997 that comprehensive conservation plans include “the

archaeological and cultural values of the planning unit,” the Service contracted for an archeological and historic resources study of the Leopold and St. Croix Wetland Management Districts. The Leopold WMD is located in southcentral Wisconsin and the report combines information for both districts. The study report was submitted in 2003.

Egan-Bruhy (2003) reports:

“Wisconsin has a rich and complex history of 11,500 years of change. Through time, populations adapted to the unique and changing environmental setting of the region. The archeological and historical records reflect alterations in the economy, belief systems, social organization, cultural composition, and lifeways of the people of what is now the state of Wisconsin.”

“The archeological data ... provides information regarding the probability of identifying prehistoric sites in association with specific environmental attributes. An association between site location and types of water bodies, soils, and elevations was established for several of the prehistoric time periods. The analysis also indicates that there is a relatively high probability of encountering historic archaeological sites ... particularly proximate to transportation routes and along section lines....”

The Saint Croix WMD and Leopold WMD cover 30 counties in Wisconsin. Consequently they are likely to contain archeological sites from all of the cultural periods found in Wisconsin: PaleoIndian, Archaic, Woodland, Mississippian, Oneota, and Western (French, British, and United States) cultures. (See Chapter 3 of the Egan-Bruhy report for a more complete discussion of cultural resources on the Districts.) In addition, Indian tribes may identify sacred sites and traditional cultural properties on WPAs, and the Districts may acquire buildings and other structures of historical importance. However, as of 2006, the Service has no record of extant sacred sites, traditional cultural properties, and historic buildings and structures on any WPA.

Just 118 acres of District land have been subjected to an archeological survey. From those surveys and other sources, 89 cultural resources sites are reported on the Districts. The potential, therefore, is high for finding many more cultural resources sites. At this time no sites on the Districts have been nominated or placed on the National Reg-

ister of Historic Places, although all sites are considered eligible until determined not eligible through the Section 106 process.

The following listed Indian tribes have been recognized by the Federal government or self-identified by the tribe as having a potential concern for traditional cultural resources, sacred sites, and cultural hunting and gathering areas in Wisconsin.

- Bad River Band of the Lake Superior Tribe of Chippewa Indians of the Bad River Reservation, Wisconsin
- Bois Forte Band (Nett Lake) of the Minnesota Chippewa Tribe, Minnesota
- Citizen Potawatomi Nation, Oklahoma
- Flandreau Santee Sioux Tribe of South Dakota
- Fond du Lac Band of the Minnesota Chippewa Tribe, Minnesota
- Forest County Potawatomi Community, Wisconsin
- Grand Portage Band of the Minnesota Chippewa Tribe, Minnesota
- Hannahville Indian Community, Michigan
- Ho-Chunk Nation of Wisconsin
- Iowa Tribe of Kansas
- Keweenaw Bay Indian Community, Michigan
- Lac Courte Oreilles Band of Lake Superior Chippewa Indians of Wisconsin
- Lac du Flambeau Band of Lake Superior Chippewa Indians of the Lac du Flambeau Reservation of Wisconsin
- Lac Vieux Desert Band of Lake Superior Chippewa Indians, Michigan
- Leech Lake Band of the Minnesota Chippewa Tribe, Minnesota
- Lower Sioux Indian Community in the State of Minnesota
- Menominee Indian Tribe of Wisconsin
- Mille Lacs Band of the Minnesota Chippewa Tribe, Minnesota
- Minnesota Chippewa Tribe, Minnesota
- Nottawaseppi Huron Band

- Oneida Tribe of Indians of Wisconsin
- Peoria Indian Tribe
- Pokagon Band of Potawatomi
- Prairie Band of Potawatomi Nation, Kansas
- Prairie Island Indian Community in the State of Minnesota
- Red Cliff Band of Lake Superior Chippewa Indians of Wisconsin
- Sac & Fox Nation of Missouri in Kansas and Nebraska
- Sac & Fox Nation, Oklahoma
- Sac & Fox Tribe of the Mississippi in Iowa
- Santee Sioux Nation, Nebraska
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, South Dakota
- Sokaogon Chippewa Community, Wisconsin
- Spirit Lake Tribe, North Dakota
- St. Croix Chippewa Indians of Wisconsin
- Stockbridge Munsee Community, Wisconsin
- Upper Sioux Community, Minnesota
- White Earth Band of Minnesota Chippewa Tribe, Minnesota
- Winnebago Tribe of Nebraska

Although Indian tribes are generally understood to have concerns about traditional cultural properties, other groups such as church congregations, civic groups, and county historical societies could have similar concerns.

Museums and Repositories

The Districts have museum property. Archeological collections are not stored on-site, but 526 artifacts from four collections are stored in non-Federal repositories. Artifacts are owned by the Federal Government and can be recalled by the RHPO at any time. The Districts have no other types of museum property such as artwork, historical objects or documents (including photographs), nor natural resources collections. They have no scope of collections statement.

Cultural resources are important parts of the Nation's heritage. The Service is committed to protecting valuable evidence of human interactions with

each other and the landscape. Protection is accomplished in conjunction with the Service's mandate to protect fish, wildlife, and plant resources.

Visitor Services

The Refuge Improvement Act established six priority uses of the Refuge System, which includes the WPAs in the District. These priority uses all depend on the presence of, or expectation of the presence, of wildlife, and are thus called wildlife-dependent uses. These uses are hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Although Congress clearly expects managers to facilitate these priority uses, they must be compatible with the purpose for which the WPA was established and the mission of the Refuge System. Compatibility Determinations for the priority uses and numerous other uses in compliance with the Refuge Improvement Act and national compatibility policy and regulations are included (Appendix F).

Waterfowl Production Areas differ from national wildlife refuges in that they are open to hunting, fishing, and trapping by specific regulation, and open to the other wildlife-dependent activities by notification in general brochures available at the District office. New and existing WPAs are thus "open until closed" versus national wildlife refuges, which are "closed until opened." Within the St. Croix WMD, Oak Ridge WPA has special hunting regulations since it is located within a state closed area. Oak Ridge WPA is closed to hunting from the opening day of waterfowl season until the first Saturday in December except deer hunting during regular archery, gun and muzzleloader seasons.

Hunters and hunting have a long and linked history with WPAs. When Congress amended the Migratory Bird Hunting and Conservation Stamp Tax Act (Duck Stamp Act) in 1958, it authorized the acquisition of wetlands and uplands as WPAs and waived the usual "inviolate sanctuary" provisions for new migratory bird units. Thus, WPAs were intended to be open to waterfowl hunting, in part because waterfowl hunters, through the purchase of Duck Stamps and support for price increases of the stamp, played a major role in acquisition of these areas.



Environmental education, St. Croix Wetland Management District. USFWS photo.

Wildlife observation, photography, interpretation, and environmental education are encouraged on WPAs and are increasing in popularity with the public. In general, WPAs lack an adequate fishery to support fishing.

Other District Uses

In addition to the wildlife-dependent recreational uses, the District regularly receives requests for various non-wildlife-dependent uses such as dog trials, horseback riding, plant collecting, berry picking, and special events. Also, various economic uses such as haying, grazing, and timber harvest are used as habitat management tools and involve the issuance of special use permits. The manager must often make decisions about other “uses” including requests for rights-of-way for new or expanded roads, utilities, pipelines, and communications equipment. Generally the District receives a few requests each year for these “uses”, although the quantity has been increasing, which may be one result of the increased developmental pressure in St. Croix County.

Current Management

Habitat Management

Wetland Management

The intention of the District is to restore and manage wetlands on the WPAs. As the District purchases new WPAs or round-outs to existing WPAs, restoring or enhancing wetlands often provides a challenge to securing the necessary funding to complete the work in a timely manner. The District has frequently utilized grant funds from the North American Wetland Conservation Act or donations from conservation organizations to accomplish much of the work on these projects. In addition to wetland restorations on new tracts, restorations are also completed on existing lands whenever possible. Some restoration opportunities are limited due to potential impacts on adjacent properties. This is frequently true when drainage ditches are involved.

A common restoration technique on the WPAs is scraping out sediment from small Type I basins. In many cases, former agricultural practices have resulted in erosion of sediment into these small seasonal basins which are usually less than 2 feet in depth. In addition, many of the small seasonal basins were filled with rocks and boulders from the adjacent farm fields. By removing the sediment and rocks after the surrounding uplands have been planted to grass, these small basins will again hold water for several weeks in the spring. These seasonal basins are extremely important feeding habitat for nesting waterfowl. In addition they provide important amphibian breeding habitat.

Once wetlands are restored, management activities include maintenance of levees and water control structures, water level manipulation through natural flow and pumping, prescribed fire, and control of exotic and invasive plants. In general, the wetlands are managed to mimic natural processes and cycles. There are only four water control structures on District wetlands. Most wetlands on the District do not have water control structures that can be used to manipulate water levels, therefore they cycle with natural drought and wet years. This cycle is a natural part of prairie wetland ecology and maintains the productivity of these basins.

Grasslands

Several management techniques are used to manage and restore grassland habitat on the District.

These techniques include planting prairie species, converting former CRP fields to prairie, mowing, grazing, prescribed fire and tree removal.

Planting Prairie Species in Cropland

As lands are acquired, uplands are restored with native prairie plantings using Wisconsin ecotype grasses and forbs. Upon acquisition, croplands are evaluated to determine when they will be planted to prairie grasses and forbs. Soybean stubble is a good seedbed for native prairie plantings. Depending on the availability of local ecotype seed, croplands in soybean stubble are usually planted in the spring after acquisition. Fields in corn or other crops may be rotated through corn and soybeans to prepare the site for planting.

Conversion of Former CRP Fields to Prairie

The District is also actively converting former Conservation Reserve Program lands, which were planted to brome and alfalfa to planted native prairie. These brome fields are usually monotypic stands of grass, meaning that usually only one species of grass is growing in the field. They are not very diverse and although they provide some wildlife habitat, it is not as good as native prairie. The fields are being plowed and planted to crops to prepare the fields for planting with native grasses and forbs. The fields will be planted to corn for 2 years and then soybeans for 1 year. Soybean stubble provides an ideal seedbed for native grasses and flowers. The cropping reduces weed competition and creates a good seedbed for native seeds.

Mowing and Haying

Mowing is another management tool used to remove or set back the growth of trees and shrubs in grasslands on the District. Mowing is used once the trees or shrubs have reached a density or size that fire cannot set back their growth. Alternate forms of management such as mowing and haying are used more frequently on units surrounded by homes or developments that limit the management options on a WPA.

Grazing

Several WPAs and easements in the District have active grazing programs to maintain grasslands. Generally, grazing occurs after July 15 and is used to set back brush and maintain the grassland. Grazing is conducted through a Special Use Permit with specific conditions that meet management objectives for the unit and minimize impact to wildlife.

Tree Removal

The District is also actively removing trees on WPAs to restore grassland. With the suppression of fire, the spread of invasive tree species and the planting of pine plantations in the 1970s and 1980s when land was in private ownership, numerous WPAs have been invaded by trees. We are removing non native or invading woody species in these areas. Some of the species that may be removed include buckthorn, green ash, black locust and box elder. These species are either not native to North America or are not native to this area and are generally considered nuisance species or create competition to native tree species.

In most cases, the trees that will be removed have invaded into existing grassland, were planted as shelterbelts or as part of building sites prior to the Service purchasing the WPA, or have come up on their own along ditches or wetland edges. These are typically cottonwood, willow, green ash, cedar, box elder, Siberian elm and aspen. We will also be removing planted stands of pine trees. Land surveys from the 1930s, aerial photos from 1958 and existing vegetation characteristics such as the presence of old mature burr oak trees are some of the pieces of information used to make a decision about tree removal.

Some WPAs have remnant stands of native trees such as burr oak, white oak, and black oak. We do not intend to remove the native oak species in native stands of trees. We will be managing these oak stands as oak savannas, a plant community adapted to fire. Tree removal is completed using several methods, including biomass utilization, firewood cutting, prescribed fire, and hydro axing. Decisions on the best technique are based on site characteristics as well as cost effectiveness.

Prescribed Fire

Prior to European settlement, fire influenced the structure and function of prairie and savannah in the area that is now the District. Fire was less of a



White-tailed deer. USFWS photo.

factor in open forests, and even less in closed forests. Now, the natural process of fire has been replaced by fire management that includes suppression and prescribed burning. Fire is essential for proper management of native, warm-season grasses and associated forbs. Prescribed fire stimulates growth of the grasses, increases seed germination and growth of forbs, creates open ground for wildlife, retards encroachment of woody vegetation, and reduces the fuel load. Prescribed fire is conducted under a specific prescription that identifies the conditions needed to safely complete a burn. Elements in the prescription include wind direction, mixing height, relative humidity, crew size and equipment requirements. The prescribed fire will only be completed when the elements in the prescription are met. Fire will play a significant role in maintaining prairie and oak savanna habitats, which benefit grassland bird species.

During a prescribed fire, efforts are taken to assure that smoke does not impact sensitive areas such as roads and local residences. The impact of smoke can be reduced through management actions that include traffic control, signing, and altering ignition techniques and sequence. Prescribed fires may temporarily impact air quality, but the impacts are mitigated by small burn units, direction of wind, and distance from population centers. In the event of wind direction change, mitigation measures are taken to assure public safety and comfort. The Prescribed Fire Plan describes specific measures to deal with smoke management problems for each unit. Any smoke from a WPA may cause some public concern. This concern is reduced through a con-

certed effort by District personnel to inform the local citizens about the prescribed burning program, emphasizing the benefits to wildlife and the safety precautions that are taken. Informational programs, explaining the prescribed burning program, may also be conducted on and off WPAs.

The prescribed fire program is conducted under a Fire Management Plan, which is revised every five years and was last approved in 2008. The Fire Management Plan covers the historical and ecological role of fire, fire management objectives, preparedness, suppression, fire management actions and responses, fire impacts, use of prescribed fire and fire management restrictions.

Forests

Most forest management consists of cutting invasive or exotic trees to restore the WPA to grassland or oak savanna. During oak savanna restoration, the native burr and white oaks are not removed. The removal of the understory vegetation and the frequent use of prescribed fire is used to stimulate the growth of the native prairie grasses and forbs. Long-term management of these areas includes periodic prescribed fire combined with occasional mechanical removal of unwanted trees and brush.

Small stands of forest also occur on several WPAs. Limited timber stand improvement is conducted on these stands.

Cropland

Approximately 640 acres were farmed in 2007 through Special Use Permits. The overall target is to break approximately 200 acres of monotypic cool season grasses each year and add them to the cropland program. In addition, we are planting approximately 200 acres of cropland coming out of the third year of rotation (soybeans) to native grasses and forbs. For the next several years, approximately 600 acres of WPAs will be cropped each year as we transition District brome fields to native prairie. The availability of local ecotype seed, which is harvested from a nursery run in partnership with the WI DNR, determines the final acreage planted each year. The seed harvest varies year to year depending on many variables including weather and rainfall.

Management of Resident Species

Federal trust species are generally those that cross state and international boundaries or are afforded national protection through various laws and treaties, such as the Migratory Bird Treaty Act and the Endangered Species Act. The well-being of waterfowl populations is a classic Federal trust responsibility and the main purpose for the creation of the Small Wetland Acquisition Program in the 1960s. This does not mean that resident species such as white-tailed deer and pheasants found on WPAs should not receive management attention. Rather it is the degree of management focus, based on the knowledge that management for trust resources like waterfowl will usually benefit the myriad of resident wildlife that share the prairie-wetland landscape.

Local and regional residents, however, may often favor the management for those species like white-tailed deer and pheasant that provide consumptive recreation opportunities. Thus, managers are often faced with requests for food plots, tree and shrub plantings, or direct stockings of game species that may have a negative effect on the primary purpose of waterfowl production and the broader goals of restoring native plant communities. The key is to seek the proper balance between practices focused on trust species and those that can accommodate the public's desire for resident wildlife management.



Blue-winged Teal. USFWS photo.

Habitat Management: Partners for Fish and Wildlife Program

The Partners for Fish and Wildlife Program is very important for the St. Croix Wetland Management District since significant wetland, prairie and oak savanna habitat has been restored in partnership with many conservation organizations and the WIDNR. Through this program, the Service assists local landowners with restoration of a variety of habitat on their property. Projects in the past several years have included wetland, prairie grassland, oak savanna and riparian restoration projects. Projects range in size from small half-acre basins to 50-acre prairie and oak savanna restoration projects. The District private lands biologist also assists landowners with other agency programs such as USDA agricultural programs that provide habitat restoration funding.

Land Acquisition

Funds for land acquisition come from the Migratory Bird Conservation Fund (MBCF) account. This account has four sources, the primary one being revenue from the sale of the Migratory Bird Hunting and Conservation Stamp commonly known as the Federal Duck Stamp. MBCF monies are allocated yearly for the purchase of wetlands that will become waterfowl production areas or national wildlife refuges.

Lands are only acquired from willing sellers. When the Service acquires land, the land is removed from the tax rolls. But, the Refuge Revenue Sharing Act and its amendments allow the Service to offset the tax losses by making an annual payment to the county or other local unit of government. The Refuge Sharing Act specifies how the revenue sharing payments are to be calculated.

St. Croix WMD is distinguished from most wetland management districts in several notable ways:

- It is located on the edge of the prairie rather than in the middle of it.
- It is adjacent to a metropolitan area of 3 million people.
- Wetland drainage is not as significant a threat as wetland degradation and loss of upland habitat because of rural residential development although there are many drained, ditched and tiled wetlands throughout the District.

- In portions of the District (especially St. Croix County), land values for WPAs are commensurate with metropolitan land values for development. Land values in the rest of the District are comparable to other wetland districts in Minnesota and Wisconsin.
- Development around WPAs in St. Croix County is accelerating rapidly. A rural residential property owner feels secure that the WPA out their back door will never be sold for development. Therefore, lands adjacent to WPAs are very desirable for rural residential development.

Because of the elements listed above, an acquisition strategy has been developed for the St. Croix WMD. The District has identified four focus areas for priority acquisition based on current management ownership, high waterfowl production potential, and land protection by other conservation agencies/organizations. (Figure 16). The first is the central part of St. Croix County into south central Polk County. The second is in Dunn County east of Menomonie. These focus areas currently contain 26 of the District's 41 WPAs and 89 percent of the acreage. Following the assembly of Geographic Information System data for the District, which has not been completed yet, we will also evaluate the rest of the District for waterfowl production potential. Land values outside of St. Croix County are comparable to other Minnesota and Wisconsin Wetland Management Districts. A comprehensive analysis of the District using information such as the "Predicted Distribution and Characteristics of Wetlands Used by Mallards in the Great Lakes States," restored wetland basin inventory, wetland inventory information and Landsat data may provide an indication of other areas of the District that should be evaluated as focus areas for acquisition.

Acquisition funding will always be in short supply. Funding levels have been static, which combined with increasing land values, results in fewer acres acquired. Biologically, the larger the tract of land, the healthier the wildlife populations. Waterfowl and many other species of grassland dependent migratory birds such as Henslow's Sparrow, Eastern Meadowlark and Bobolink are dependent on large tracts of unbroken grassland, therefore tracts that add to existing complexes or connect permanently protected habitat will be given priority in acquisition. Wildlife corridors between WPAs and State wildlife areas also provide valuable habitat. What we exclude from a tract (including building sites) will

likely become residential in the future, complicating management later. If the opportunity arises to acquire potential in-holding building sites, we will weigh the acquisition cost against future management implications when making a decision.

The acquisition priorities are:

- Round-outs of existing WPAs in the two focus areas.
- New WPAs over 80 acres in the two focus areas.
- Wildlife corridors connecting WPAs/State wildlife areas and other permanently protected lands.
- Roundouts of existing WPAs in the prairie pothole counties.
- New WPAs over 120 acres.
- Evaluation of the remainder of the District for other focus areas.

Monitoring

No surveys, censuses, studies or investigations are conducted by District staff.

Visitor Services

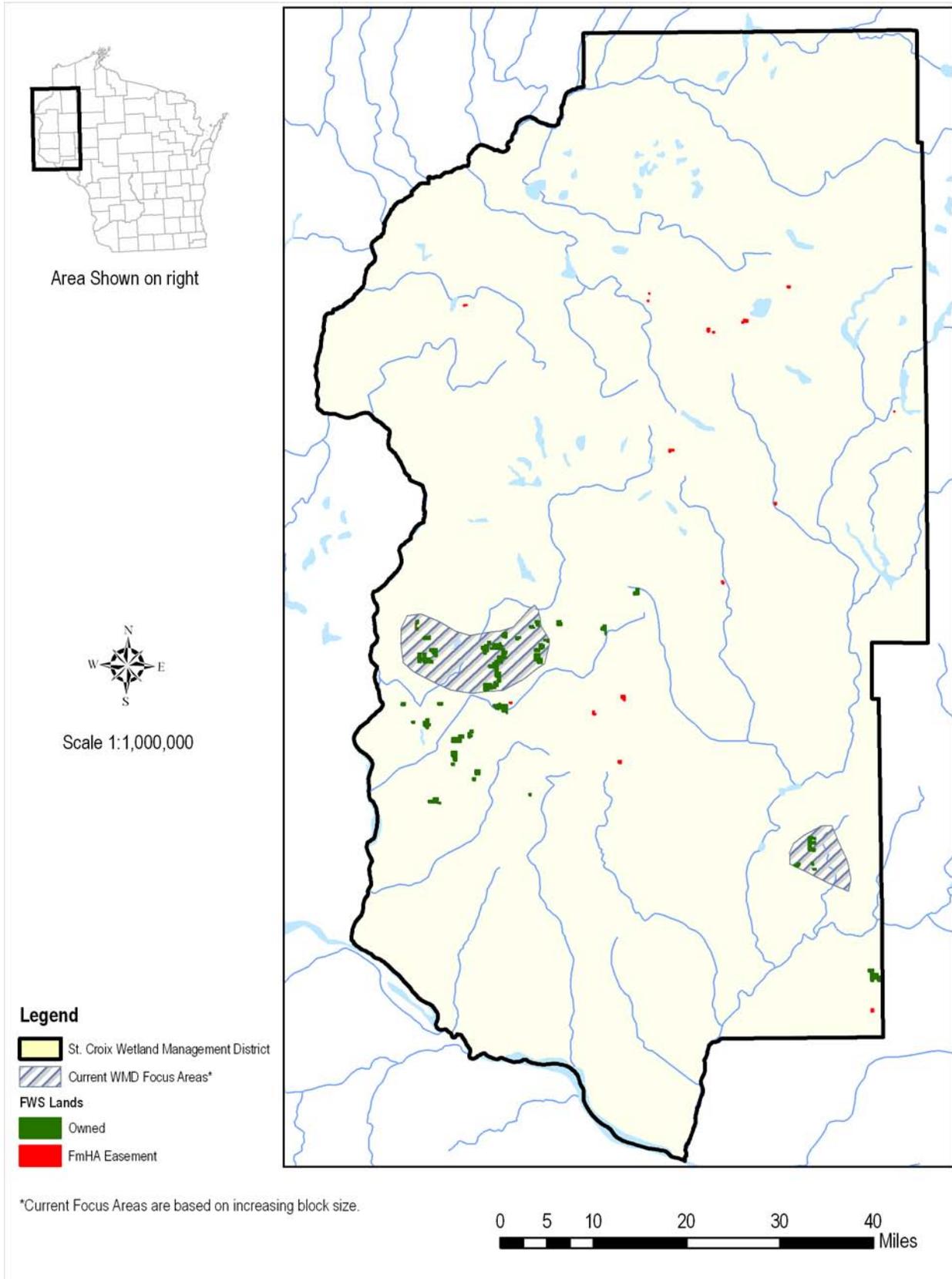
The District facilitates wildlife-dependent recreational uses by distributing information and maps of the WPAs and developing wildlife trails, interpretive signs, and kiosks. Currently, the District has 26 parking lots, three kiosks and a 1-mile loop trail. The number of people visiting the District is estimated from the number of cars employees see in WPA parking lots as they go about their duties.

Hunting

Hunting consistent with state regulations is allowed on all Waterfowl Production Areas. The only WPA with special regulations is the Oak Ridge WPA in St. Croix County. The Oak Ridge WPA falls within a state closed area and therefore, consistent with state regulations, is closed to hunting from the opening day of waterfowl season until the first Saturday in December except deer hunting during regular archery, gun and muzzleloader seasons.

Twenty-six parking lots are provided on 24 WPAs in the District. General county maps designating WPA locations are provided upon request and are available at the headquarters kiosk. The majority of

Figure 16: Focus Areas, St. Croix Wetland Management District



hunters on WPAs are waterfowl and small game hunting. Waterfowl, pheasants and Wild Turkey are the common species that hunters pursue.

The District receives one or two requests a year for special use permits for accessible hunting opportunities.

Fishing

Fishing consistent with state regulations is allowed on all WPAs. Only a limited number of WPAs have wetlands or rivers capable of supporting fish. Parking lots that can be used for fishing access are available on some WPAs.

Interpretation, Wildlife Observation, and Photography

District staff provide several interpretive programs each year to groups and conservation organizations. There are no specific facilities on WPAs for wildlife observation or photography.

Environmental Education

District staff respond to occasional requests for environmental education programs for school groups. The District does not have a visitor services specialist and therefore does not provide structured curriculum based environmental education.

Pest Management

Various herbaceous and woody pest plants are found on District lands. Of primary concern are Canada thistle, spotted knapweed, purple loosestrife, box elder, black locust, and buckthorn.

Chemical, biological, and mechanical methods are employed in an integrated approach to control unwanted plant growth. Chemicals and mowing are used to control Canada thistle. *Galerucella* beetles are used to discourage purple loosestrife, which has increased on several WPAs. Spotted knapweed (*Centaurea maculosa*) has been found on numerous WPAs. In most cases the spotted knapweed was found in the parking lots or invading from roadside ditches where highway department mowing activities perpetuate and further its spread. More recently this pest plant has invaded into established grassland fields and is dramatically expanding its presence in the District. Plants are hand pulled prior to seed set. Chemical control is also being evaluated on several small areas.

The District is also releasing *Apthona laceratosa*, *A. nigriscutis* and *Oberea spp.* to control leafy spurge on WPAs. Leafy spurge is becoming more common on District lands.

Brush and tree species are controlled to restore oak savanna, improve woodlands, maintain grasslands, and remove wooded fence lines between grassland fields. Mechanical and chemical control and a combination of the two are used to control brush and trees.

Archaeological and Cultural Resources

Cultural resources 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 archeological permits, and for Indian tribal involvement. The Regional Historic Preservation Officer (RHPO) advises the Regional Director about procedures, compliance, and implementation of cultural resources laws. The District Manager assists the RHPO by informing the RHPO about Service undertakings, by protecting archeological sites and historic properties on Service managed and administered lands, by monitoring archeological investigations by contractors and permittees, and by reporting violations.

Farm Service Agency Conservation Easements

When the Farm Service Agency (FSA), formerly the Farmers Home Administration (FmHA), acquires property through default of loans, it is required to protect wetland and floodplain resources on the property prior to resale to the public. The Service assists the FSA in identifying important wetland and floodplain resources on the property. Once those resources have been identified, FSA protects the areas through a perpetual conservation easement and transfers management responsibility to the Service. The authority and direction comes from the Consolidated Farm and Rural Development Act (7 U.S.C. 1981 and 1985, as amended); Executive Order 11990 providing for the protection of wetlands; and Executive Order 11988 providing for the management of floodplain resources. The Service administers the easements as part of the National Wildlife Refuge System.

The District manages 14 conservation easement areas totaling 438.5 acres located within the Wildlife Management District, an eight-county area in west-central Wisconsin (see Figure 17). Most conservation easements are visually checked for boundary signs, trespass, and various other infractions each year and a letter is sent to the landowners describing the conditions of the easement.

Existing Partnerships

The District has partnerships with local, state, and national organizations. These partnerships benefit the District in many ways, including fostering good community relations and enhancing habitats and wildlife populations. Examples of partnerships include the following:

- Cooperative seed nursery for growing and harvesting local ecotype native grass and forb seeds with the WI DNR.
- Partners for Fish and Wildlife Program partnership with the WI DNR for cost share on private lands wetland and grassland restoration projects within the District.
- The Service partnered on a cooperative restoration project with Ducks Unlimited, St. Croix County Highway Department, St. Croix and Polk County Land and Water Conservation Departments, WI DNR and the Squaw Lake Association for the restoration of wetlands in the watershed to improve the water quality of Squaw Lake.
- The District is a member of the St. Croix Conservation Collaborative, a group of government agencies and conservation organizations that provides a forum for basin wide conservation activities and needs.

Figure 17: Locations of Conservation Easements, St. Croix WMD

