

Chapter 3: Affected Environment

Ecosystem Setting

The Upper Mississippi River/Tallgrass Prairie Ecosystem

The U.S. Fish and Wildlife Service has adopted an approach to fish and wildlife conservation that is described as an ecosystem approach. This means that the Service is working to perpetuate dynamic, healthy ecosystems that ultimately will foster natural biological diversity. The strategy behind this effort is interdisciplinary and integrates the expertise and resources of all stakeholders.

Trempealeau National Wildlife Refuge lies within the Upper Mississippi River/Tallgrass Prairie (UMR/TGP) Ecosystem (Figure 4). This large, ecologically diverse area encompasses land in the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The ecosystem is bisected into an east and west portion by the Mississippi River. Major rivers in this ecosystem include the Minnesota, Chippewa, Black, Wisconsin, Iowa, Rock, Skunk, Des Moines, Illinois, and Kaskaskia. The Refuge is located within two overlapping ecotypes within the ecosystem – these include the Driftless Area and the Oak Savanna and Forestland Area. The Driftless Area covers parts of Minnesota, Iowa, Wisconsin, and Illinois. Because it was not subject to glacial drift during the latter part of the Pleistocene epoch, the Driftless Area is characterized by highly dissected uplands with deeply cut valleys. Overlaying the Driftless Area in much of southern and western Wisconsin is a fire-dependent ecotype which once covered more than 30 million acres in the Region. Today, the oak savannas of the Midwest are considered by some to be the world's most threatened communities. Conversion of oak savanna to agricultural lands, elimination of fire, invasion by exotic species, and human development



Raccoon in a tree along Refuge Road, Trempealeau NWR.
USFWS

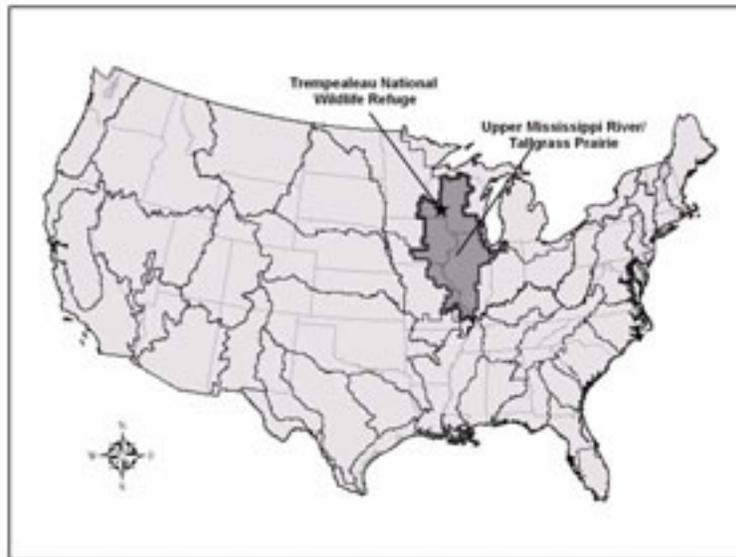
have largely eliminated this ecotype from the UMR/TGP Ecosystem. Trempealeau NWR is blessed with remnants of prairie/oak savanna habitats with opportunities for management to extend their life into the future.

Physical Environment

Climate

The Upper Mississippi River Watershed, which includes the Refuge, is characterized by great temperature extremes. Lows occur in January and February with extremes of minus 30 degrees Fahrenheit or lower and highs in the 90s occurring in July and August. Extreme maximum temperatures of 108 degrees Fahrenheit have been recorded. Some moderation in temperature extremes within the Upper Mississippi River valley have been observed. This is apparent in the spring

Figure 4: Trempealeau NWR and Upper Mississippi River/Tallgrass Prairie Ecosystem



when hardwood trees begin leafing out several days earlier than those on the plateaus flanking the valley.

Average annual precipitation is about 30 inches. About 80 percent occurs as rain from April through October with the remainder falling as snow from November to March. Winter moisture accumulates and can cause excessive runoff and flooding following the spring break-up.

Hydrology

With the closing of the culverts and bridges in the BNSFRR dike separating the Refuge from the main channel of the Mississippi River; and construction of the barrier dikes to divert the Trempealeau River in 1911, Refuge wetlands were essentially isolated. Floodwaters entered the Delta FFF marshes during the damaging flood in 1965 when the BNSFRR dike washed out. Floodwaters entered what is now the Refuge main pool. The upper limits of high water during the spring of 1965 define what is referred to as the “100-year flood” as depicted on Figure 5.

The BNSFRR dike protects Refuge wetlands from the impacts of barge traffic, oil spills, and other pollution that is occurring in the Mississippi River. Probably most significant is the much slower rate of siltation occurring in Trempealeau NWR wetlands. An abundance of wild rice and other sensi-

tive species of aquatic plants on the Refuge that are becoming scarce in many river backwaters attests to the buffering influence of these dikes.

Construction of a series of locks and dams on the Mississippi River in the 1930s created a deeper, relatively stable water system, especially during the summer. Although flooding was not a serious problem at Trempealeau NWR because of barrier dikes, the low water cycle, so important to aquatic plants dependent on mud flats and sandbars for their reproduction, was virtually eliminated. With stable and higher water levels, wind and wave action gradually eliminated aquatic plant beds, particularly in the lower Refuge pools.

Prior to 1994 water management in the 5,500-acre Refuge pools consisted mainly of discharging flows into the adjacent Trempealeau River through a four-bay, gravity structure located in the Lower Diversion Dike near Trempealeau Mountain (Figure 6 on page 24). Water management by the U.S. Army Corps of Engineers at Lock and Dam No. 6 downstream from the Refuge can have a significant effect on the ability to manage water levels. The Trempealeau River enters Pool 6 of the Mississippi River about 1 mile downstream from the

Figure 5: Portion of Trempealeau NWR Above the 100-Year Flood Elevation (1965)

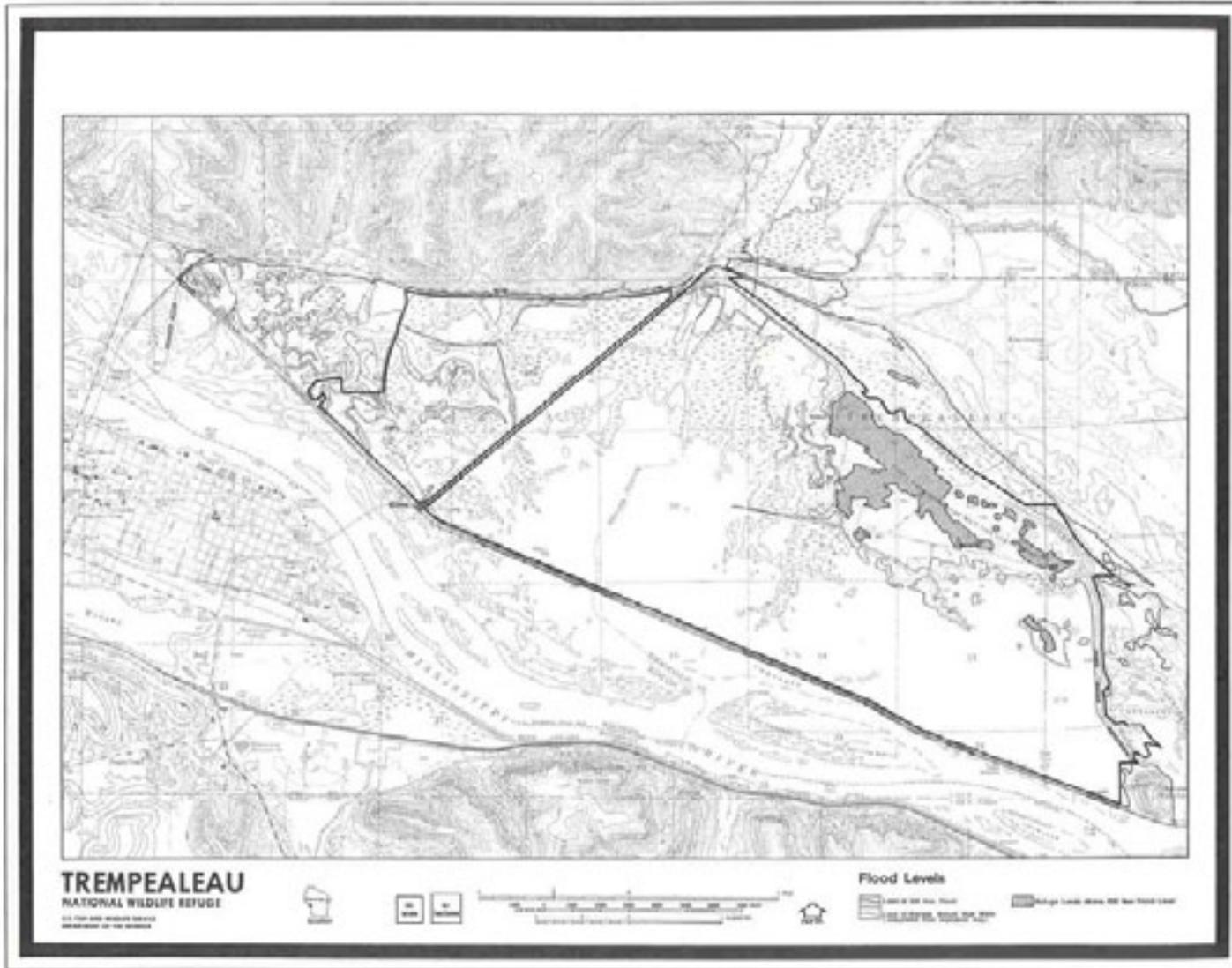
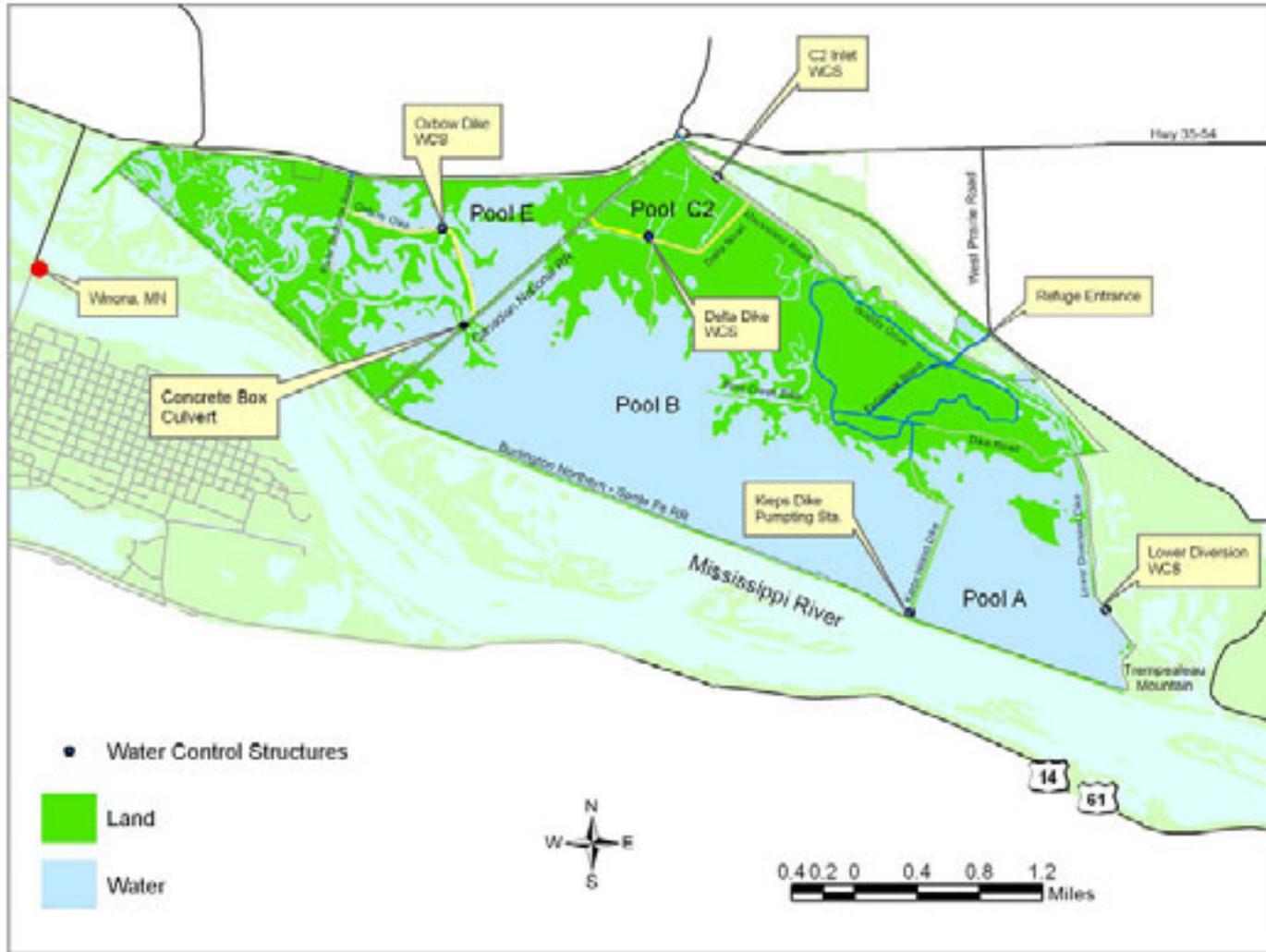


Figure 6: Existing Water Management, Trempealeau NWR





Aerial view of Pool A looking south during the summer of 2002 drawdown. USFWS

Lower Diversion Dike. How the Corps manages water levels in Pool 6 determines the level of the Trempealeau River at this location. This determines the water head at the present discharge site and sets the upper limit on Pool A outflow.

Through the Environmental Management Program a series of dikes and pump stations was completed in 1999. This system created three separate impoundments of 700, 225, and 600 acres within which water levels can be manipulated by gravity and/or pumping to enhance conditions for growth of desirable plants. However, the remaining 4,000 acres of water in Pool B are essentially unmanageable. Water levels in this pool since 2001 have been above desirable levels but pumping and discharge to improve conditions are impractical due to its large area and depth. Subdividing this pool into smaller, more manageable units has been discussed.

The new water management system received its first “test” in 2000 when water level manipulation began. In Pool A water was drawn down by pumping to the maximum (3 feet) exposing about 15 to 20 percent of the bottom. Aquatic plant response on these areas, which had not been exposed for over 60 years, was excellent. By allowing a rise in water levels in the fall, important habitat for migrating waterfowl and marsh birds was provided. Experience gained during the 2000 drawdown showed that groundwater seepage in Pool A is considerable and would probably preclude maintaining low water levels throughout the winter months. In 2004, the Pool A pump station was modified to permit removal of additional water to expose a greater area of pool bottom during a drawdown.

The ability to draw down Pool A allows the Refuge to create mudflats and vegetated shallow water

areas that attract thousands of shorebirds and hundreds of Blue-winged Teal and Northern Shovelers during late spring migration. Through the summer, Sandhill Cranes, Canada Geese, and Mallards feed on the mudflats, and White Pelicans, Great Egrets, and Great Blue Herons loaf in the shallows and feed on schools of fish. During a drawdown, the pool is held as low as possible into the winter when ice conditions prevent pumping. Waterfowl and other birds take advantage of the plentiful food source during fall migration.

Flooding Pool C2 in the late winter attracts waterfowl when the remainder of the Refuge waters are still iced over. This provides limited ability for water level control because the water is released after three weeks to prevent swamp white oak trees in the southeast corner of the impoundment from being stressed.

Pool E is lowered about 6 inches in early June to allow wild rice to grow. The rice attracts waterfowl in the fall. Typically there is an abundant rice crop every other year.

Pool B is the largest pool and includes the wetlands from Kieps Dike west to the Canadian National Railroad and the wetlands west of the railroad outside of Oxbow Pool. This makes it difficult to manage and over the years the emergent marsh habitat and floating vegetation mats have declined in quantity due to high water levels.

As mentioned earlier, the BNSFRR dike forms an integral part of the barrier dike system which impounds water within Trempealeau NWR. This dike was breached and over-topped in 1965 and was repaired by the railroad. During the near-record flood in the spring of 2001, floodwaters rose to a level even with the bottom of the rails at several points but the dike held. Again, additional rock was added at several points. Railroad personnel were concerned about the large “head” of water against their dike and requested that the Service let water into Trempealeau NWR to equalize the pressure on the dike. In response, gates on the water control structure in Lower Diversion Dike near Trempealeau Mountain were opened as well as gates on the Marshland Road inlet structure, allowing water from the Trempealeau River to enter the Refuge pools. Water elevations on the Trempealeau River were several feet lower than on the Mississippi River at points upstream where pressure on the dike was greatest. As a result, the quantity of water

which could be diverted into the Refuge pool was insufficient to offer protection for the railroad dike at the critical locations.

From the Refuge's perspective, opening the gates on the Lower Diversion and Marshland Road structures and allowing floodwaters to enter the Refuge caused serious damage to biological resources and infrastructure as follows:

1. High inflows damaged the electric weir and one lift gate on the water control structure with a repair cost of several thousand dollars.
2. Higher water levels in Refuge pools coupled with strong winds caused bank erosion on the Refuge side of the BNSFRR dike.
3. With damage to the electric weir, carp and other rough fish were allowed to enter Pool A. In the future, with big-headed and silver carp and other exotic species entering the Mississippi River, biological consequences from this action to aquatic systems in the Refuge pool could be severe.
4. Floodwaters uprooted or drowned out beds of emergent aquatic plants that had become established during the previous year's drawdown in Pool A and those beds that were well established in the upper ends of Pool B between Pine Creek Dike and the Canadian National Railroad.
5. Interior Refuge roads and dikes suffered damage from high water. Kieps Island spillway was damaged from overtopping and needed extensive repairs.



The main access road into Trempealeau NWR floods annually. USFWS

In summary, this incident clearly demonstrated that the present water management infrastructure at Trempealeau NWR affords little opportunity for management actions that can reduce Mississippi River flood impacts on the BNSFRR dike. Letting flood waters into Pool A through the lower diversion structure will damage emergent vegetation thereby countering the beneficial effects of drawdowns, and may accentuate bank erosion on the railroad and interior dikes while offering virtually no additional protection to the BNSFRR dike.

If the BNSFRR placed a large, gated culvert or series of culverts through their dike upstream of the junction with the Canadian National Railroad (CNRR) dike, it might be possible to discharge enough water into the upper portion of Trempealeau NWR to save the dike during a disastrous flood event. Such a project could jeopardize the CNRR dike that bisects the Refuge pool and would undoubtedly cause considerable damage to Refuge habitats and infrastructure.

Water inflow into Refuge pools can occur through an inlet structure between the upper end of C2 Pool and the Trempealeau River backwaters and through a drainage ditch off the Buffalo Township Park. Other inflow comes from seepage through railroad and barrier dikes and from groundwater input. This latter source is probably considerable but has not been measured. A number of artesian wells drilled by the former owners of the Delta FFF are scattered throughout Refuge wetlands. The quantity of water inflow has not been measured but is believed to be relatively insignificant.

Flooding of the 0.2-mile township road that provides the main access to the existing auto-tour route occurs for up to 6 weeks annually during spring break-up and at other times following heavy rains. During this time, the surface gravel is washed from the road into the wetland downstream. This material is slowly filling the wetland from years of flooding. As part of a feasibility study to look at alternatives for providing all-weather access to the Refuge, a hydraulic analysis of Trempealeau River flows was conducted. These data are available in Refuge files.

Geology and Soils

The Upper Mississippi River Valley was substantially influenced by the Pleistocene geologic age. During this period, heavy water flows caused substantial erosion and cut the present deep valley. As

flows lessened, sediments composed of sand and gravel were deposited forming the basis for present Refuge soils.

Soils within the Refuge range from alluvial types in the wetlands to finely eroded sands on the steeper uplands. Varying levels of silt overlies sand and gravel sediments in the wetland bottoms. However, isolation of Refuge marshes from adjacent river floodwaters by the barrier dikes has reduced the degree of siltation compared to adjacent Mississippi backwater areas.

The 700-acre central upland portion is an area of rolling sand dunes formed from wind-blown material deposited in the valley during a former dry period.

Soils, to a great extent, influence the growth and type of vegetation which occur on a particular area. Soil also determines the suitability of a site for a particular use. Accordingly, soil characteristics as described in soil surveys from Buffalo and Trempealeau Counties (USDA 1962, 1977) were mapped and used in conjunction with other data to determine the suitability of various locations for Refuge management and development.

Environmental Contaminants

In February 1991, sediment samples were collected from several locations in the main Refuge pool. These were borings taken from 0 to 19 feet for bulk chemical testing to determine suitability of sand for dike construction. Samples were analyzed for heavy metals, organochlorine pesticides and PCBs and were found to be relatively clean. Complete results of the analysis are listed in Appendix A of the January 1994 Corps of Engineers Definite Project Report for the Trempealeau NWR HREP (USACE 1994).

As mentioned earlier, Trempealeau NWR is bordered and bisected by active railroad grades. The BNSFRR in particular is a busy track with trains passing at 20 to 30 minute intervals during working hours. Railroads transport a variety of chemicals, fertilizers, and other materials, some of which would be harmful to fish and wildlife if a derailment occurred adjacent to the Refuge and contaminants entered the wetlands.

Water Quality

Outbreaks of blue-green algae have been noted in Refuge pools during summer months, turning the water a pea-green color. Studies during July 2002 by

USGS researchers from the Upper Mississippi Environmental Sciences Center (UMESC) in La Crosse found that nitrogen concentrations in the Refuge pool were low relative to phosphorus. Low nitrogen levels can limit phytoplankton growth. Phytoplankton such as blue-green algae that can fix atmospheric nitrogen, however, will have a competitive advantage over non-fixing species – hence the huge bloom noted.

Refuge pools are shallow and fertile and receive no inflow from adjacent rivers during the winter months. As a result, dissolved oxygen levels become quite low during most winters particularly when snowfall is above normal.

Vegetation and Habitat Resources

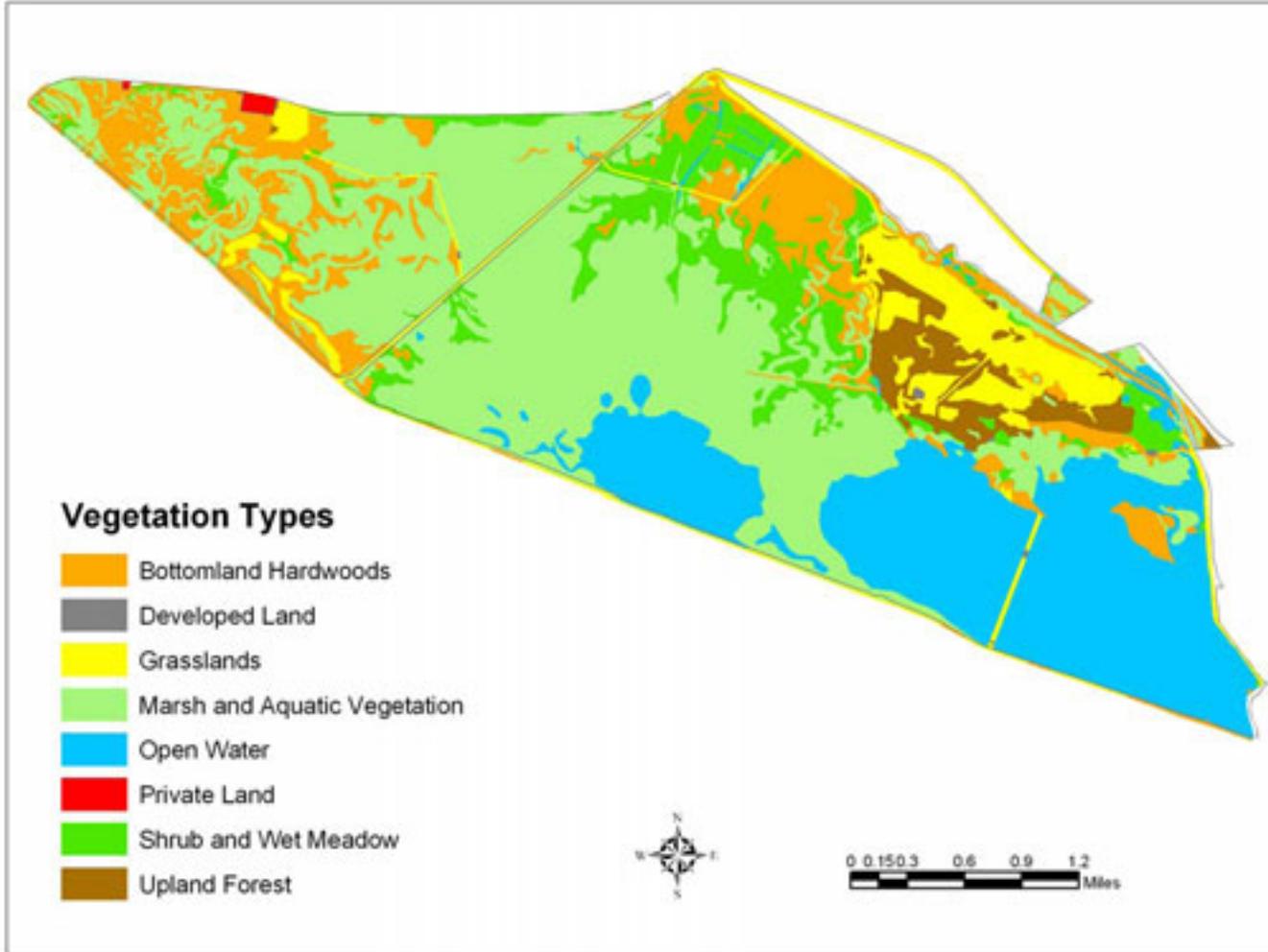
Habitats and Vegetation Types

Vegetative cover type, density, and height are all important factors used in planning and managing the Refuge. The 1994 GIS habitat coverage maps from USGS and ground fieldwork were used to code all the vegetative types on the Refuge. Figure 7 illustrates these vegetative types.

Using this system, the Refuge's vegetation types can be grouped into the following categories: 2,574 acres of marsh and aquatic vegetation; 1,446 acres of open water; 572 acres of wetland, shrub, and wet meadow; 227 acres of upland forest; 969 acres of bottomland forest; 408 acres of grassland; and 30 acres of developed land. The total Refuge area is 6,226 acres.

Marsh and aquatic vegetation occupies about 41 percent of the Refuge. The primary emergent species are cattail, burreed, sedges, bulrush, arrowhead, and phragmites. Wild rice, a particularly important fall food plant for migratory birds, is abundant, particularly in the western half of the Refuge. During some years this plant may occupy several hundred acres of the Refuge. Floating-leaf and submergent aquatics including American lotus, pickerelweed, water lily, pondweeds, waterweed, coontail, and water milfoil are present in varying levels of abundance. First noted in the mid-1980s, the invasive purple loosestrife has spread throughout the Refuge and now occurs in some stands that are several acres in size. Other invasive aquatic plants present include Eurasian milfoil and curly-leaved pondweed.

Figure 7: Landcover/Land Use Map, 1994, Trempealeau NWR





Oak stand with a dense understory of European buckthorn and honeysuckle. USFWS



The same area after removal of invasive woody shrubs. USFWS

Wetland shrub and **wet meadow** types comprise about 9 percent of the Refuge. Principal species within the wetland shrub type are willow, red-osier dogwood, and buttonbush. The wet meadow type includes various sedges and the invasive reed canary grass. There are indications that willow may be spreading and occupying areas formerly occupied by emergent and wet meadow species.

Upland forest covers about 4 percent and is dominated by red and black oaks, black locust, green ash, and black cherry with a few scattered pine plantations. Nearly 190 acres of this upland forest are dominated by non-native tree species in their overstory. The red and white pine found on the Refuge are not indigenous to this particular area of Wisconsin. Scotch pine and red cedar are not native to this area. All of these species were planted decades ago in an attempt to provide additional habitat niches. However, these plantings fragment prairie habitats that are becoming extremely rare in the region due to development and agriculture.

Recently, nearly all upland forests have been invaded by European buckthorn which in many areas forms a dense, monotypic understory shading out native hardwood tree and shrub seedlings and wildflowers. An extensive effort to remove buckthorn, honeysuckle, Siberian pea and exotic elms was made in fall 2003 and winter 2003/2004 (see adjacent photographs). This was done in conjunction with an environmental education effort using over 500 students and a few staff to clear most of the understory invasives and all of the mature exotics in the overstory within a 4.5-acre area. This level of effort likely could not be maintained at the current level of staffing.

The **bottomland hardwood forest** covers about 16 percent of the Refuge and is dominated by silver maple, river birch, swamp white oak, cottonwood, willow, and ash.

Prior to impoundment, much of the old river channels on the western portion of the Refuge were bordered with bottomland hardwoods. Some areas were cleared for farming and then later maintained by the Refuge as grasslands in order to create edge habitat. Now that the importance of bottomland hardwoods (and other habitats) in unfragmented condition is known, and the difficulty of maintaining these fields using fire is realized, the Refuge has recently begun to restore these areas to bottomland hardwoods. Some restoration has already occurred with planting of seedlings and direct seeding of various trees including swamp white oak, hackberry, and green ash. This restoration may make these areas more attractive to such species as the Red-shouldered Hawk and Cerulean Warbler.

Grassland areas make up about 7 percent of the Refuge. Past management efforts have encouraged re-establishment of native grasses such as big and little bluestem, switchgrass, Indian grass, side-oats grama, Junegrass, and green needlegrass. In the last two decades, the importance of prairie wildflowers has been recognized including species such as purple prairie clover, lupine, prairie larkspur, goatsrue, spiderwort, leadplant, and yellow puccoon. Non-native, cool season grasses such as quackgrass, smooth brome grass and bluegrass occur throughout the grasslands. Leafy spurge began invading grasslands on Trempealeau NWR in the mid 1980s and is now present throughout upland prairie habitats. This plant thrives from its persistent underground

root system, defying mowing and burning. Releases of flea beetles that attack and feed on leafy spurge plants began in the early 1990s and show promise for future control.

Prescribed burning has been an important part of prairie management on Trempealeau NWR. About 335 acres within 17 grassland units are burned on a rotational system during the spring months under prescriptions described in a Fire Management Plan (USFWS, 2008).

Black locust, a native of the southeastern U.S. was brought to the Refuge in the late 1930s and 1940s to control erosion and provide wildlife cover. The species did well in sandy soil areas and became very invasive due to its aggressive, spreading root system. The Refuge has been “battling” black locust using mechanical and chemical means for many years with varying levels of success. At present, black locust stands of varying age occupy about 30 percent of the upland area of the Refuge.

Developed land accounts for less than 1 percent of the Refuge area and includes the headquarters area, maintenance and storage facilities, roads, parking areas, and water control structures.

Fisheries Habitats and Resources

General

Based on limited population sampling conducted in 1979, 1981, 1984, and 1994, the fishery resource of the Refuge can best be described as mixed, but



Refuge staff planting Swamp white oak trees on a former cropfield. October 2003. USFWS

dominated by non-game fish. Carp, buffalo, and bullheads are the most abundant species and may comprise as much as 85 percent of the standing crop by weight. These species are the most resistant to the partial and often severe winter-kills that occur regularly. Northern pike and yellow perch are the most abundant game species found in Refuge pools. Using a diversity of sampling techniques in 1994, a total of 23 species of fish were recorded (Appendix C).

Commercial Fishing

Commercial harvest of carp and buffalo on the Refuge has occurred sporadically over the past 25 years. During the period from 1982 to 1986, more than 700,000 pounds of fish were taken. Attempts to utilize commercial harvest to control rough fish populations to improve aquatic plant growth and survival have met with limited success. Unstable pricing and market conditions have often reduced incentives for harvest at times when rough fish populations are high and resource impacts most severe. However, with completion of the interior dikes and pump stations in 1999, commercial salvage for carp in Pool A prior to a drawdown year can significantly reduce the population. This improves conditions for growth of both emergent and submersed aquatic vegetation by reducing the amount of carp foraging in the sediment. It also allows a quicker drawdown to occur because fewer fish are present to reduce the flow of water to the pumping station by blocking the intake culvert. Pumps can then run continuously.

Forage Fish

Little is known about this component of the fish population in Refuge pools. However, its importance to many fish-eating birds that frequent the Refuge is substantial. White Pelicans and Double-crested Cormorants, for example, arrive in April and are present until late October in numbers often exceeding 500 birds of each species. Hundreds of Ring-billed Gulls and Bald Eagles roost and feed on the Refuge during both spring and fall migrations. Great Blue Herons and Great Egrets from a rookery 1 mile west of the Refuge number more than 500 nesting pairs and use the Refuge as a major feeding area during breeding season. In short, Trempealeau NWR pools provide an enormous food source for many hundreds of fish-eating birds for 8 to 9 months of the year. This food base is comprised of young-of-the-year carp and buffalo, gizzard shad, and an undetermined number of other species.

Sport Fish

Trempealeau NWR supports a meager sport fishery with bullheads comprising the majority of the catch by bank fishermen. Limited numbers of northern pike are taken with a few large fish (over 10 pounds) usually reported each year. Other game fish including bass, bluegill, crappie and yellow perch are present. Their numbers tend to fluctuate depending on severity of the most recent winterkills.

Threatened and Endangered Fish

No federally listed species are known to occur within the Refuge. However, state listed species including the American eel (special concern) and the river and greater redhorse, both threatened, are known to occur in the Trempealeau River. There are also records of the pirate perch collected on the former Delta FFF in 1947 although the species has not been encountered recently.

Invasive and Exotic Fish and Molluscs

Several non-native species have been introduced into Wisconsin waters either accidentally or, in some cases, on purpose. Some have become “invasive” in that they overwhelm native species and take over a body of water. Aquatic invasive species threaten the diversity and productivity of the Mississippi River System and Trempealeau NWR.

Common carp have been present in the Refuge pool system for many years. Their numbers have somewhat stabilized and tend to fluctuate depending on the severity of winterkills. Two other species of carp are cause for serious concern, however. Big-head carp and silver carp were first brought to the U.S. in the 1970s by Arkansas fish farmers to consume algae in fish production ponds. They escaped and began to appear in the southern Mississippi River in the 1980s and now occur in large numbers below Lock and Dam 19 in Iowa. A bighead was caught in Pool 4 (Lake Pepin) about 25 miles upstream from Trempealeau NWR in the fall of 2003. Both species are large-bodied filter feeders that compete directly with native mussels and other fish for food. There is great concern about their potential effect on fish communities if they become established in Wisconsin waters. Both bighead and silver carp are known to jump out of the water in response to boat motors. Continued maintenance and operation of the electric barrier in the Lower Diversion Dike water control structure is essential to ensure that exotic fishes like the silver and big-



Red fox. USFWS

head carp do not enter Trempealeau NWR from the Trempealeau River when the gates are open and water is being discharged.

Zebra mussels, native to Eastern Europe and Western Asia, are now found in the entire Wisconsin portion of the Mississippi River. These hardy and prolific mollusks, which can clog water-intakes and decimate native mussel populations, as yet have not been found in Trempealeau NWR pools.

Wildlife

Trempealeau NWR habitats provide potential resting and feeding areas for migratory and resident wildlife. Wooded river bluffs are used by songbirds while many species of raptors take advantage of updrafts created by the valley slopes for their migrations. The diverse mix of wetland, forest, and prairie habitats within and adjacent to Trempealeau NWR support a great variety of birds, mammals, reptiles, and amphibians as described in the following sections.

Refuge wildlife monitoring is an important priority with results used to support adaptive management techniques that can be used to benefit a variety of wildlife species. Various techniques are used as specified in the stations current Wildlife Inventory Plan (USFWS 1987).

Waterfowl

Waterfowl usually begin arriving in mid-March as ice break-up occurs in Refuge pools. Migrants, which include Goldeneyes and Common and Hooded Mergansers, show up earlier on adjacent Mississippi River backwaters where river currents and water level fluctuations cause ice-out to occur before Trempealeau NWR. Essentially all diving and dab-

bling ducks common to the Mississippi Flyway can be seen at Trempealeau NWR during the spring migration. Canada Geese are a common spring migrant – Snow Geese are rarely seen. Tundra Swans move through by the thousands in mid to late March on their way to sub-arctic nesting grounds. Flocks numbering into the hundreds can be seen on the Refuge for brief periods in the spring. Blue-winged Teal are usually the last waterfowl species to arrive.

Canada Geese, Mallards, Blue-winged Teal, and Wood Ducks are the principal nesting waterfowl. All four are listed as Resource Conservation Priority (RCP) species based on their recreational and economic value (Appendix C). Families of Canada Geese are conspicuous during summer months when flightless molting adults and their young congregate in Refuge marshes. An annual roundup in July coordinated by Wisconsin DNR usually results in over 100 goslings and flightless adults being banded on the Refuge. Wood Ducks are the most abundant nesting duck on Trempealeau NWR and adjacent Mississippi River backwaters using cavities in bottomland hardwood forest stands for nesting.

Fall migration begins in late August coinciding with the ripening of wild rice in stands on the upper pools. During bumper years, this plant may occupy hundreds of acres in the western half of Trempealeau NWR providing a tremendous food source utilized by Wood Ducks, Mallards, Sora and Virginia Rails, Coots, and thousands of Black Birds. Flocks of Blue-winged Teal are apparent at this time preparing for their early fall departure.

Trempealeau NWR is important as a fall waterfowl feeding and resting area for the complex of wetlands occurring in the general area. Neither



Refuge and Wisconsin DNR staff and volunteers round up flightless geese for banding on the Refuge. July 2002. USFWS

adjacent Pool 6 within the Upper Mississippi River NW&FR nor state-managed wetlands in Trempealeau Bay include any areas closed to waterfowl hunting. By maintaining only limited waterfowl hunting for disabled persons and restricting human entry and modes of access during fall migration, adequate sanctuary has been provided on Trempealeau NWR to protect and hold large numbers of waterfowl. This has improved waterfowl hunting and wildlife viewing opportunities on surrounding areas over the years.

Diving ducks including Ring-necked Ducks and Canvasback ducks are attracted to Trempealeau NWR pools during the fall migration. More than two-thirds of the mid-continent population of Canvasbacks are believed to pass through the “Upper Miss” and Trempealeau NWR during fall migration.

In recent years it has been estimated that more than 30,000 Tundra Swans move through the Upper Mississippi River Valley during fall migration, staging on closed areas within the Upper Mississippi River NW&FR and on Trempealeau NWR. These birds begin to arrive in late October and may stay for a month or more. Peak numbers in excess of 1,000 on the Refuge have been recorded. Thousands of visitors enjoy watching these spectacular birds as they brighten our lives for a few brief weeks in the fall (and spring).

Canada Geese and Mallards are usually the last waterfowl to depart. During years when snow comes late and birds can feed in harvested crop fields nearby, hundreds of geese and thousands of Mallards can be seen roosting on pool ice well into December.

Waterbirds

Pelicans and Cormorants

White Pelicans began appearing on Trempealeau NWR and vicinity in the mid-1980s. Since then numbers have increased with peaks of up to 1,000 birds recorded. Flocks are assumed to consist of non-breeding adults and sub-adults since nesting occurred for the first time in 2007 on the Mississippi River navigation Pool 9. These birds find ample forage fish for their diet as flocks of pelicans can usually be seen on the Refuge from ice-out to freeze-up.

Formerly listed as endangered in Wisconsin, Double-crested Cormorant numbers have rebounded dramatically in the Upper Midwest. Until 1985, a small nesting population was maintained on man-made structures located west of



American White Pelicans. © Sandra Lines

Delta Point. This effort was discontinued as Cormorant numbers increased and it became obvious that major recruitment was occurring elsewhere. The large flocks that now stage on the Refuge and adjacent Mississippi River backwaters in late summer and fall are causing consternation among anglers regarding their potential impacts on gamefish numbers. As with pelicans, main food sources within Trempealeau NWR are likely young carp, buffalo, and gizzard shad.

Hérons, Bitterns and Egrets

Serious declines in numbers of nesting Great Blue Herons and Great Egrets have occurred on the adjacent Upper Mississippi River in recent years. For example, of four known rookeries active in 1987 on Pools 4, 5, and 6 of the Winona District, only the Mertes Slough rookery in Pool 6 remains viable. This colony located only 1 mile upstream of Trempealeau NWR contained an estimated 600 Great Blue Heron and 100 Great Egret nests in the year 2000. Vegetation losses and general decline in foraging habitat are believed to be at least partly responsible for the demise of these rookeries.

Studies demonstrate that many nesting Great Blue Herons and Great Egrets that were followed by aircraft traveled from the Mertes Slough rookery to Trempealeau NWR for feeding (Custer, 1999). It is likely that Trempealeau NWR marshes play a critical role in the survival of this rookery. Other heron species found on the Refuge include the Green Heron, Black-crowned Night Heron, and Least Bittern. Sightings/records of the American Bittern on or near the Refuge are extremely rare.

Cranes and Rails

Sandhill Crane numbers have increased in recent years with six to 10 nesting pairs on the Refuge. Flocks of up to 30 birds on and near the Refuge are common.

Sora and Virginia Rails become apparent when wild rice begins to mature. Many birds can be heard calling from stands of wild rice and other emergent vegetation in the western two-thirds of the Refuge from late August into early October. Both species nest on Trempealeau NWR.

Gulls and Terns

Flocks of Ring-billed Gulls winging their way up through the Mississippi River Valley are a sure sign that spring and flocks of waterfowl are not far behind. These birds move through by the thousands, but do not nest.

Trempealeau NWR provides one of the largest nesting populations of Black Terns on the Upper Mississippi River. These birds build their nests on floating vegetation. Nesting pairs peaked in the mid- to late-90s between 60 and 100 pairs. The population bottomed out at 15 pairs during the high water year of 2001. Since then numbers recovered and stabilized at about 30 nesting pairs. Clearly, more stable water levels within Trempealeau NWR provide more secure nesting conditions for Black Terns than adjacent Mississippi River backwaters where water level fluctuations are more severe. Black Terns are a Regional Resource Conservation Priority Species and are listed as a species of Special Concern in Wisconsin. (Appendix C).

Shorebirds

Shorebird habitat is generally scarce on Trempealeau NWR except during years when drawdowns are conducted on Pool A, exposing mudflats for shorebird foraging. Shorebirds took advantage of the Pool A drawdown in 2000 which coincided with their northward migration in the spring. Twenty-three species of shorebirds used the Refuge during this time. Greater and Lesser Yellowlegs were the first to arrive in mid to late April. Dunlins came in the hundreds from early to late May peaking at about a thousand. Unusual species included a Red Knot, Hudsonian and Marbled Godwits, American Avocets, and Ruddy Turnstones. Though the fall migration was less spectacular, a few hundred shorebirds made use of low water levels in the pool.

The American Woodcock is a common migrant and a nesting species on Trempealeau NWR.

Raptors

Bald Eagle (see Section on page 35) and Osprey, which is listed as threatened in Wisconsin, nest on the Refuge. A pair of Ospreys have nested most

years on a platform on top of a transmission line support structure along the Canadian National Railroad dike. This nest was first discovered in 1975 and at that time was the only known nest in the area. Since then at least three other nests have appeared within 5 miles west of the Refuge. A pole and nesting platform placed near Kiep's Island has received limited use by Ospreys. Nesting occurred in 1998, 1999, 2000, 2001 and 2007 but only two young were fledged in 2000 and 2007.

There are previous nesting records for the Red-shouldered Hawk on Trempealeau NWR but sightings of this species have been few in recent years. Red-shouldered Hawks seem to prefer large tracts of mature bottomland forest within the Mississippi River floodplain for nesting. This kind of habitat is present but limited on Trempealeau NWR.

The Peregrine Falcon, a state-listed endangered species in Wisconsin, has nested on bluff outcrops within 2 miles of the Refuge and on man-made structures in towns and cities nearby. The species is observed occasionally at Trempealeau NWR and has been seen taking waterfowl.

Upland Game Birds

Wild Turkeys were reintroduced into southwestern Wisconsin in the mid-1980s. Since then Wild Turkey sightings have become more frequent and at present a population of 20-25 birds on the Refuge is estimated. Although few in number, the birds are often conspicuous providing visitors with many wildlife observation opportunities. Spring and fall turkey hunting seasons are offered in Wisconsin but the Refuge is closed to Wild Turkey hunting.

Ruffed Grouse are an uncommon resident of forest edges and shrub habitats on Trempealeau NWR.

Passerines (Songbirds)

The most recent bird list for Trempealeau NWR includes 266 recorded species of which 143 are passerines. This great diversity of species is a response to the variety of habitats on and near the Refuge. Riverine wetlands with a mix of emergent marshes, shrub swamps and bottomland forest combined with upland forest and "goat prairies" on the valley slopes attract many species during spring and fall migrations. The period from late April to mid-May in particular is a high point for visitors who come to Trempealeau NWR to watch the spring warbler migration. During the summer few warblers nest here, but many other passerines do. The woodlands

support a number of woodpecker species, Vireos, Black-capped Chickadees, White-breasted Nuthatches, House Wrens and other songbirds nesting there. The prairie is home to Eastern Meadowlarks, Grasshopper Sparrows, Dickcissels, Field Sparrows, and Orchard Orioles. In the wetlands there are Sedge Wrens, Red-winged Blackbirds, and Yellow-headed Blackbirds. Yellow-headed Blackbirds were observed frequently prior to the 1990s before the cattail beds were destroyed in Pool B. Very few were found on the Refuge until spring 2003 when they began nesting in cattails that became established after the Pool A drawdown in 2000.

A series of point count surveys were made on Trempealeau NWR from spring to fall in various habitats. A total of 76 species were recorded, of which 60 were passerines (Appendix C).

Mammals

A resident white-tail deer herd estimated at between 50 and 75 animals occurs on the Refuge and provides both wildlife viewing and hunting opportunity for the public. Since the early 1980s managed hunts including some "antlerless only" seasons have reduced the herd to a level which is currently at or below carrying capacity of Refuge habitats. Many people would like to see more deer on the Refuge, but higher deer numbers could cause negative impacts on hardwood forest reproduction through over-browsing.

Beaver and muskrats are the most conspicuous of the furbearers. Beaver lodges with food piles and cuttings, and the presence of the animals themselves, provide enjoyment for many visitors. When colonies are situated near roads, culverts, and dikes, however, they can cause serious problems. Selected harvest of problem beaver by permittee trapping has been conducted in the past and is recommended where necessary. Harvest of muskrats through permittee trapping is allowed with an annual harvest of 1,000 to 1,500 animals. Trapping of muskrats reduces the number of these animals, which burrow into dikes and cause structural damage. Beaver and muskrat trapping units are awarded through an auction held each year prior to the opening of the season.

The Refuge and surrounding area seems to support high numbers of raccoons, based on observations of tracks and other sign and numbers of roadkills. During Wood Duck trapping and banding operations in late summer, placement of corn for



Leopard frog. © Sandra Lines

bait at trap sites immediately attracts raccoons, which must be live-trapped and relocated or excluded from banding sites with electric fencing. The impacts of this high raccoon population on nesting waterfowl and other ground-nesting birds on the Refuge is unknown but may be significant. Trappers remove a small number (7-10) of raccoons during the fall season.

Coyote numbers have also increased throughout southwest Wisconsin. Sightings on Trempealeau NWR are now becoming more frequent. Other mammals known to occur include minks, otters, striped skunks, weasels, red and gray foxes, cottontail rabbits, gray and fox squirrels, and a variety of small mammals including ground squirrels, moles, pocket gophers, voles, mice, and shrews.

Reptiles and Amphibians

According to the Wisconsin Herpetological Society, 59 species of reptiles and amphibians are known to be indigenous to Wisconsin. Forty-nine of these species may occur on Trempealeau NWR – 15 have been recorded to date (Appendix C). Three species are of special significance and are listed in Wisconsin. The wood turtle and Blanding's turtle are both classified as threatened while the eastern Massasauga rattlesnake is listed as endangered by the State. The Blanding's turtle is frequently observed during the egg-laying season.

Frog and toad call surveys have been conducted on the Refuge since 1981 by staff and volunteers. Species recorded include the American toad, green frog, wood frog, leopard frog, chorus frog, spring

peeper, Eastern gray treefrog and Cope's gray treefrog. A reptile and amphibian list covering the Upper Mississippi River NW&FR includes 35 recorded species with 10 additional recorded from adjacent counties. Since the Upper Mississippi River NW&FR stretches north and south 261 miles downstream into northwest Illinois, the list includes a few species that would not be expected to occur at Trempealeau. The bullfrog, for example, has not been found north of LaCrosse, Wisconsin.

Invertebrates

A lack of benthic invertebrates in bottom sediments has been noted in Trempealeau NWR pools. Studies were conducted by USGS to determine if toxic sediment ammonia or fish predation was responsible for the scarcity of aquatic invertebrates (Richardson, pers. comm). Using comparisons within and outside of fish exclosures, it was concluded that fish predation probably limits invertebrate populations. This is not surprising in view of the large standing crop of black and brown bullheads in Refuge pools.

Invasive and Exotic Wildlife Species

European Starlings are uncommon on the Refuge during most seasons of the year. There is potential for their early nesting behavior to compete with Bluebirds, Tree Swallows, Wood Ducks, Kestrels, and probably many other species for nest cavities. Mute Swans are occasionally seen on the Refuge and vicinity. A native invasive species is the Brown-headed Cowbird, which is common and parasitizes nest of other songbirds.

Federally Endangered and Threatened Wildlife Species

The Bald Eagle was recently removed from the federal threatened and endangered species list. The eastern Massasauga rattlesnake is currently a candidate species being considered for federal listing. Formerly, this species was found at numerous sites in bottomland forests and emergent marsh habitats on the Upper Mississippi River NW&FR. It is now known to occur only on state and Refuge lands along the lower Chippewa River near Nelson, Wisconsin and at a site in the Van Loon Bottoms in Pool 7. There are no recent records of the eastern Massasauga rattlesnake on Trempealeau NWR, however, former owners of the Delta FFF reported having killed several Massasaugas prior to 1975 while cutting hay on fields adjacent to what is now Delta

Road. Karner Blue butterflies have not been seen on the Refuge but suitable habitat may exist.

Three Bald Eagle nesting territories were active in the spring of 2006 on Trempealeau NWR. Bald Eagles pass through during migration often in large numbers particularly during ice break-up in the spring. Peak numbers of more than 100 birds are common during the month of March when ice-out exposes an abundance of carcasses from the most recent winter fish kill.

State Listed Species

Table 1 lists vertebrate species receiving special designation as Endangered, Threatened, or Special Concern Species pursuant to the Wisconsin Endangered Species Act.

Special Uses

Scientific Research

A number of research projects have been conducted on the Refuge since 1995. Most of these are studies designed to better understand ecological processes occurring on the Refuge and to assist in developing effective management strategies. A few have been carried out by local universities to address research interests not directly related to Refuge management questions.

Research has included Black Tern nesting, frog deformities, White Pelicans, Cormorants, Tundra Swans, and aquatic ecology in Refuge pools.

Utilities

Several electric transmission lines border and cross the Refuge. These structures and the wires stretching between them cause an undetermined number of bird strikes and they impact aesthetics by disrupting views of the natural landscape. On the other hand, of four known Osprey nests in the area, all were built on powerline structures. Eagles and other raptors are often observed using these structures for perches. Utility companies have easements from the Refuge for right-of-way maintenance and structure repair; however, all entry and work is done via Special Use Permit with Special Conditions regarding mode of access, herbicide use, etc.

Table 1: Species With Special State Designation, Trempealeau NWR

Species	Status
Plants	
Brittle Prickly Pear Cactus	State Threatened
Butterflies	
Karner Blue Butterfly	Endangered
Fritillary Butterfly	Endangered
Birds	
American Bittern	Special Concern
Least Bittern*	Special Concern
Trumpeter Swan	State Endangered
American Black Duck	Special Concern
Peregrine Falcon	State Endangered
Red-shouldered Hawk*	State Threatened
Osprey*	State Threatened
Northern Harrier	Special Concern
Great Egret	State Threatened
Great Blue Heron	Special Concern
Black-crowned Night Heron	Special Concern
American White Pelican	Special Concern
Caspian Tern	State Endangered
Forster's Tern	State Endangered
Black Tern*	Special Concern
Red-headed Woodpecker*	Special Concern
Prothonotary Warbler*	Special Concern
Grasshopper Sparrow*	Special Concern
Lark Sparrow*	Special Concern
Dicksissel*	Special Concern
Orchard Oriole*	Special Concern
Reptiles	
Blanding's Turtle	State Threatened
Wood Turtle	State Threatened
*Breeding on Trempealeau NWR	

Public Access, Education and Recreational Opportunities

This section describes existing public access, educational and recreational opportunities on Trempealeau NWR. Recreational features and access points on the Refuge are shown in Figure 8.

Public Access

Trempealeau NWR is open to the public during daylight hours throughout the year. The main Refuge entrance, which also serves as part of the Great River State Trail, is a low-lying gravel road in the backwaters of the Trempealeau River. Approximately 1,800 feet of this road is subject to frequent flooding and lies below the elevation of the entrance road bridge that was replaced in 1994. The entrance road and parts of the auto tour route are closed for about 4 or 5 weeks each year due to high water. Typically this occurs in the spring and summer months when visitation is greatest due to opportunities to observe migrating birds in the spring and warmer temperatures in the summer.

The existing entrance road north of the Trempealeau River bridge is owned by the Township of Trempealeau but maintained by the Refuge under a Cooperative Agreement. There are no entrance fees charged at Trempealeau NWR at this time.

Alternate access to the Refuge during flooding is available via the Marshland entrance; however, Wisconsin Department of Transportation has requested that this alternate entrance not be promoted due to its location on a curve of State Highway 35 and close proximity to a signed railroad crossing (Figure 8).

A third Refuge access point is from Highway 35 via a parking area at the north end of River Bottoms Road (Figure 8). From this parking area visitors can hike or bike to areas of the Refuge west of the Canadian National Railroad dike.

The old railroad right-of-way on the north side of the Refuge is bordered by private property on the north and south sides. These properties are currently owned by the same owner. The Refuge constructed two crossings to allow the private landowner to move cattle and farm machinery back and forth. This special use permit will continue to be renewed as long as there are no violations of the permit conditions



River Education Days at Trempealeau NWR. USFWS

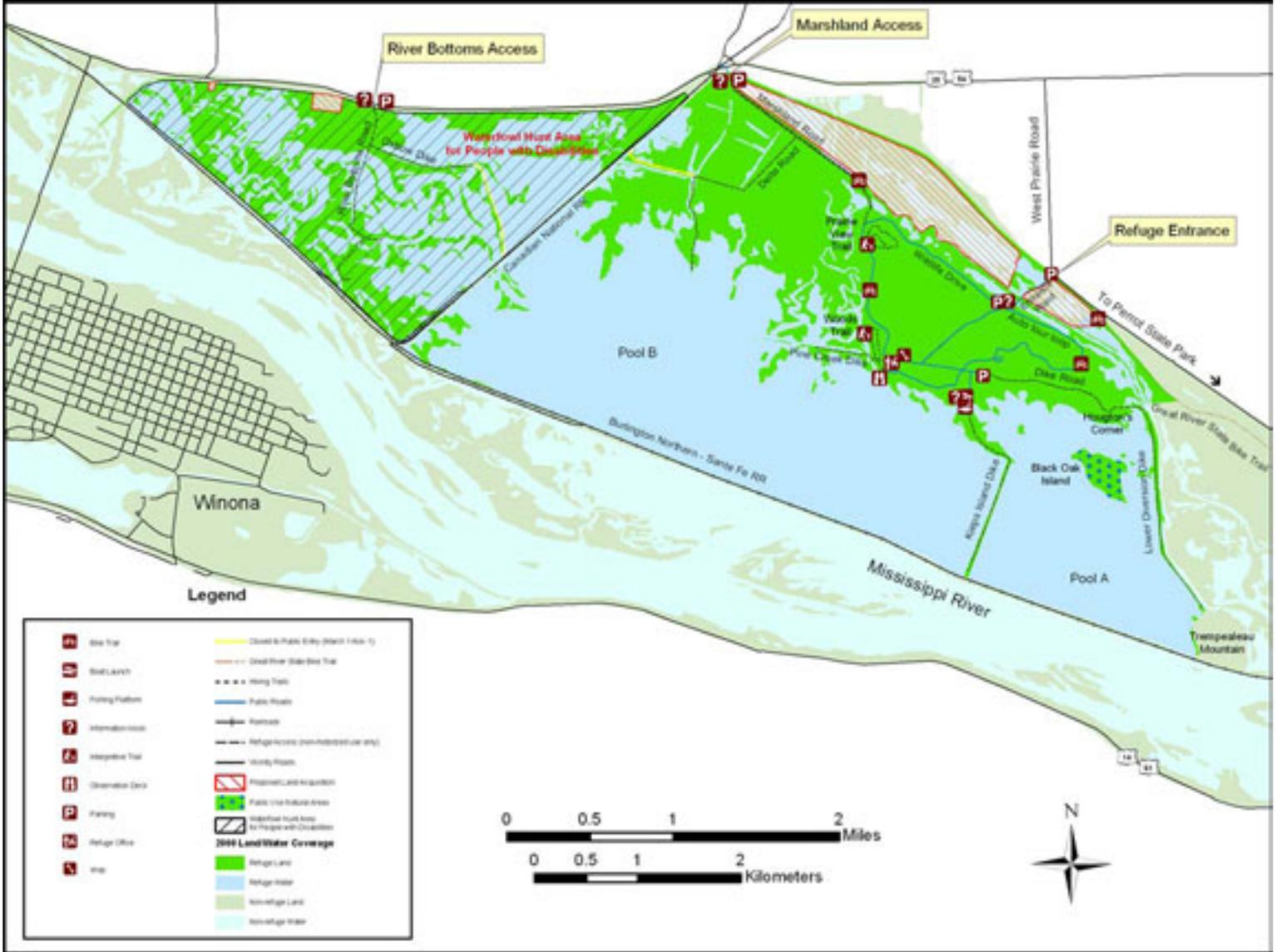
Recreation

Wildlife Dependent Recreation

Between 60,000 and 70,000 people visit Trempealeau NWR annually to participate in the variety of wildlife-dependent recreational and educational opportunities offered. These include wildlife observation and photography, interpretation, environmental education, fishing, and hunting. These activities are supported by a number of facilities including a 5-mile, self-guided auto tour route which is also open to bicycles, a visitor contact area in the Refuge office, a boat access for hand-powered and electric-motor equipped boats, a bank fishing structure, an observation platform for wildlife viewing, two interpretive trails, and several miles of dikes and roads closed to motor vehicles but open to hiking and biking.

Wildlife Observation and Photography. Wildlife viewing at Trempealeau NWR is best in spring and fall as migrating birds pass through. The observation platform near Refuge headquarters provides an expansive view of the main pool area where Bald Eagles, Tundra Swans, geese, and ducks can be seen from mid-March well into April. A walk on one of

Figure 8: Current Public Use, Trempealeau NWR



many miles of trails, roads, and dikes open to hiking in late April or early May can be rewarding for visitors wanting to view migrating warblers, vireos, and other songbirds that may only be seen at Trempealeau NWR for a few weeks each year. Driving the 5-mile auto tour route or biking that portion of the Great River State Trail passing through the Refuge affords visitors an opportunity to see Wild Turkeys, deer, and an abundance of wild flowers blooming on sand prairies.

During years when Pool A is drawn down, an abundance of exposed mudflats attract a variety of shorebirds not normally seen. Excellent viewing opportunities of this pool are available to visitors that hike on the Kieps Island or Lower Diversion dikes (Figure 6 on page 24).

Beginning in late summer (August), a ripening crop of wild rice on the western portion of Trempealeau NWR offers visitors some unique wildlife observation opportunities. The wild rice crop attracts large numbers of Mallards, Wood Ducks and teal and other birds, especially Soras and Virginia Rails. Opportunities for photography from either River Bottoms Road or Oxbow dike are usually very good. Both these areas are accessible via a short hike from River Bottoms Road parking area just off Highway 35 (Figure 6).

For visitors who want a closer view of birds on the marsh, a boat landing at Kieps Island provides visitor access via canoes, kayaks or boats with electric motors.

Two interpretive trails are available on the Refuge. The 1-mile Woods Trail winds through upland forest beginning at an observation deck parking lot across from Refuge Headquarters. The Prairie View Trail is one-half mile in length, surfaced with screened gravel and is accessible to persons with disabilities. This looped trail begins at a parking area just off the wildlife drive (Figure 6 on page 24) and affords excellent views of rolling sand prairie habitat and close-ups of native grasses and wild flowers in season.

Interpretation. Refuge Headquarters constructed in 1998 includes a small visitor contact area with public restrooms. A 4-by-8-foot table top topographic model of the Refuge is popular with visitors providing both orientation as well as demonstrating how Trempealeau NWR fits into the surrounding landscape. The office is staffed from 7:30 a.m. through 4:00 p.m. weekdays and some Saturdays.

Refuge brochures, maps, bird lists, etc., are available to visitors.

About 25 qualified Refuge volunteers assist visitors on the observation platform on weekends from May to October. They help answer questions and assist with wildlife identification. In recent years more than 1,400 visitors were contacted annually.

A 5-mile self-guided wildlife drive winds through the upland portion of Trempealeau NWR. A leaflet provides explanation for visitors regarding management programs and habitats and wildlife featured at several numbered stops along the drive. Prairie management, prescribed fire, invasive species, and unique wildlife species are high-lighted. The wildlife drive is also included as a portion of the Great River State Trail, which is open to bicycles through the Refuge. Approximately 18,000 bikers have used this trail annually since it was opened in 1990. The Woods Trail and Prairie View Trails have interpretive signs along the route.

Refuge staff conduct several interpretive programs annually both on and off Refuge. Opportunities for these activities are currently somewhat limited by staff and group facility availability.

Fishing. Because rough fish (carp and buffalo) and bullheads dominate the fish population in Refuge pools, the demand for angling on Trempealeau NWR is relatively low. Most anglers fish for bullheads from shore. Bullheads are quite plentiful and easy to catch but not large in size. Refuge pools are open to boat fishing (electric motors only) via the ramp at Kieps Island boat landing. A bank fishing structure on Kieps Island dike is used regularly by anglers. A limited number of canoeists and kayakers use the Refuge, mostly on weekends.



Songbird banding for a Girl Scout program at Trempealeau NWR. USFWS

Hunting. Trempealeau NWR is not open to public hunting for waterfowl. However, for the past 14 years a special hunt for sportspersons with disabilities has been held on a portion of Refuge lands west of the Canadian National Railroad (CNRR) dike. From 1988 to 2001 the hunt was conducted on one weekend only in an area between the CNRR and River Bottoms Road. The waterfowl hunt was expanded to include new acquisition of 500 acres west of River Bottoms Road (Figure 6 on page 24). After 2001, hunting was permitted from two blinds for two additional weekends. In 2003, 20 hunters with disabilities participated in the hunt along with 25 volunteer helpers. The hunting program is coordinated, managed, and financed by volunteers, particularly members of Wisconsin Waterfowl Association and Wisconsin DNR, with Refuge staff providing equipment and administrative and logistical support. During the two-day weekend hunt in October 2003, a total of six geese and 103 ducks were harvested.

The Refuge is open to the public by special use permit for firearms (rifles prohibited) deer hunting during the regular nine-day Wisconsin season which begins the Saturday before Thanksgiving. In recent years, 35 to 60 individuals were selected by random drawing for the either-sex hunt. Archery deer hunting is permitted in the Refuge during the late archery season. An unlimited number of permits is issued to archery hunters. All hunting permits cost \$10.00.

The number of deer harvested from the Refuge from all hunts in recent years has averaged about 20.

Non-Wildlife Dependent Recreation

People look for (hunt) and pick morel mushrooms in late April and early to mid-May. Morel crops are sporadic depending on spring rainfall and soil temperature. Red and black raspberries, locally called “black caps” are sought by wildlife and a small number of visitors. Mushroom and berry picking for personal use is allowed without a permit.

Bicyclists riding that portion of the Great River State Trail passing through Trempealeau NWR probably consist of two kinds of users: those who come because of the opportunity to see wildlife; and those who are riding strictly for the exercise or for general enjoyment of the outdoors. At present the Great River State Trail ends at Trempealeau NWR, so the Refuge is, to a degree, an end point or destination. Therefore, at present the assumption is that



Bicycling on the Great River State Trail generates more than one-fourth of all public visits to the Refuge. USFWS

bicyclists come to the Refuge to see wildlife and they are counted as wildlife observation the same as people driving the 5-mile auto tour route in their motor vehicle. In the future, however, the proposed bike trail extension from Marshland, Wisconsin, into Winona, Minnesota, could result in the Refuge becoming more of a rest stop or wayside for bicyclists passing through. This could change the way this activity is viewed in terms of wildlife-dependent versus non-wildlife-dependent recreation. For the present, we recognize that some level of non-wildlife-dependent bicycling occurs on Trempealeau NWR.

Environmental Education

Programs for school groups, scouts and other organized groups are conducted by Refuge staff both on and off Trempealeau NWR. In recent years between 800 and 1,200 students/scouts have participated in Refuge-led environmental education programs. Regularly scheduled events include a spring birding festival and a Refuge Week activity in the fall. There appears to be plenty of demand for further use of Trempealeau NWR as an outdoor classroom.

Resource Protection

During certain times of the year, some areas are closed to limit disturbance to wildlife. Access beyond the water control structures at Oxbow and Delta Dikes is prohibited March through mid-November to prevent disturbance to all wildlife in those areas. Access around eagle nests is posted as closed to prevent disturbance to eagles during the breeding season.

Those persons participating in hunting or fishing are expected to comply with Refuge and state regulations. Several general regulations are in place to reduce disturbance to wildlife while visitors participate in public use programs. These include:

- All pets must be confined by a leash 6 feet or shorter.
- The Refuge is closed during night time hours (dusk to dawn) to reduce disturbance to wildlife.
- Bicycles are restricted to service roads to prevent habitat damage including erosion caused by off trail riding.

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. 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 undertakings, for issuing archeological permits, and for Indian tribal involvement. The Regional Historic Preservation Officer advises the Regional Director about procedures, compliance, and implementation of the several cultural resources laws. The Refuge Manager protects archeological sites and historic properties on Service managed and administered lands, by monitoring archeological investigations by contractors and permittees, and by reporting violations.

The following information was taken from a report by Michael M. Gregory et al. entitled "A Cultural History Summary and Cultural Resources Management Planning Resource for the Upper Mississippi River National Wildlife and Fish Refuge and the Trempealeau National Wildlife Refuge." (Great Lakes Archaeological Research Ctr. 2003)

Native American Cultural History and Landscape

Prehistoric

The combined cultural history sequence for the Upper Mississippi River NW&FR and Trempealeau NWR reflects a continuous human occupation that

began 12,000 or more years ago. The earliest evidence of human use of the area surrounding Trempealeau NWR dates to the **Paleoindian** period from 12000 Before Present (B.P) to 7500 B.P. Paleoindians are characterized as nomadic hunters and gatherers whose subsistence base depended heavily upon the exploitation of Pleistocene mammals, for example, mammoth, mastodon, bison, and caribou. Much of what is known about this period is derived especially from kill sites excavated in other parts of the region. Site 47-TR-85 on the Refuge contains a Paleoindian component as do three sites in the vicinity of the Refuge. Undisturbed sites from this culture are very rare and thus very important to archaeologists.

The **Archaic** period followed the Paleoindian from about 9000 B.P to 3000 B.P and is marked by a subsistence strategy that incorporated smaller game and a broader range of plant species. This subsistence base was linked to climatic conditions, which became more moderate as the glaciers retreated. Two sites on the Refuge have components from late in the Archaic period, although none with human remains.

Adaptations that characterized Archaic traditions carried into **Woodland** traditions (3000 to 700 B.P). Well defined traits marking the tradition are the presence of ceramics, the construction of earthen mounds for burials, and the cultivation of plants. However, hunting and gathering continued to dominate the subsistence strategy. Ten sites on the Refuge are from the Woodland culture. The Refuge may contain a mound group near the Trempealeau River. Human remains have been excavated from non-mound sites.

Middle Mississippian (1000 to 500 B.P) cultures occupied the fertile alluvial land of the Mississippi River and its tributaries. Together, the arrival of corn and interaction with Middle Mississippian cultures eventually led to the disappearance of the Woodland peoples and gave rise to a group known as the Oneota. Oneota sites of the Upper Mississippi traditions are distributed throughout the Upper Midwest and were occupied by farmers pursuing a subsistence economy based on cultivating corn, supplemented by fishing and hunting. The present day Winnebago, including the HoChunk, are believed to be descendants of the Oneota. Two sites on the Refuge contain evidence from the late prehistoric Oneota culture.

Historic Native American Groups

The Upper Mississippi River Valley Region associated with the “UMRNWFR” and Trempealeau NWR has been utilized or inhabited primarily by twelve historical Native American groups. They are the Ioway, Winnebago, Ottawa, Huron, Miami, Eastern Dakota, Menominee, Mascouten, Kickapoo, Sauk, Meshwaki, and Potowatomi. Several of these groups trace their origin to the region, while others immigrated into it as a result of political and economic events linked to interactions with French, British, and American interests. Constant warring and displacement of groups continued into the mid-nineteenth century. Indian tribes listed in Chapter 6 have a potential concern for traditional cultural resources, sacred sites and cultural hunting and gathering areas in the counties in which the Refuge is located. The tribal concern was identified by federal government recognition, self identification, or presumption from the historical record.

Archaeological Resources

A number of recorded archaeological sites are located on Trempealeau NWR. More sites probably exist. During an archaeological survey in September 1990, Robert Boszhardt from Mississippi Valley Archaeology Center (MVAC) collected a number of diagnostic ceramic sherds from the Early, Middle, and late Woodland traditions that span a time range of circa 250 B.C. - A.D. 1200. During this survey, he noted that severe bank erosion was threatening cultural resources. Since then, extensive bank stabilization work with rock has been conducted to protect cultural resources at those sites.

Illegal collecting of artifacts along eroded shorelines has occurred in the past and law enforcement patrolling emphasis has been increased in response to the problem. In January 1984, an anonymous “collector” reported a human skull protruding from an exposed bank. A team of archaeologists from MVAC excavated the remains which proved to be an adult male Native American about 30 years of age at death. The remains were estimated to be between 50 and 1,000 years old.

An upland location includes a grave marker or headstone dated 1895. The marker has the inscription “Jim Yellowbank” with the accompanying date. A core sample did not reveal evidence of a human burial associated with this marker. However, further excavation is needed to determine if indeed a burial is associated with the site.

Since the Refuge was established, 18 cultural resources studies, reports, or collections have surveyed 82 acres of the Refuge, identified 48 sites, and produced 6,906 artifacts. Most of these artifacts are stored and curated at the Mississippi Valley Archaeology Center under terms of a cooperative agreement. The Federal Government owns the artifacts, and the Regional Historic Preservation Officer may recall them for exhibits or other Refuge purposes. The prehistoric artifacts are currently not associated with any modern tribe. The artifacts include human remains but no funerary objects, sacred objects or objects of cultural patrimony as defined in the Native American Graves Protection and Repatriation Act. The U.S. Army Corps of Engineers, Saint Paul District, is thought to have the 724 artifacts from the 1991 O’Mack collection. Private collectors have additional artifacts from the Refuge. The Refuge manages museum property under terms of the Region-wide scope of collections statement dated October 31, 1994. The Refuge has no on-site museum property such as archeological collections, artwork, historical documents, or natural history collections.

Euro-American Cultural History

The Fur Trade. The French first established the fur trade in the Upper Mississippi River Valley and maintained it from about 1610 through the early 1760s, when control passed to the British, who dominated it until the War of 1812, after which Americans controlled the regional trade until it collapsed in the late 1840s and early 1850s. The Trempealeau area developed into a strategic fur trading location. However, the exact location of forts, posts, homes, and settlements is not well known as little archaeological research has been directed there.

Transportation and Settlement. Between 1830 and 1890 the adjacent Mississippi River served as a transportation route for moving huge rafts of logs from the pineries of northern Wisconsin and Minnesota to St. Louis for distribution. Steamboats were the chief means of transporting goods up and down river until the advent of the railroads during the late 19th century. The grade that is now the Burlington Northern Santa Fe Railroad was constructed in 1895 and formed the beginnings of isolation of wetlands within what would become the Delta FFF and later Trempealeau NWR.

The upland portion of Trempealeau NWR was settled sometime after the General Land Office surveys were completed in the late 1840s. An 1896 Plat

Book for Trempealeau County shows that S.A. Hamilton owned much of the bottomland portion of what is now Refuge. By 1910, H.E. Clark, a surveyor for one of the railroads purchased most of the land from Hamilton and established the Trempealeau Drainage District.

On April 11, 1911, rerouting of the Trempealeau River began. Both the Trempealeau River and Pine Creek were rerouted near Marshland and channeled to flow along the east boundary of present Refuge lands. A huge levee was constructed to retain the waters of the rerouted Trempealeau River. The rerouting, culverts, ditches, and additional dikes were built by the newly formed LaCrosse Dredging Company.

In 1915, two large pumps were installed at the lower end of the levee, just north of Trempealeau Mountain, to pump during periods of high water and dike seepage. This attempt to convert the bottomlands into farmland failed and the area later became the Delta Fish and Fur Farm. Michael Lipinski and later his son Richard managed the Delta FFF from the 1930s until the property was sold to Dairyland Power Cooperative in 1975. A number of dwellings and farm buildings remained on the property when the Service acquired the Delta FFF in 1979. These buildings were sold, materials salvaged and the remainder buried on-site. Prior to Refuge establishment, 707 acres of land were purchased from H.E. Clark by the U.S. Biological Survey with the intention of acquiring the surrounding wetlands of the Delta FFF. Administrative buildings consisting of a residence, pump house, service building/office and a small barn were constructed. A large lodge/laboratory was constructed on the site of the H.E. Clark home, which formerly stood near the existing observation platform. Policy changes caused this building to be unused and it was later used by the Girl Scouts as a campsite and meeting place. Both the lodge and former residence were demolished in the early 1980s.

In 1935 a Civilian Conservation Corps (CCC) Camp was maintained on the Refuge for several months. Remnants from structures associated with the camp still remain. The CCC aided in construction of roads, trails, bridges, and fences and planted trees, shrubs, and food plots. During the late 1930s, Works Progress Administration (WPA) workers did further improvements including construction of several miles of split-rail fence using salvaged timber.

As of December 2006, the National Register of Historic Places does not include any properties in

the immediate vicinity of the Refuge. On the Refuge, the National Park Service has determined that site 47-TR-86 is eligible for the National Register. The State Historic Preservation Officer (SHPO) considers all the sites on Kieps Island as eligible. For the rest of the Refuge, the SHPO has determined 4 sites are eligible and 9 are not eligible. The SHPO considers any remaining sites as eligible until determined otherwise.

Existing Facilities and Infrastructure

Major facilities on the Refuge are shown in Figure 9 and described below.

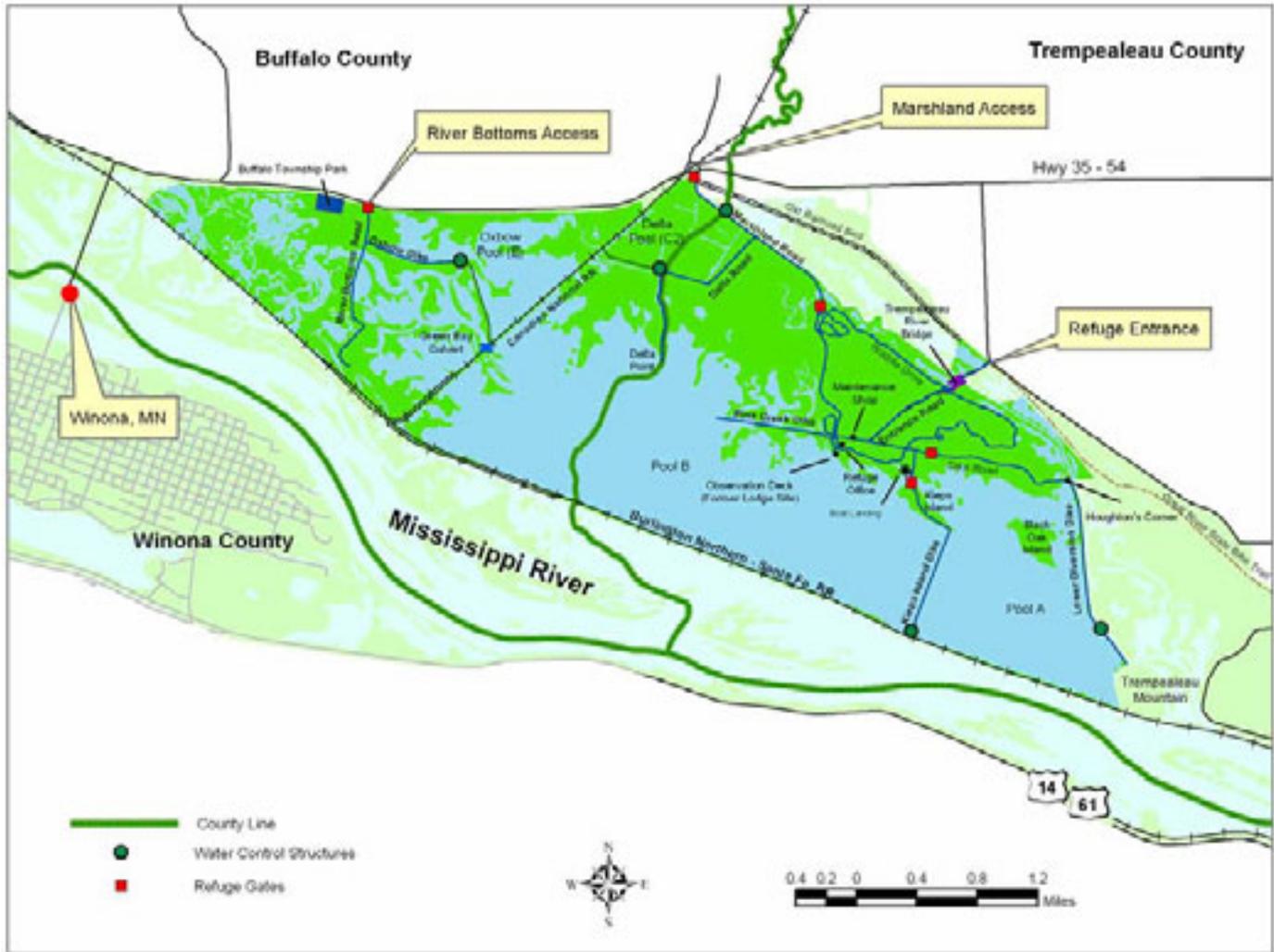
Buildings. The existing Refuge office building was constructed in 1998 on a site above the 100-year flood elevation. It includes a visitor contact and display area, offices for five Refuge staff, a conference room and restrooms. The former headquarters building is now used as a shop and office for maintenance staff. A 60-foot by 100-foot pole building and three-stall garage on the site are used for vehicle and equipment storage.

Bridges. A concrete bridge spanning the Trempealeau River on the entrance road was constructed in 1994, replacing an iron structure that had a restricted load capacity. (Figure 9).

Dikes. About 2.5 miles of barrier dikes separate Refuge pools from the man-made channel of the Trempealeau River. Lower Diversion Dike is about 1.5 miles long and ties into Trempealeau Mountain on its lower end (Figure 9). Marshland Dike spans about 1 mile from the wildlife drive to the Marshland access. Both dikes were originally constructed in 1911. They have been repaired and added to over the years but received major reconstruction in 1995 when they were raised and widened considerably. Interior dikes include the Kieps Island dike (0.75 mile), Oxbow dike (1 mile), and the C2 dike (1.25 miles). About 7 miles of the BNSFRR dike borders Trempealeau NWR on the south and separates Refuge pools from the Mississippi River. The 2.5-mile long CNRR dike crosses the Refuge. A large box culvert under this dike allows water levels to equalize on the upstream and downstream sides (Figure 6 on page 24).

Water Control Structures (WCSs). There are five water control structures on the Refuge. These include the lower diversion structure, Pool A pump station, C2 pool WCS and portable pump station, C2

Figure 9: Facilities and Structures, Trempealeau NWR





*Bush chipping and clearing dikes at Trempealeau NWR.
USFWS*

pool inlet structure, and the E Pool WCS and portable pump station (Figure 6 on page 24).

The lower diversion structure is a four-bay structure with steel lift gates. Constructed in 1984, this structure has no pumping capability and is used primarily to discharge water from Pool A by gravity flows when Trempealeau River levels permit. The structure is equipped with an electric weir to prevent entry of rough fish from the Trempealeau River when the gates are open.

The Pool A pump station is located in the south end of Kieps Island dike. It is equipped with two permanent pumps with a combined capacity of 22,000 gallons per minute. An outlet pipe under the BNSFRR dike allows discharge of water by pumping into the Mississippi River. The pump station has the capability of removing water from Pool A or Pool B. There is also an attached water control structure that allows gravity flow of water between Pools A and B when the pumps are not being used (Figure 6 on page 24).

Both the C2 and E WCSs may be used to manage water by gravity flow or portable electric pumps with a combined pumping capacity of 9,000 gallons per minute. Pumps are stored at the Refuge shop and installed in the structures only when needed.

The C2 inlet structure is located in the Marshland Dike and is used in the early spring to divert water from the Trempealeau River and Pine Creek into C2 pool.

Roads. There are nearly 14 miles of roads on Trempealeau NWR. Of these, only the 1-mile entrance road is black-topped. All other roads are surfaced with gravel. Of the 14 miles of roads, about 7 miles are open to private vehicles. This includes the entrance road and the 4.5-mile wildlife drive. All surfaced roads are open to the public for hiking and bicycling. The 0.25-mile gravel access road between

West Prairie Road and the concrete bridge over the Trempealeau River is owned by the Township of Trempealeau but maintained by the Refuge under a Cooperative Agreement.

Socioeconomics

This section provides an overview of the local demographic, land use and economic setting in the vicinity of Trempealeau NWR and its watershed, with emphasis on issues specific to the CCP. It is estimated that the majority of annual recreational visitors (approximately 85 percent) to the Refuge reside within a 30-mile radius. Thus, the “local area” described here includes the lower Trempealeau River watershed and an area bounded on the north by Arcadia and Alma, Wisconsin; on the west by Winona, Minnesota; and on the south by La Crosse, Wisconsin. (Figure 1 on page 2). Socioeconomic data for both Trempealeau and Buffalo Counties are included in this section.

Socioeconomic Setting

Trempealeau NWR is located in southwest Wisconsin with about one-third of the Refuge (2,100 acres) in Buffalo County and two-thirds (4,100 acres) in Trempealeau County. The largest population center nearby with more than one million people is the Minneapolis-St. Paul metropolitan area located a distance of about 125 miles to the northwest. Smaller cities within the local area include La Crosse, Wisconsin and Winona, Minnesota, with populations of 51,800 and 27,100 respectively.

Light industry and government provide the greatest share of employment in the vicinity of the Refuge. Major private sector employers include Fastenal Corporation and Peerless Chain in Winona; Ashley Furniture in Arcadia with 2,800 employees; and Trane Company, City Brewing, and St. Francis and Gundersen-Lutheran Medical Centers in La Crosse. Collectively, government offices including federal, state, County, and City jurisdictions within the Refuge’s local area employ a significant number of people.

Four universities are located within the local area of the Refuge. These include Winona State and St. Mary’s University in Winona and Viterbo University and the University of Wisconsin-La Crosse in La Crosse. The influx of several thousand university students for 9 months each year has a significant positive impact on local economies.

Population and Demographics

From 1980 to 2001 the human population in the State of Wisconsin went from 4.7 to 5.4 million, an increase of almost 15 percent (Henderson, 2004). During this period, Trempealeau County showed a 3.3 percent increase and Buffalo County a 3.7 percent decrease (Henderson, 2004). However, major population growth is occurring nearby, notably in areas between the Refuge and La Crosse. Large tracts of land are being developed for residential subdivisions in formerly rural townships in northwestern La Crosse County.

Trempealeau County

Trempealeau County is about 734 square miles in size with the community of Whitehall as county seat. County population trends have changed during the past 20 years. From 1980 to 1990 the population went from 26,214 to 25,317, a decrease of 3.5 percent (Henderson, 2004). From 1990 to 2000, however, a 6.9 percent increase from 25,317 to 27,010 occurred. This trend was more apparent for the Township of Trempealeau which includes all of the Refuge lands in the southern portion of Trempealeau County. From 1990 to 2000 the population of Trempealeau Township increased by 20.6 percent from 1,341 to 1,618 (Town of Trempealeau, 2002). Projections for the year 2010 are for the township population to increase by an additional 13 percent. The job center of the La Crosse area has shifted and expanded northward towards Trempealeau County. U.S. Highway 53 was recently reconstructed to a four lane, 65 mph highway which leads directly from the expanding job center of La Crosse and Onalaska to the Town of Trempealeau via State Highway 35 (Town of Trempealeau, 2002).

In 2000, county population was 98.8 percent Caucasian compared to 88.9 percent for the state as a whole and 75.1 percent for the U.S.A. Persons of Hispanic or Latino origin constitute the largest non-white population group at 0.9 percent.

Buffalo County

Buffalo County is about 685 square miles in size with the county seat located at Alma, Wisconsin. Population trends have shown a similar pattern to Trempealeau County with a 5.7 percent decrease from 14,337 to 13,558 from 1980 to 1990, and a 1.9 percent increase from 13,558 to 13,819 from 1990 to 2000. Again, recent growth in Buffalo County is well below the state and national levels.

All Refuge lands within Buffalo County are included within Buffalo Township which is located at

the southern tip of Buffalo County. Since 1980 the township population has declined steadily from 821 to 667 people, a decrease of 18.8 percent (Buffalo County Outdoor Recreation Plan, 2002). Projections through 2010 show a continued decline in population.

Employment and Income

Trempealeau County

In 1980, over four-fifths of Trempealeau County's employment was concentrated in five sectors: farming (22 percent), retail trade (16 percent), services (16 percent), manufacturing (15 percent), and government (14 percent). In 2001, employment in manufacturing increased to 32 percent, while services (20 percent) and government (13 percent) remained strong. However, farming experienced a noticeable decline, where employment represented only 13 percent of total employment in Trempealeau County. Between 1980 and 2001, dramatic employment decreases were exhibited in farming, retail trade, and finance, insurance, and real estate.

Employment in Trempealeau County between 1980 and 2001 increased by 22 percent, which is comparable to the employment growth in Wisconsin



Wild bergamot. USFWS

(29 percent). While the Trempealeau County population has grown only by 3.2 percent over the last 20 years, the rise in employment has outpaced population growth.

Total employment earnings from the major business sectors in Trempealeau County increased about 30 percent from \$292 million in 1980 to \$417 million in 2001 (Henderson, 2004). During that 21-year period, per capita income increased from \$18,085 to \$24,010, an increase of 24.7 percent based on 2003 dollars. This is close to the 25.2 percent increase in per capita income for the State of Wisconsin as a whole.

Buffalo County

Buffalo County's employment growth between 1980 and 2001 has far outpaced its population growth. Employment remained relatively constant between 1980 and 1990, and then increased over the following 10 years.

In 1980, nearly one-third of employment was represented by the farming sector. Other predominant employment sectors included services (14.2 percent), government (14.1 percent), and retail trade (13.5 percent). Between 1980 and 2001, the composition of employment has moved away from the farming sector (28.2 percent decrease) and retail trade sector (20.1 percent decrease). While the farming sector still comprised 16.6 percent of employment in 2001, the services sector accounted for 24.3 percent.

Buffalo County earnings from the major business sector increased 32.1 percent from \$160 million in 1980 to \$233 million in 2001. During this same period, per capita personal income (adjusted for 2003 dollars) went from \$19,452 to \$27,385, an increase of 29 percent. This was slightly more than the 25.2 percent increase for Wisconsin as a whole during this period (Henderson, 2004).

Transportation Patterns

The Refuge Office is 2 miles from State Highway 35-54. This two-lane highway provides the main route of travel in Wisconsin between Winona and La Crosse. It is 10 miles from the City of Winona to the office via Highway 35-54 and the Minnesota-Wisconsin bridge. La Crosse is about 25 miles away. A new, expanded section of Highway 53 now provides a double-lane connection between Highway 35 near Holmen, Wisconsin and Interstate 90 at La Crosse.

State Highway 35-54 borders the north boundary of Trempealeau NWR in Buffalo County between Marshland and the turn-off to the interstate bridge

at Winona. Traffic on this road can be heavy with an average daily traffic of 3,000 vehicles per day at Marshland, Wisconsin (Buffalo County Outdoor Recreation Plan, 2002). This highway provides many thousands of travelers and commuters an opportunity to enjoy scenic views of the Trempealeau NWR.

Land Use

This section presents an overview of land uses within the local area of Trempealeau NWR. Because the Refuge covers portions of both Trempealeau and Buffalo Counties, the land use practices and regulations of both are included. This section also emphasizes the lands comprising the Black Oak Island Public Use Natural Area and portions of the Great River State Trail.

General Land Use and Management

Historically, the area surrounding Trempealeau NWR supported a variety of land uses (see Section on page 37 and Section on page 40). These included subsistence hunting and gathering, fur trapping, logging, commercial fishing and clamming and agriculture. Today, low-density residential and agriculture constitute the principal land uses within the local area of the Refuge. Within the Trempealeau NWR, visitors can enjoy open space while viewing wildlife and habitats that are becoming rare elsewhere in the vicinity.

A number of observed changes in the land use patterns have occurred in the local area since the Refuge Master Plan was completed in 1983 (USFWS 1983). Some may indirectly affect Refuge habitats and/or programs while others may potentially affect wildlife habitat, water quality or viewshades in the local area.

Bluffland development. New homes are continually being built on the wooded valley bluffs. Viewshades in some areas are changing from a more pristine natural landscape to a more structured, suburban look.

Increased land prices. Land prices are being driven higher by an increased demand for rural housing and hunting land. Leasing of farms or woodlots for hunting and higher timber prices have resulted in woodland and property values exceeding that of cropland in many areas. Landowners often split off and sell the woodland portion of their farm for hunting land while continuing to farm the remaining cropland.

Increase in non-resident land ownership. Non-local and non-residents are purchasing land in Buffalo and Trempealeau Counties for hunting land and cabin sites.

Decline in dairy operations. The number of farms milking cows in Buffalo and Trempealeau Counties has declined significantly in recent years. From 1987 to 1997, the number of dairy herds in Trempealeau County decreased by 40.8 percent (Town of Trempealeau, 2002).

Conservation Reserve Program (CRP). Retiring cropland and planting of permanent grass/forb cover or trees has created blocks of valuable wildlife habitat on private lands in the Refuge vicinity.

Trempealeau County

Trempealeau County is primarily a rural county with about 25 percent of the land in forests and scattered woodlots. The remainder of the landscape is farmland with scattered towns and a few housing developments. In December 2000, the Town of Trempealeau adopted a revised Trempealeau County Zoning Ordinance. This document implemented the Town of Trempealeau Land Use Plan (Trempealeau County 2002). The objectives of the land use plan were to develop zoning and land use categories, including a land use map, determine a minimum lot size for the township, preserve farmland, and develop policies to guide future development. Land use and agricultural preservation policies developed for the township included the following:

1. Promote forest management through the County Forester's office.
2. Create and maintain tourism opportunities.
3. Do not offer incentives for development.
4. Develop criteria that the Town of Trempealeau and the County Zoning Committee can utilize when analyzing a property owner's land use change request (Town of Trempealeau, 2002).

Buffalo County

Buffalo County is located on the western border of Wisconsin and is characterized by a topography consisting of broad rolling uplands and deep valleys. About 43 percent of the County is covered by forest land with 37 percent devoted to harvestable agricultural crops and 14 percent in pasture or idle cropland. The remaining 6 percent is in rural home sites, roads, farm sites, towns, and cities. Although Buffalo County is a typical Wisconsin dairy county, the

number of milking herds is declining. Still farming continues to employ the largest number of people, with nearly 20 percent of the work force engaged directly in farming. It is not surprising that in a county with 43 percent of the area forested, timber harvest and lumber processing are important activities on the land (Mississippi River Regional Planning Commission, 2002).

Special Status Lands

The Service manages one Public Use Natural Area and a portion of a State Recreation Trail on the Refuge. These areas are shown on Figure 8 on page 38 and are described below.

Black Oak Island Natural Area

This 46-acre island complex is located in Pool A within the Trempealeau NWR (Figure 9 on page 44). The unit was designated a Public Use Natural Area in October, 1986 based on its unique and relatively undisturbed character. The complex includes one large and three small islands covered with mature stands of red and black oaks. Many of the trees are quite large, exceeding 24 inches in diameter breast height (d.b.h.). The islands are accessible only by canoe or kayak and receive very little use by visitors. The unit is open to the public for staff-guided wildlife observation, hiking, and photography.

Great River State Trail

See Section on page 40 for a description of the Great River State Trail.

Refuge Management Economics

The existing Refuge staff consists of four permanent employees who account for an annual payroll (including salaries and benefits) of approximately \$203,608. Trained volunteers are part of the Refuge's volunteer program. In 2003, volunteers on Trempealeau NWR contributed about 1,676 hours assisting with visitor services, invasive species control, facility and grounds maintenance and administration of the Refuge.

In addition to providing salaries and benefits, the Refuge purchased goods and services totaling approximately \$107,008 in 2003. Some of these expenditures (e.g. for flood damage restoration and maintenance management system projects) were one-time costs and are not expected to be repeated.

Trempealeau NWR contributes funds to local units of government (townships) in Wisconsin for revenue sharing payments. The federal government

makes payments in lieu of taxes of up to 0.075 percent of the appraised value of Refuge lands out of the Refuge Revenue Sharing Fund. In 2003, \$7,520 were paid to Trempealeau Township and \$4,868 to Buffalo Township.

Area Recreation Sector

The natural beauty and abundant wildlife of the Upper Mississippi River (UMR) attracts millions of boaters, anglers, hunters, and other individuals seeking recreation. Recreational resources along the UMR within the local area of Trempealeau NWR include the Upper Mississippi River NW&FR, Great River State Trail, Perrot State Park, and the Trempealeau Lakes area (Figure 10).

Portions of the Upper Mississippi River National Wildlife and Fish Refuge lie adjacent to Trempealeau NWR and include most backwater and main channel habitat on Navigation Pool 6. In addition to being an important fish and wildlife refuge, the “Upper Miss” also supports both wildlife dependent recreation including fishing, hunting, wildlife observation and interpretation. Open water and main channel areas adjacent to sand beaches are also popular for non-wildlife dependent uses such as power boating, water skiing, swimming, and camping. Annual visits on the 50-mile stretch of Mississippi River from Lock and Dam 6 at Trempealeau upstream to the mouth of the Chippewa River may exceed 750,000.

The Great River State Trail connects with the La Crosse River State Trail near Onalaska, Wisconsin and continues 24 miles north and west on an abandoned railroad grade to Marshland, Wisconsin. The Trail crosses 18 bridges and is surfaced with compacted gravel screenings for most of its length. It enters Trempealeau NWR where bikers can follow the 4.5-mile wildlife drive and exit the Refuge at the Marshland gate or return to the main trail at the Refuge entrance. It is estimated that 18,000 to 20,000 bikers use the Refuge portion of the Great River State Trail annually.

Perrot State Park lands border the Refuge on the east (Figure 10). This 1,400-acre property administered by Wisconsin DNR has several miles of hiking and cross-country ski trails that wind through mature upland forest and native grasslands called “goat prairies.” Spectacular views of the Mississippi River and Trempealeau NWR are available from places like Trempealeau Mountain, Brady’s Bluff and Perrot Ridge. The Park also features a 98-unit campground, nature center and boat launch ramp



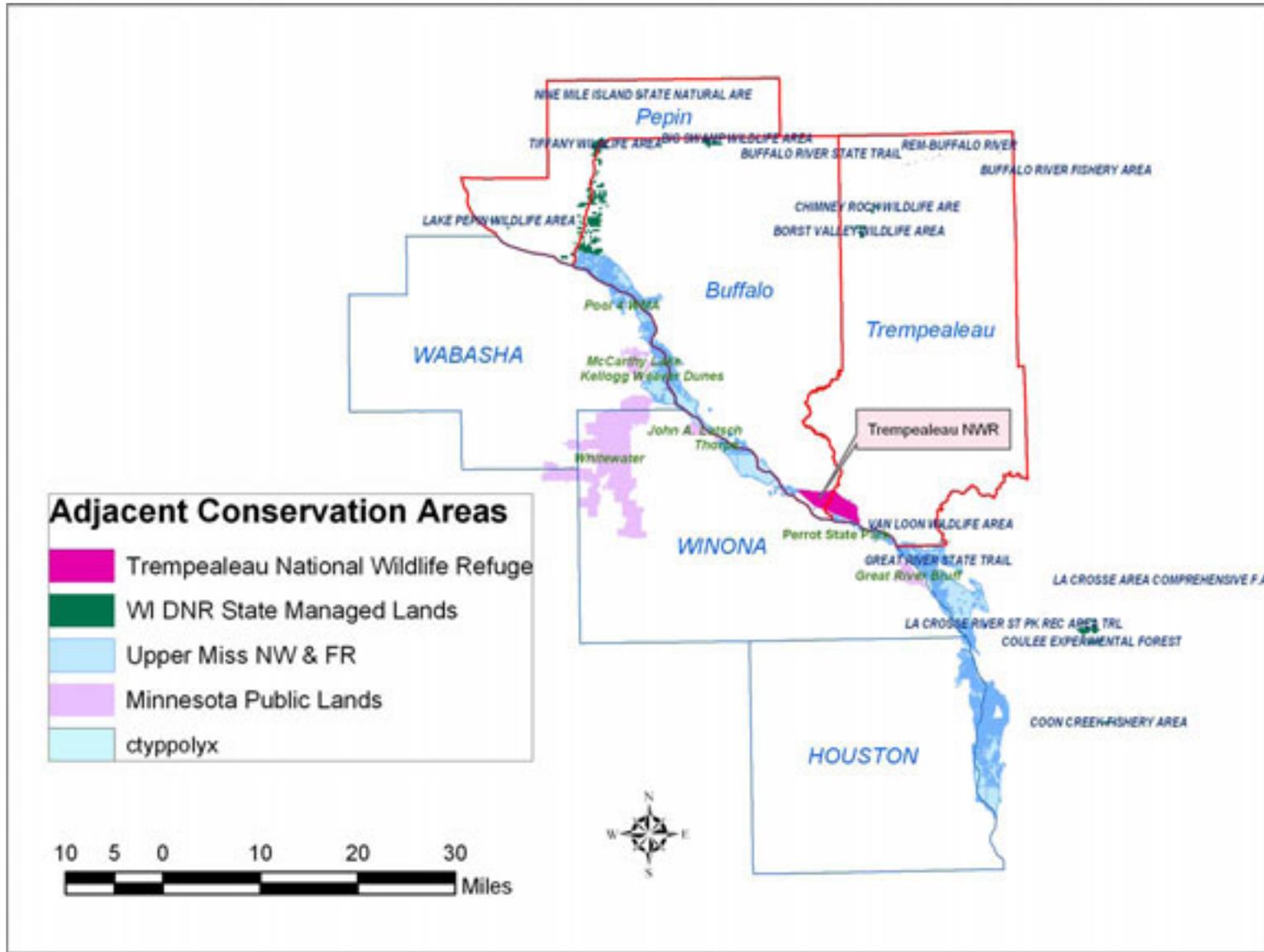
Trempealeau NWR volunteers planting swamp white oak.
USFWS

which provides access to the Mississippi and Trempealeau Rivers. Unique cultural and historic resources are also found in the Park including Native American burial mounds and stone buildings and structures built by the Civilian Conservation Corps in the 1930s. Perrot Park staff also manage state lands within the Three Lakes Recreation Area located east of the village of Trempealeau, Wisconsin. This property includes shoreline on First, Second, and Third Lakes which are popular fishing areas.

Trempealeau County

The southern portion of Trempealeau County offers many outdoor recreation opportunities due to the scenic qualities of lands bordering the Mississippi River and an abundance of public lands. Portions of two national wildlife refuges, a recreational trail, a state park, and a recreational fishing area occur within the county. Many miles of rural roads within Trempealeau County provide opportunities for sight-seeing and biking. The Trempealeau Township Land Use Plan reflected the importance given to protecting and maintaining the rural and scenic character of the landscape, both for local residents and as a basis for tourism. (Town of Trempealeau, 2002).

Figure 10: Adjacent Conservation Areas, Trempealeau NWR



Buffalo County

The **Great River Road** passes through Buffalo County between the Pepin and Trempealeau County lines adjacent to the Mississippi River. This road, also designated State Highway 35, was recently named a **National Scenic Byway** allowing the County and individual communities to compete for funds to enhance the cultural, scenic, natural and recreational features related to the natural beauty and features of the road.

The 2002-2005 Wisconsin State Comprehensive Outdoor Recreation Plan recognized **pleasure driving** as the second most popular form of outdoor recreation, engaged in by 69 percent of respondents to a statewide survey. Buffalo County also recognized the importance of resource protection to support this activity when they wrote:

“Because this activity is almost entirely related to the scenic, historic, or natural resource attractions available, it is necessary to maintain the integrity of the attractions to serve the anticipated demand. This will necessitate the protection of these attractions from changes in land use and from incompatible uses. The county’s various land use and zoning ordinances that together make up the county’s environmental protection tools are among the best friends outdoor recreationalists have as they work towards protecting the outdoors.” *Buffalo County Outdoor Recreation Plan, 2002-2005*

Agricultural SectorTrempealeau County

Principal cash crops in the county are corn and soybeans with acreage on the increase. Soybean acreage increased by 48 percent from 1987 to 1997. Hay and alfalfa acreage declined by 29 percent during the same period (Town of Trempealeau, 2002). Harvested cornfields in the local area of the Refuge are used by field feeding waterfowl, principally Mallards and Canada Geese, particularly late in the hunting season. This trend provides some unique waterfowl hunting opportunities on private lands in the area.

Buffalo County

About 37 percent of the land area of Buffalo County is devoted to harvestable crops, principally corn and soybeans. Another 14 percent is in pasture, cover crop or set-aside/CRP (Buffalo County Outdoor Recreation Plan, 2002). The mix of forest, hay, and cropland in the county provides excellent habitat which supports good populations of Wild Turkeys, Ruffed Grouse, gray and fox squirrels, and white-tailed deer.