

HABITAT MANAGEMENT PLAN FOR RED RIVER NATIONAL WILDLIFE REFUGE

Bossier Parish, Louisiana



Southeast Region



Red River National Wildlife Refuge

Habitat Management Plan



**U.S. Department of the Interior
Fish and Wildlife Service
Southeast Region**

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I. Introduction

Throughout the century of its existence, the National Wildlife Refuge System (Refuge System) has established a reputation as premier ground for the refinement of habitat management techniques. Ever since the establishment of Pelican Island National Wildlife Refuge in 1903, refuge employees have taken pride in developing the latest tools for wildlife conservation, with limited resources. Some of the first examples of rocket nets and airboats, equipment now considered essential for wildlife management, were developed by refuge employees. The first prescribed fire on refuge lands was conducted in 1927, at a time when the benefits of this natural process were not well-recognized and most federal agencies still considered fire to have “no place in any forest” (USFS 2004).

As the discipline of wildlife management evolved, largely through the efforts of Aldo Leopold with his publication of *Game Management* in 1933, it was recognized that a greater emphasis needed to be placed on making decisions that are based on the best science of the day, while retaining some of the artful intuition that comes from years of field experience. Sound wildlife and habitat management will always involve the skillful integration of science and art in disciplines as diverse as biology and sociology.

Habitat is defined as simply “the physical and biological surroundings of an organism” (Bolen and Robinson 1995). It includes all of the natural components of an ecosystem that are essential for survival including food, cover, and water. The processes that shaped features in northern Louisiana, including Red River National Wildlife Refuge (NWR), are complex and dynamic. This Habitat Management Plan (HMP) was developed to provide a clear, science-based outline for managing Red River NWR in this challenging environment. To this end, an HMP was developed as a first step in closing the gap between the needs of refuge wildlife and the knowledge of its stewards.

PLANNING PROCESS

The HMP is a dynamic working document that provides refuge managers a decision-making process; guidance for the management of refuge habitat; and long-term vision, continuity, and consistency for habitat management on refuge lands. Each HMP incorporates the role of refuge habitat in international, national, regional, tribal, state, ecosystem, and refuge goals and objectives; guides analysis and selection of specific habitat management strategies to achieve those habitat goals and objectives; and utilizes key data, scientific literature, expert opinion, and staff expertise.

The statutory authority for conducting habitat management planning on national wildlife refuges is derived from the National Wildlife Refuge System Administration Act of 1966 (Administration Act), as amended by the National Wildlife Refuge Improvement Act of 1997 (Improvement Act), 16 U.S.C. 668dd - 668ee. Section 4(a)(3) of the Improvement Act states: “With respect to the System, it is the policy of the United States that each refuge shall be managed to fulfill the mission of the System, as well as the specific purposes for which that refuge was established” and Section 4(a)(4) states: “In administering the System, the Secretary shall monitor the status and trends of fish, wildlife, and plants in each refuge.” The Improvement Act provides the Service the authority to establish policies, regulations, and guidelines governing habitat management planning within the Refuge System (620 FW 1).

An HMP is a step-down management plan of the comprehensive conservation plan (CCP). The CCP describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purpose(s) of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the biological integrity, diversity, and environmental health of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System, if appropriate; and meets other mandates. The CCP for Red River NWR was finalized in 2008 (USFWS 2008).

HMPs comply with all applicable laws, regulations, and policies governing the management of the Refuge System. The lifespan of an HMP is 15 years and parallels that of refuge CCPs. HMPs are reviewed every 5 years, utilizing peer review recommendations, as appropriate, in the HMP revision process or when initiating refuge CCPs. An annual habitat work plan is prepared to guide implementation and assessment of specific management prescriptions to meet habitat objectives established in the HMP.

LEGAL MANDATES

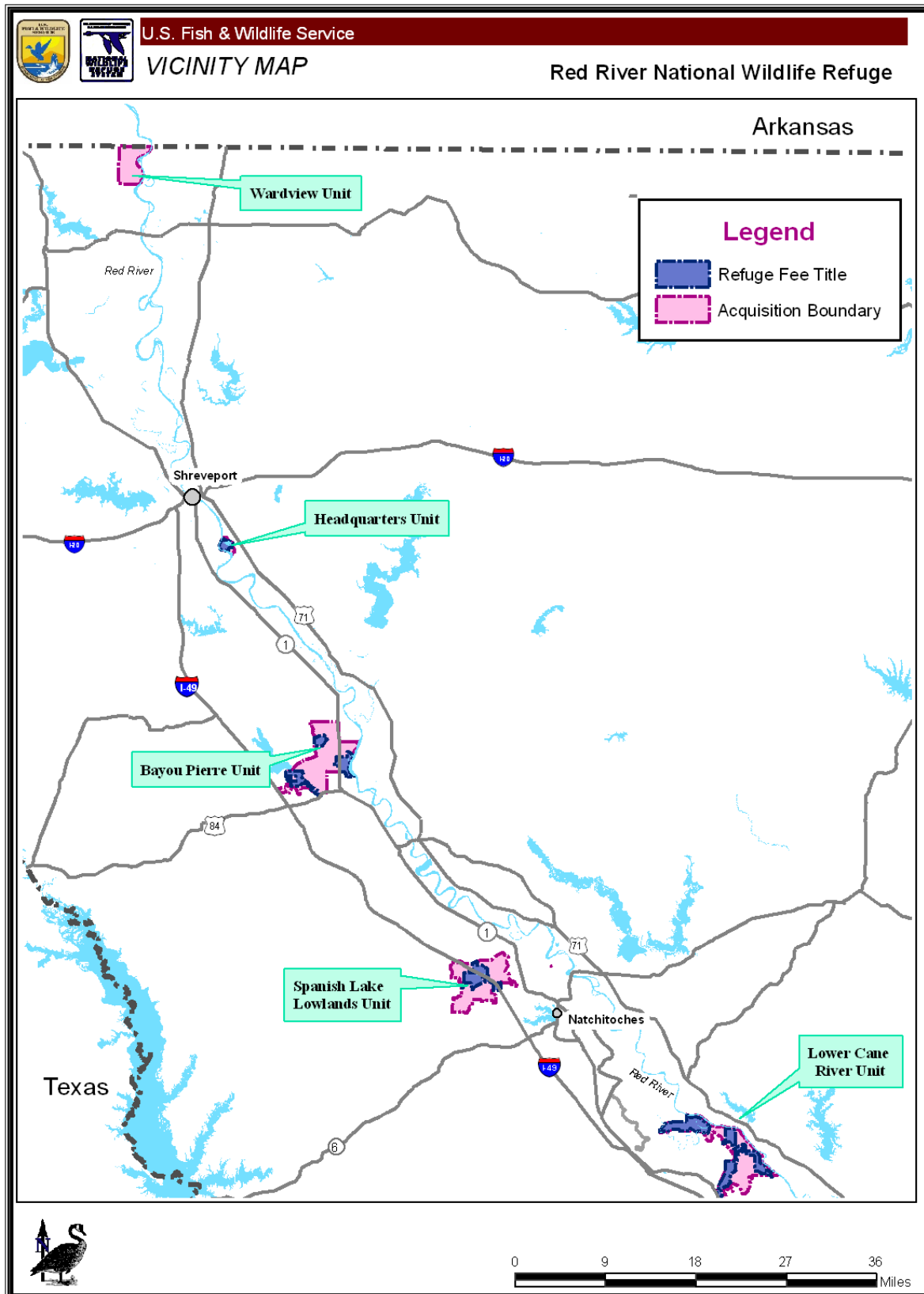
ESTABLISHMENT OF THE REFUGE

The purposes of a national wildlife refuge, as established by Congress or the Executive Branch, are the barometer by which all actions on that designated public land are measured. Habitat management, public use, and all other programs are conducted as required to fulfill the established purposes of the refuge.

On October 13, 2000, House Resolution 4318, the Red River National Wildlife Refuge Act, was signed into law (Pub. Law 106-300). This legislation authorized the establishment of the Red River NWR to provide for the restoration and conservation of fish and wildlife habitats in the Red River Valley ecosystem in northwest Louisiana. The legislation that established the refuge stated that the refuge shall consist of up to 50,000 acres of federal lands, waters, and interests therein within the boundaries of Colfax, Louisiana, to the Arkansas state line. The legislation allowed that when the Service acquired sufficient property within these boundaries to constitute an area that could be effectively managed as a national wildlife refuge, then the establishment of the refuge would take effect. Sufficient property was acquired and the refuge was established on August 22, 2002, with the initial purchase of 1,377 acres in the Spanish Lake Lowlands Focus Area at a cost of \$1 million.

To guide land acquisition efforts, the Service identified four focus areas plus an additional area to establish a proposed headquarters and visitor center site within the approved selection areas. These four units compose the refuge with a Headquarters Unit near the Shreveport and Bossier City area. The focus areas include Lower Cane River (Natchitoches Parish); Spanish Lake Lowlands (Natchitoches Parish); Bayou Pierre (DeSoto and Red River Parishes); and Wardview (Caddo and Bossier Parishes) (Figure 1).

Figure 1. Location of focus areas and fee-title lands of Red River NWR



The purposes for which the refuge was established are as follows:

1. To provide for the restoration and conservation of native plant and animal communities on suitable sites in the Red River basin, including restoration of extirpated species;
2. To provide habitat for migratory birds; and
3. To provide technical assistance to private landowners in the restoration of their lands for the benefit of fish and wildlife (114 Stat. 1056, dated October 13, 2000).

According to legislation, the refuge shall consist of up to 50,000 acres from the Headquarters Unit and four focus areas within a selection area covering 220,000 acres. Currently, the Service has acquired 13,000 acres and has 37,000 acres remaining to purchase. The lands within the five units (Wardview, Headquarters, Spanish Lake Lowlands, Bayou Pierre, and Lower Cane River focus areas) will be acquired through a combination of fee-title purchases from willing sellers and conservation easements, leases, and/or cooperative agreements with willing landowners. Currently, fee-title lands have been purchased within portions of all the focus areas except Wardview.

FEDERAL LAWS, MANDATES, AND POLICIES

In addition to the specific purposes established for each refuge, Congress passed the Improvement Act in 1997. This legislation provides clear guidance for the mission of the Refuge System and prioritizes wildlife-dependent public uses. The Improvement Act states that each refuge will:

- Fulfill the mission of the Refuge System;
- Fulfill the individual purposes of each refuge;
- Consider the needs of wildlife first;
- Fulfill requirements of CCPs that are prepared for each unit of the Refuge System;
- Maintain the biological integrity, diversity, and environmental health of the Refuge System; and
- Recognize that wildlife-dependent recreation activities, including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation are legitimate and priority public uses; and allow refuge managers authority to determine compatible public uses.

Other laws and policy statements that Red River NWR operates under are:

- The Endangered Species Act
- National Wildlife Refuge System Improvement Act of 1997
- Title 50 of the Code of Federal Regulations
- Fish and Wildlife Service Manual – specifically 601 3(D2G), which states: “Through the comprehensive conservation planning process, interim management planning, or compatibility reviews, determines the appropriate management direction to maintain and, where appropriate, restore biological integrity, diversity, and environmental health, while achieving refuge purpose(s).”

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- National Historic Preservation Act - The Fish and Wildlife Service, like other federal agencies, is legally mandated to inventory, assess, and protect cultural resources located on those lands that the agency owns, manages, or controls. The Service's cultural resource policy is delineated in 614 FW 1-5 and 126 FW 1-3. In the Service's Southeast Region, the cultural resource review and compliance process is initiated by contacting the Regional Historic Preservation Officer/Regional Archaeologist (RHPO/RA). The RHPO/RA would determine whether the proposed undertaking has the potential to impact cultural resources, identify the "area of potential effect," determine the appropriate level of scientific investigation necessary to ensure legal compliance, and initiate consultation with the pertinent State Historic Preservation Office and federally recognized Native American tribes.

REFUGE VISION

The following vision was developed for the CCP for Red River NWR (USFWS 2008):

Red River NWR will be managed to provide for the restoration, enhancement, and conservation of bottomland hardwood forests, managed wetlands, and associated prairies, as an integral component of the Red River ecosystem. These habitats will support a variety of migratory birds, species of special concern, and other associated wildlife and plants. This effort will be enhanced and encouraged through both strong private landowner partnerships and public support by providing opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

RELATIONSHIP TO OTHER PLANS

A CCP was finalized for Red River NWR in 2008, which includes goals and objectives for management over a 15-year period (USFWS 2008). The Biological Review Report was instrumental in the development of the CCP (USFWS 2006). The purpose of the HMP is to provide more specific guidance that will facilitate the selection of prescriptions for implementing the goals and objectives of the CCP. In order to maintain consistent strategies for managing wildlife and habitats on the refuge, several other planning documents were also used in the development of this HMP.

No endangered species are known to exist on refuge lands.

Other plans incorporated into the HMP include the North American Waterfowl Management Plan, Bird Conservation Plan for the West Gulf Coastal Plain (Rich et al. 2004), U.S. Shorebird Conservation Plan for the Lower Mississippi/Western Gulf Coast (Elliott and McKnight 2000), the Southeast United States Waterbird Conservation Plan (Hunter et al. 2006), Northern Bobwhite Conservation Initiative, American Woodcock Management Plan, and Louisiana Comprehensive Wildlife Conservation Strategy (Lester et al. 2005) as follows:

North American Waterfowl Management Plan (NAWMP)

Working under the direction of the NAWMP, the Lower Mississippi Joint Venture (LMVJV) strives to provide habitat for over-wintering waterfowl in the Mississippi Alluvial Valley (MAV) and West Gulf Coastal Plain (WGCP) Bird Conservation Region. As such, the LMVJV assumes that the availability of foraging habitat is the most important factor affecting the number of dabbling ducks that can be accommodated during winter. Diving duck habitat is not thought to

be limiting in WGCP. Based on a step-down process, the LMVJV established habitat objectives that link continental waterfowl populations to on-the-ground habitat objectives. Habitat objectives are apportioned among three categories: public managed, private managed, and natural flooding within each state (in the LMVJV administrative boundaries) (USFWS 2006). By doing so, each national wildlife refuge (e.g., Red River NWR) is responsible for contributing to some portion of the habitat objectives. This step-down process has been completed for the WGCP. That is, foraging habitat objectives have been allocated within the WGCP portion of Louisiana, in which Red River NWR is located. These objectives should be used as a guide in developing management objectives for individual refuges. The step-down objectives for Red River NWR are as follows: 259 acres of unharvested rice (6.2 million DEDs) and 1,012 acres of moist-soil (1.9 million DEDs) for a total objective of 8.1 million DEDs.

Bird Conservation Plan for the West Gulf Coastal Plain

Red River NWR is within the WGCP. This section of the region is primarily mixed pine/hardwood types with bottomland hardwood forest species in the more mesic areas and on slopes. These forests are of high conservation priority for conserving the natural communities and the bird populations within these habitats. The primary threats to these forests include reservoir construction; stream modifications; destructive timber harvesting practices; and conversion to pine plantations, pastures, and other land uses (LMVJV 2007). This plan will define conservation strategies to foster support for the WGCP priorities. At this time, step-down objectives have not been finalized for the WGCP. Habitats found on Red River NWR and associated bird species that are considered a high priority in the WGCP Plain include:

Bottomland Hardwood Forest: Swainson's warbler, Louisiana waterthrush, Northern parula, Acadian flycatcher, white-eyed vireo, wood thrush, yellow-throated warbler, red-shouldered hawk, rusty blackbird, wild turkey, wood thrush, prothonotary warbler, yellow-throated vireo, and American woodcock.

U.S. Shorebird Conservation Plan for the Lower Mississippi/Western Gulf Coast

The U.S. Shorebird Conservation Plan is a partnership effort throughout the United States to ensure that stable and self-sustaining populations of shorebird species are restored and protected. The plan was developed by a wide range of agencies, organizations, and shorebird experts for separate regions of the country, and identifies conservation goals, critical habitat conservation needs, key research needs, and proposed education and outreach programs to increase awareness of shorebirds and the threats they face. This plan recommends that public lands provide as much fall shorebird habitat as possible to meet the goal of 520 ha (1,285 acres) of fall habitat in Louisiana. Although step-down objectives have not been created for the WGCP, the following are considered high-priority species for the region:

(1) Piping plover; (2) American golden-plover; (3) marbled godwit; (4) ruddy turnstone; (5) red knot; (6) sanderling; (7) buff-breasted sandpiper; (8) American woodcock; and (9) Wilson's phalarope.

Southeast United States Regional Waterbird Conservation Plan

This plan provides a framework for the conservation and management of waterbirds in the Southeast that are not covered by either the North American Waterfowl Management Plan or the U.S. Shorebird Conservation Plan. Threats to waterbird populations include destruction of inland and coastal wetlands, introduced predators and invasive species, pollutants, mortality from fisheries and industries, disturbance, and conflicts arising from abundant species. Particularly important habitats include pelagic areas, marshes, forested wetlands, and barrier and sea island complexes. The WGCP is considered to have “high responsibility and interest” for king rails, little blue herons, and great blue herons. Step-down population objectives, as listed, have been set in the WGCP for king rails and little blue herons: 2,000 breeding pairs of little blue herons for Louisiana and 1,000 pairs of king rails.

Refuge surveys have shown yellow rails and soras utilizing portions of the moist-soil units during spring and fall migrations, particularly the Yates Tract on Bayou Pierre Unit. Potential exists for promoting migration habitat and research on rails at Red River NWR.

Northern Bobwhite Conservation Initiative

The initiative’s goal is “to restore northern bobwhite populations range wide to an average density equivalent to that which existed on improvable acres in 1980 [58,857,000].” The population objective for the WGCP Bird Conservation Region is to add 131,033 new coveys, 21,833 of these in Louisiana. The only habitat management objective in this plan that could pertain to Red River NWR is the following: Increase the amount and enhance the quality of agricultural lands for nesting, brood-rearing, and roosting by bobwhites and other grassland species by adding native warm-season grasses and other conservation plantings, such as shrubs and forbs.

American Woodcock Management Plan

The American Woodcock Management Plan was developed by the Service in 1990 to “guide the conservation of woodcock in the United States.” The plan gives general guidance for habitat and population management at the national level. Though habitat for woodcock is limited on Red River NWR, habitat practices that benefit woodcock have been considered in this HMP.

Louisiana Comprehensive Wildlife Conservation Strategy

The Louisiana Department of Wildlife and Fisheries (LDWF) is a critical partner in the effort to implement conservation strategies. In 2005, LDWF published the Louisiana Comprehensive Wildlife Conservation Strategy as required by Congress in association with federal funding. This Strategy is a “blueprint for guiding LDWF in the development of management actions for Louisiana’s fish and wildlife species with emphasis on species of conservation concern and associated habitat they depend upon” (Lester et al. 2005). The state plan identifies all vegetation communities in the state along with species of concern and threats that are associated with each community. Red River NWR would contain the bottomland hardwood forest and Batture, Calcareous Prairie, and Cypress Swamp communities listed in the state plan.

This HMP also incorporates the recommendations of other approved refuge plans including the Fire Management Plan (USFWS 2011) and the Wildlife and Habitat Biological Review Report (USFWS 2006). Prescribed fire strategies detailed in this HMP will be incorporated into the next revision of the Fire Management Plan.

II. Environmental Setting and Background

LOCATION

Red River NWR is located in northwestern Louisiana, in four disjunct units along the Red River Valley from Bossier City to south of Natchitoches, Louisiana. The refuge's most northern unit is the 650-acre Headquarters Unit in Bossier City. Going south, the next parcel is the Bayou Pierre Unit, consisting of three tracts of land encompassing 3,693 acres. The Spanish Lake Lowlands Unit consists of 2,790 acres and is located north of Natchitoches. The most southern parcel of the refuge is the 5,870-acre Lower Cane River Unit near Cloutierville. The current acquisition area encompasses 50,000 acres, of which 13,000 acres have been purchased. Red River NWR is administered by North Louisiana National Wildlife Refuge Complex (Complex) (Figure 2).

MANAGEMENT UNITS

The refuge is delineated into 40 management units (Figure 3) defined by habitat types that have the same habitat management objectives. The habitat type, size, soil type, current condition, and past management history for each unit is described in Table 1. A total of 1,661 acres of lands is currently owned by The Conservation Fund and managed by the Service.

PHYSICAL FEATURES

CLIMATE

The climate at Red River NWR is humid-subtropical and is primarily influenced by the refuge's subtropical latitude and proximity to the Gulf of Mexico. The climate is controlled by two principal air masses. Warm, moist air from the Gulf of Mexico generally dominates in the spring and summer, and cooler, drier air from the Central Plains prevails during the winter months. Extended, hot, sultry summers and moderately cool winters are the norm. The average annual air temperature is 65 degrees Fahrenheit. During the winter, the average temperature is 50 degrees, with an average daily minimum of 39 degrees. Average seasonal snowfall is less than an inch. The average temperature is 81 degrees during the summer, but temperatures above 90 degrees occur almost daily.

The mean annual precipitation is 60 inches. Half of this rain (30 inches) usually falls during April through September. The growing season is about 235 days long and begins in mid-March and ends during early November. Thunderstorms occur on average about 70 days each year, with most occurring during the summer months. The average relative humidity in the mid-afternoon is about 60 percent. The humidity is higher at night.

The sun shines 60 percent of the time during the summer, and 50 percent during winter. The prevailing wind is from the south. Average wind speed is highest, 9 miles per hour, during the spring months. These climatic values play an important role in influencing the area's hydrologic regime, which subsequently shapes ecosystem processes and functions.

Figure 2. Location of Red River NWR within the Complex

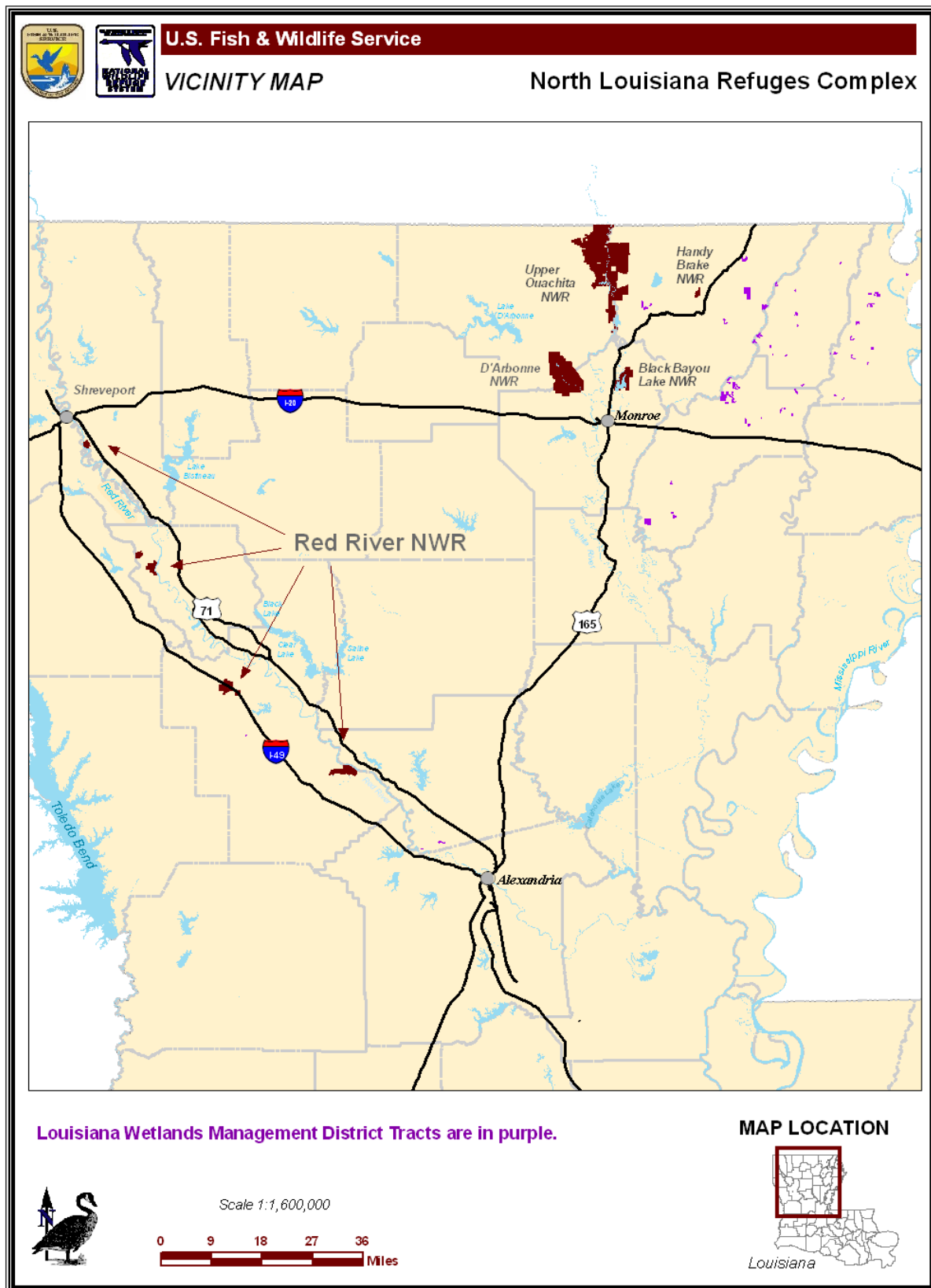
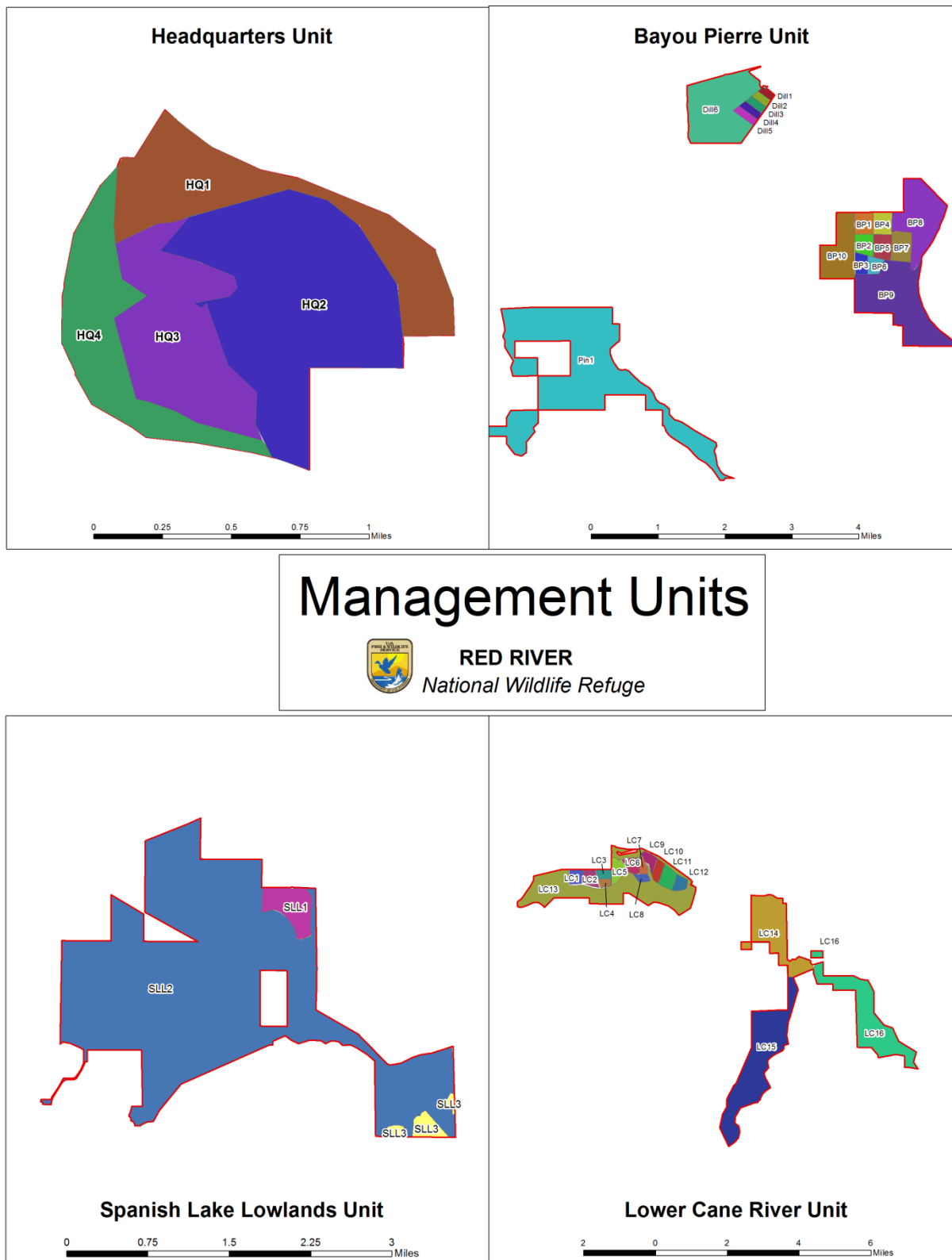


Figure 3. Forty management units of Red River NWR



TOPOGRAPHY AND HYDROLOGY

As the climate has changed on the Earth, marine and deltaic sediments have been deposited in alternating cycles in Louisiana. Geologists have determined from studying these deposits that a major river system, corresponding to the modern Red River, has persisted here at least since the Gulf of Mexico began to form (Louisiana Geologic Survey 1990).

The topography of the refuge has been greatly influenced by the actions of the Red River and much of the geology is from Quaternary alluvial deposits. Although the continental ice sheets did not reach this far south, the lower Red River valley carried glacial meltwaters and outwash in a braided-stream pattern that concurrently widened and aggraded the valley during periods of waning glaciation. As each glacial cycle progressed and the sediment loads and stream discharges declined the river abandoned its braided stream configuration in favor of a single-channel meandering pattern. This alluvium has been sorted, reworked, and deposited many times by riverine processes (USFWS 2008).

The Red River has a narrow floodplain, averaging 6 to 8 miles in width. The lands in the valley can, in general, be classified as alluvial floodplain or terrace uplands. The formations of alluvium described above compose the bulk of the refuge. Relict channels and natural levees, often referred to as ridge and swale topography, are easily seen by visitors to the refuge. Human disturbances, including artificial levees and channelization projects, have drastically altered these natural alluvial processes within the Red River floodplain.

The elevation at the refuge averages 150 feet above sea level at its lower end below Natchitoches to 250 feet near the Arkansas border. The topography is complex, with numerous stream channels, small tributaries and depressions, old river meanders and oxbow lakes, multiple river terraces in various stages of erosion and deposition, and adjacent poorly drained lowlands. Added to this complexity are farming activities that have modified the hydrology of the area, resulting in a subtle but complex topography that has given rise to the flora and fauna found on the refuge.

Drainage in Louisiana is into the Gulf of Mexico. The Red River basin is the largest drainage area in the state. The Red River joins with the Atchafalaya and Old Rivers, the latter forming an outlet to the Mississippi River. Most of the water from the Red River flows to the Gulf through the Atchafalaya River system. Because of an extensive artificial levee system on the Mississippi River, there is not much drainage directly into the Mississippi River within the state. Lowlands which border the Red and upper Atchafalaya Rivers are also protected by levees.

Red River NWR is located within three distinct watersheds of the Red River: Bayou Pierre, Middle Red–Coushatta, and Lower Red–Lake Iatt watersheds. The Headquarters Unit is located in the Middle Red–Coushatta watershed. Bayou Pierre and Spanish Lake Lowlands Units are located in the Bayou Pierre watershed which consists of approximately 395,715 acres of cropland, pasture/hayland, forestland, and urban land. The Lower Cane River Unit is located in the Lower Red–Lake Iatt Watershed to the south of the Little River.

The hydrology of the refuge is dominated by the Red River, the three distinct watersheds, and the impacts of the Red River Waterway Project. For 500 years or more before it was finally cleared in 1873, the Great Red River Raft (log jam) dominated hydrologic character along the stretch of the Red River that is now occupied by the refuge. The Red River raft was a result of the highly erodible soils of the Red River alluvial valley being carved by each

high-water event on the river. As the river moved back and forth across its alluvial plain, trees were undermined along the riverbanks and fell into the river. These trees formed a discontinuous series of logjams that extended approximately 150 miles along the river from the vicinity of present day Natchitoches to the Louisiana-Arkansas state line. The raft artificially raised the banks of the river and forced the creation of numerous distributaries of the Red River, evidence of which can still be seen today.

Numerous raft lakes also formed in river low spots along the tributaries to the Red River. These raft lakes were transitory in nature. The raft was not stationary; rather, it was inexorably moving upstream at about a fifth of a mile per year. As pieces of the raft broke up and floated downstream on the lower end, new logs and debris were added to the upper end. As the channel naturally cleared on the lower end, the Red River channel would deepen and drain the raft lakes and close off the distributaries, leaving a single river channel.

Piecemeal attempts were made to clear the raft starting in the 1830s. Portions of the raft were cleared for a brief period, but it would eventually reform. Captain Henry Miller Shreve dramatically increased the pace of the natural clearing of the logjam with the invention of the snag-boat. By the mid 1870s, the raft had been cleared. Steamboats plying the Mississippi River could now go up the Red River to Shreveport and points north, as well as west along Cypress Bayou to Jefferson, Texas. However, as the railroad commerce expanded in the late 1800s, steamboat commerce declined. Removal of the Red River raft caused the river to scour its channel deeper, making the river have unusually high banks. Because of these unnaturally high banks, bank erosion became a tremendous problem on the river. Thousands and thousands of acres of productive land were eroded by the river and deposited downstream as less-productive sandbars. This continual erosion also led to shoaling in the river, making navigation treacherous.

The Red River Waterway project, which Congress authorized in 1964 and completed in 1994, consists of five lock and dam complexes located between the Old River Lock on the Mississippi River to a point just south of Shreveport and Bossier City. The river's water levels are now higher and more constant, and its turbidity levels have been greatly reduced. This initially increased the fisheries resource due to water flooding new forested areas that were nutrient rich. However, now that the water levels do not fluctuate, the fisheries resource is on the decline. The river does not fluctuate as it would have naturally.

The USDA's Wetlands Reserve Program and Conservation Reserve Program are restoring valuable wildlife habitats through the reforestation of previously cleared and highly erodible lands in the Red River Valley.

Table 1. Description of 40 management units on Red River NWR

Management Unit	Size (ac)	Soil Type	Habitat Type	Current Condition	Refuge Treatment History
HQ1	149.3	Coushatta	Pecan Orchard	100% mature pecan orchard; not maintained	None
HQ2	295.1	Severn	Lake	Cypress lake, lotus, open water	None
HQ3	152.5	Severn	Field	100% plum thicket	Plum mulched and chemically treated in 2009-10; NRCS biologists and soil scientists believe area to be young deposit with little organic matter and will become cottonwood type.
HQ4	117.2	Severn	Bottomland Hardwood	100% cottonwood type	None
SLL1	89.9	Moreland	Moist-soil	100% moist-soil with water control	Disked
SLL2	2,711.1	Moreland, Sacul	Reforested Bottomland Hardwood	100% reforested bottomland hardwoods, 7-9 years old	Reforested in 2002-04 with oaks, green ash
SLL3	30	Severn	Upland Pine-hardwood	30% 15-year old loblolly pine; 10% cane thickets; 10% upland hardwood; 50% grass	None
Dill1-5	98.6	Moreland	Moist-soil	100% moist-soil with water control	Disked

Management Unit	Size (ac)	Soil Type	Habitat Type	Current Condition	Refuge Treatment History
Dill6	581.2	Gallion, Armistead, Moreland, Coushatta	Reforested Bottomland Hardwood	100% reforested bottomland hardwoods, 5-6 years old	Reforested in 2005 and 2006
BP1-7	389.5	Buxin, Moreland	Moist-soil/Agriculture	Millet, sedge, smartweed with water control	Disked and flooded in 2010; Agriculture/moist-soil rotation
BP8	369.7	Moreland, Coushatta, Severn, Armistead, Latanier	Reforested Bottomland Hardwood and Cottonwood type	55% reforested BLH, 40% cottonwood type, 5% open water	Portions reforested in 2005
BP9	629.4	Buxin, Moreland, Severn, Coushatta	Reforested Bottomland Hardwood	95% reforested bottomland hardwood, 6 years old; 5% open water	Reforested in 2005
BP10	255.7	Buxin	Bottomland Hardwood	100% bottomland hardwood forest; 7 years old	Clear-cut in 2004
Pin1	1,598.7	Yorktown, Perry, Kirvin, Moreland Forbing, Ruston	Bottomland Hardwood	60% hackberry-ash; 30% cypress; 10% willow oak-sweetgum; mature forest	None
LC(1-12)	1068.4	Moreland	Agriculture/Moist-soil	12 agricultural fields	Half in moist-soil; half farmed in rice
LC13	1,881.5	Latanier, Acadia, Moreland, Severn, Gallion	Reforested Bottomland Hardwood	100% reforested bottomland hardwoods, 5 years old	Reforested in 2006

Management Unit	Size (ac)	Soil Type	Habitat Type	Current Condition	Refuge Treatment History
LC14*	1,181.4	Gallion, Latanier, Moreland	Reforested Bottomland Hardwood	15% WRP; cottonwood-green ash	None
LC15	1,918.5	Latanier, Perry, Moreland	Reforested Bottomland Hardwood	48% reforested bottomland hardwood, 2 years old; 48% WRP, ca. 15 years old	Reforested in 2009
LC16*	1,384	Moreland, Gallion, Latanier	Reforested Bottomland Hardwood	18% reforested bottomland hardwood, 2 years old; 74% WRP, ca. 15 years old	Reforested in 2009

SOILS

Red River NWR consists of 28 different soil associations (Figure 4). The majority of the Bayou Pierre, Spanish Lake Lowlands, and Lower Cane River Units are clays, specifically Moreland clay. The Headquarters Unit is made up of sandy and silt loams, in the Severn family. Severn soils are also found near the river within the cottonwood forest type on the refuge.

HISTORY OF REFUGE LANDS

The purpose of habitat management is often to restore an area to the historical conditions that were present before the land was substantially altered by European settlement. Most habitat loss in northern Louisiana occurred within the last 200 years when development, especially in the past 40 years, increased. There are other human effects on the environment that are less conspicuous than development but can result in severe degradation of habitat. For example, alterations to the natural hydrology, such as levees, channelization of rivers, locks and dams, etc., have severe negative effects on bottomland hardwood systems and other wetlands. Lands managed for timber are harvested at an early age. When the forest is not allowed to mature, the ecosystem does not function naturally. Although these factors do not cause the dramatic die-off of animals that can be readily observed, the subsequent gradual downward trend in wildlife reproduction can result in the extirpation of a species from its native range.

In order to define objectives for habitat management on the refuge, a substantial effort was made to determine the historical condition of refuge lands and their surrounding areas. Historical literature, aerial photographs, and consultations with botanical ecologists were used during the development of this HMP.

CULTURAL AND REFUGE LAND HISTORY

Between 10,000 BC and 1400 AD, Native Americans inhabited northeastern Louisiana. The Paleo-Indian people developed regional culture groups; along the Red River, the Caddo people were becoming defined. The first known European explorer was de Soto who passed through the area during 1542-1543. A century later French explorers, hunters, and trappers traveled through the areas. Already by the 17th Century, the Caddo people were suffering population decline due to introduced European diseases. In 1714, France established Natchitoches along the Red River. The Caddo welcomed the French, establishing trade with them. In 1763, Spain assumed control of Louisiana, but they were not as good as the French at Indian relations. Louisiana was expensive to Spain, and Spain ceded it back to France in 1800. Three years later, the United States purchased the Louisiana Territory and President Jefferson ordered Freeman and Custis to explore the Red River.

PRE-EUROPEAN SETTLEMENT CONDITIONS

Researchers have studied General Land Office surveys in an attempt to characterize bottomland hardwood forests before European settlement. Willow, hackberry, ash, cottonwood, and baldcypress are mentioned in the surveys (MacRoberts and MacRoberts 2008b). Marcy (1854) reported elm and oak along the banks of the Red River. The bottomlands of the Red River are interesting in that they did not necessarily have the clinal progression of vegetative communities often found in bottomland hardwood systems. Often the cottonwood/willow/sycamore (batture) areas extended from the river to the uplands.

Figure 4. Soil types present on Red River NWR

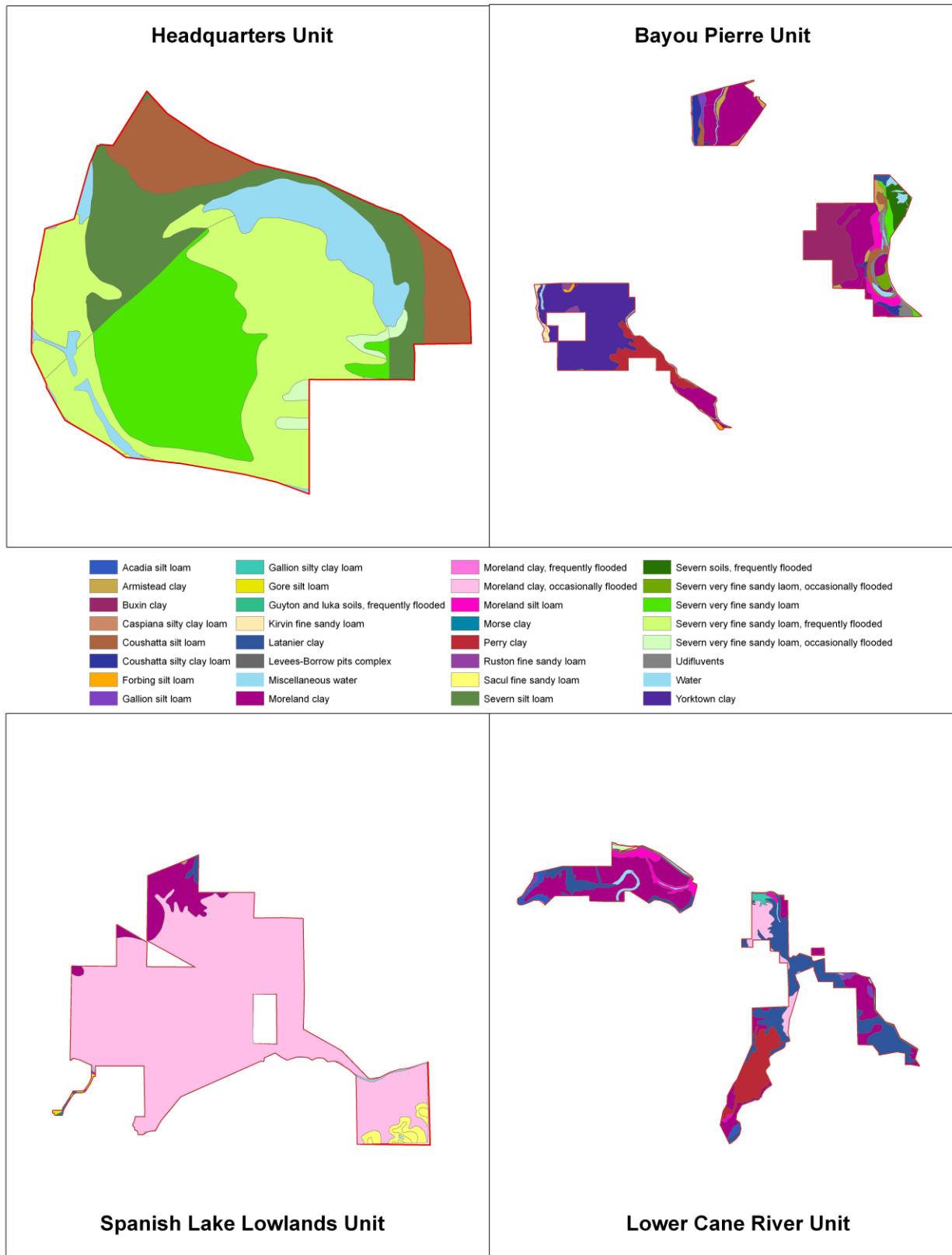
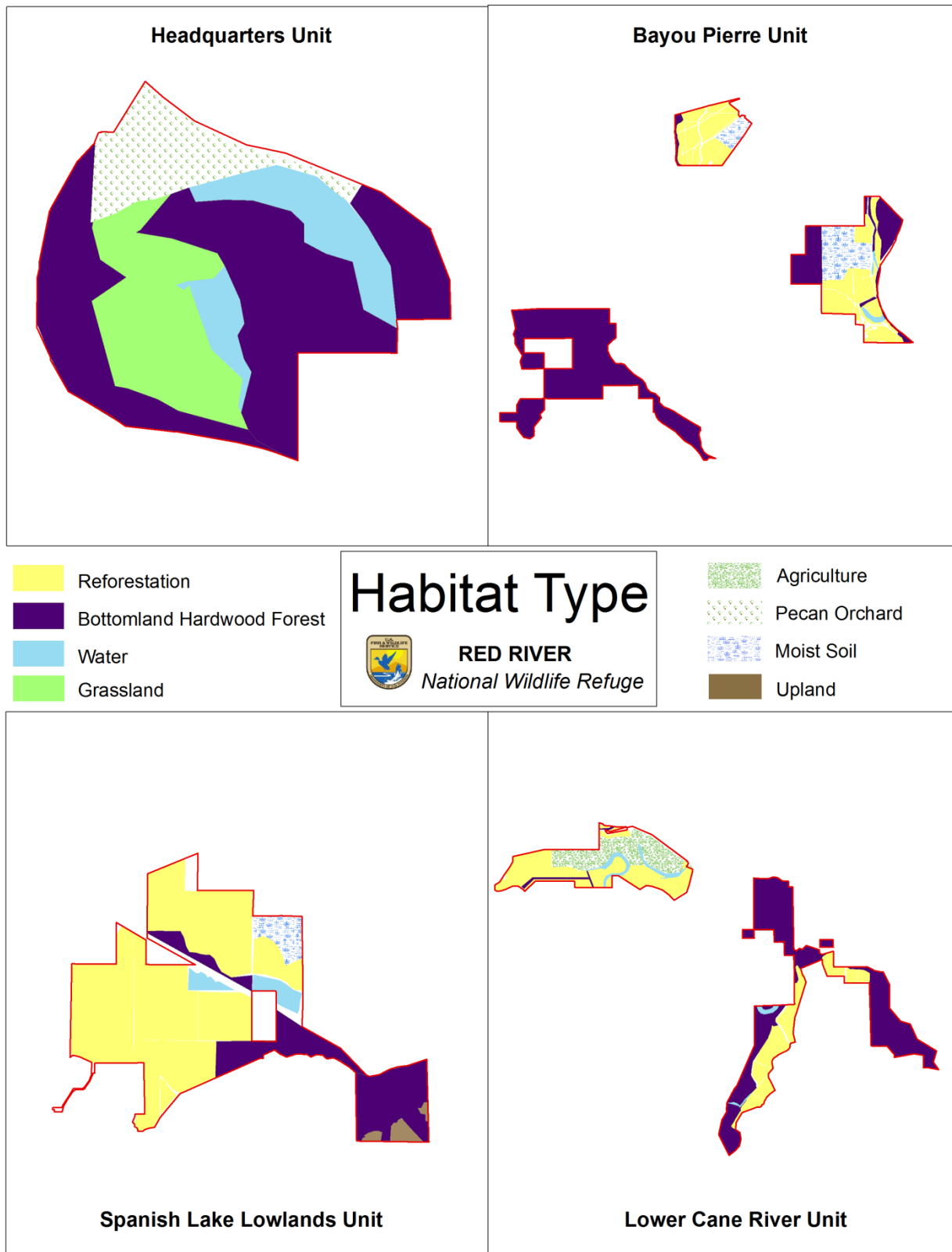


Figure 5. Habitat types on Red River NWR



Freeman and Custis mentioned bottomland prairies, canebrakes, and cedar forests often. MacRoberts and MacRoberts (2008a) quote Freeman as saying “the undergrowth is almost universally of cane, so strong, as seldom to allow the party to penetrate far from the margin of the river” when speaking of the river floodplain. With regards to prairies, Freeman writes “We did not wait, but pushed on, through bushes in a kind of Bayou within the Lake, and at last got through the lake, and entered a Bayou, but which we entered a handsome Prairie; the surface of the land was four feet higher than the water of the Bayou; the soil rich, the grass high and luxuriant” (MacRoberts and MacRoberts 2008a). Paxton (1829) reported that Lake Badcau was a prairie with buffalo present in 1793. The red cedar forests were apparently abundant as this tree is mentioned often in the Freeman and Custis account. This forest was found mostly north of Shreveport, where the cedars grew along the borders of the river. They were cut out by the 1870s and were not regenerated (MacRoberts and MacRoberts 2008a).

Wildlife species present just prior to European settlement that are not found in the Red River valley today include the wood bison, elk, mountain lion, red wolf, passenger pigeon, Carolina parakeet, whooping crane, ivory-billed woodpecker, swallow-tailed kite, Bachman’s warbler, and trumpeter swan. Black bears were much more abundant throughout the area than today.

The Great Raft was a significant feature of the Red River prior to European settlement and even afterwards. The raft, consisting of a series of logjams, spanned 150 miles. The raft originated near Natchitoches in the late 1400s and extended to just south of the Louisiana-Arkansas border. Cottonwoods composed most of the raft but sweetgum, elm, oak, sycamore, willow, baldcypress, and cedar were also recorded (Triska 2008). The raft created several inland lakes including Lake Bistineau, Badcau, Caddo, Cross, Sodo, Ferry, and Clear. By the late 1800s, the raft had been permanently cleared.

CURRENT CONDITIONS AND HABITAT TYPES

The refuge is spread out along the Red River within the WGCP. Red River NWR is predominantly former bottomland hardwood forest that was converted to agriculture.

The refuge currently consists of 6,518 acres of bottomland hardwood forests, 5,655 acres of reforested bottomlands, 600 acres of moist-soil impoundments, 1,245 acres of agricultural fields, 97 acres of pecan orchards, 30 acres of uplands, and 511 acres of open waters (Figure 6). Although the refuge owns 13,000 acres in fee title, 1,661 acres of land owned by The Conservation Fund are managed by the refuge and therefore included in this HMP.

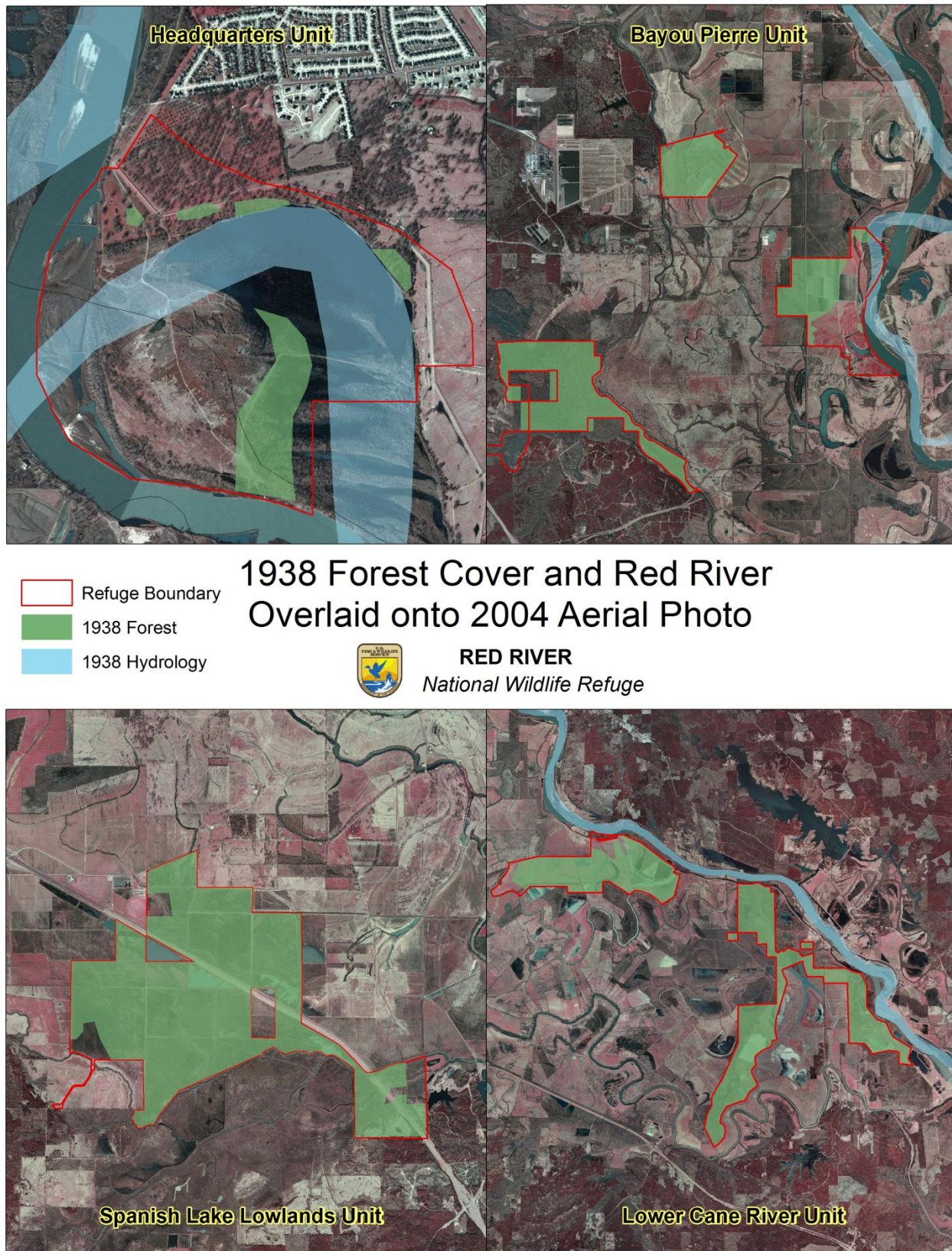
BOTTOMLANDS

Unlike many river floodplains, the Red River Valley does not necessarily have an ordered succession of vegetative communities from the river edge to the uplands (MacRoberts and MacRoberts 2008a). Batture can extend from the river’s edge to the uplands.

The refuge’s bottoms have been altered severely by man. A dramatic effect on the valley’s bottomland hardwoods was the construction of locks and dams, dredging, and erecting levees on the Red River.

Five primary habitat types are found in the bottomlands of the refuge: (1) Baldcypress-Water Tupelo; (2) Overcup Oak-Water Hickory; (3) Sugarberry-American Elm-Green Ash; (4) Sweetgum-Willow Oak; and (5) Cottonwood (Eyre 1980) (Figure 6).

Figure 6. Changes in hydrology and forest coverage from 1930s to present



Baldcypress-Water Tupelo

Baldcypress and water tupelo together make up the majority of stocking in this forest type, which occurs in swamps, deep sloughs, and very low, poorly drained flats. The sites are always very wet, and surface water stands well into or throughout the growing season. Soils are generally muck, clay, or fine sand. Common trees associated with this type are black willow (*Salix nigra*), water locust (*Gleditsia aquatica*), overcup oak (*Quercus lyrata*), green ash (*Fraxinus pennsylvanica*), and persimmon (*Diospyros virginiana*). Among the shrub species are swamp privet (*Forestiera acuminata*), buttonbush (*Cephalanthus occidentalis*), and planertree (*Planera aquatica*). Woody vines include red vine (*Brunnichia ovata*). A variety of herbaceous plants will be commonly seen and take the form of flotants, emergents, and submergents. Frequently, a variety of mosses and lichens adorn the exposed tree trunks, and the crowns may be draped with Spanish moss (*Tillandsia usneoides*).

Overcup Oak- Water Hickory

This type usually occurs in low, poorly drained flats and sloughs with tight clay or silty clay soils. These sites are the lowest within the first bottoms and are subject to late spring inundations. Overcup oak (*Quercus lyrata*) and water hickory (*Carya aquatica*) together constitute the majority. Associates include willow oak (*Quercus phellos*), Nuttall oak (*Q. nuttalli*), cedar elm (*Ulmus crassifolia*), green ash, and water locust. Minor associates include black willow, persimmon, and sweetgum (*Liquidambar styraciflua*). Common shrub species include swamp privet, hawthorn (*Crataegus spp*), buttonbush, planertree, and deciduous holly (*Ilex decidua*). Woody vine species often associated include red vine, peppervine (*Ampelopsis arborea*), trumpet-creeper (*Campsis radicans*), and possibly greenbrier (*Smilax spp*). Panicums, asters, annual grasses, and cocklebur may occur in openings within the stand.

Sugarberry-American Elm-Green Ash

This type usually is found on the transitional areas between the sweetgum-willow oak type which occupies higher elevations and the overcup oak-water hickory type which occurs at lower elevations. It occupies low ridges, flats, and sloughs in first bottoms. Sugarberry, American elm (*Ulmus americana*), and green ash represent the majority of the stocking. Major associates include water hickory, Nuttall oak, willow oak, water oak (*Q. nigra*), overcup oak, sweetgum and boxelder (*Acer negundo*). Other associates include honeylocust (*Gleditsia triacanthosa*), waterlocust, red maple (*Acer rubrum*), sycamore (*Platanus americana*), and cottonwood. Understory species include hawthorn, mulberry (*Morus rubra*), trumpet-creeper, peppervine, red vine, rattan vine (*Berchemia scandens*), grape (*Vitis spp*), Virginia creeper (*Parthenocissus quinquefolia*), and poison-ivy (*Toxicodendron radicans*). Herbaceous plants include bedstraw, violet, wild carrot, wild lettuce, mint, legumes, sedge, smartweed, and false indigo.

Sweetgum-Willow Oak

The low ridges in the broad slackwater areas of the first bottom are typically occupied by this forest type. Willow oak and sweetgum comprise the largest proportion of the stocking in stands of this type. There are extensive areas of this type on the poorly drained willow oak flats on the refuge. These stands are strongly dominated by willow oak because of the heavy clay soils. Sweetgum often forms only a minor proportion of the stocking. A major associate on higher clay ridges and flats is Nuttall oak, which may represent 30 - 50 percent of the composition. Other trees associated with this forest type are sugarberry, green ash, overcup oak, water oak, water hickory, cedar elm,

persimmon, and sometimes baldcypress. Common shrubs include swamp privet, American snowbell (*Styrax americanus*), deciduous holly, and hawthorn. Woody vines occasionally present are greenbrier, peppervine, and red vine.

Cottonwood

Cottonwood (*Populus deltoides*) is the dominant species and comprises a majority of the stocking. Associates include willow, pecan (*Carya illinoensis*), sycamore, and sugarberry. This type is found along the banks of major rivers on sandy soils and is a pioneer successional stage type. Cottonwood will outgrow willow and eventually become dominant unless the site frequently floods, and then willow will out-compete the cottonwood. The next successional stage includes sycamore, pecan, sugarberry, green ash, American elm, red maple, and boxelder.

After willow and cottonwood drop out, this type will become a sugarberry-American elm-green ash type.

Invasive Plants

Invasive, exotic plants are a large problem on the refuge. Because refuge lands were highly disturbed through timber clearing and agriculture, invasive plants flourished. Chinese tallowtree (*Triadica sebifera*) is one of the most injurious species present. Others found on the refuge include Chinese privet (*Ligustrum sinense*), Chinaberry (*Melia azedarach*), mimosa (*Albizia julibrissin*), royal paulownia (*Paulownia tomentosa*), tree-of-heaven (*Ailanthus altissimus*), trifoliate orange (*Poncirus trifoliata*), Japanese honeysuckle (*Lonicera japonica*), and water hyacinth (*Eichhornia crassipes*). Chinese tallowtree is increasing exponentially and is an imminent threat to wildlife habitats. This species causes large-scale ecosystem disruption by replacing native vegetation, which reduces native species diversity, which in turn has a negative impact on wildlife. The tallowtree can quickly become the dominant plant in disturbed areas and invade bottomland forests, such that it earned a spot on the "America's Least Wanted-The Dirty Dozen" list of The Nature Conservancy (Flack and Furlow 1996).

Uplands

Currently, the refuge has only 30 acres of upland habitat. Some of this is stocked with a loblolly pine plantation that is approximately 15 years old. The rest is largely grassy (broomsedge, Bermuda) areas, cane thickets, and upland hardwood.

Moist-soil – Agriculture

A total of 1,068 acres is currently managed as moist-soil rotated with agriculture. Usually, half of the agriculture acreage is farmed while the other half is managed as moist-soil. Then in the following year, the areas are swapped, keeping this rotation so that the land is farmed (disked) every two years. Rice is the primary crop, but millet and milo are farmed also. An additional 578 acres are managed as moist-soil only.

HABITAT CHANGES FROM HISTORIC TO CURRENT CONDITIONS

After the United States acquired Louisiana, American settlers established farms in the uplands around the lower Red River throughout the first half of the 19th Century. By 1812, fields were cleared along the river up to Natchitoches. Settlers' farmed cotton, established

businesses, and introduced livestock. Captain Shreve began removal of the Great Red River Raft in 1833. Removal of the raft continued for the next 40 years and by 1873 navigation had been permanently established along the Red River. By 1892, levees and channelization had begun along with the practice of clearing the banks of trees to keep them from falling into the river and creating logjams. Dredging of the river began in 1908. Large-scale timber clearing began in the early 1900s (Triska 2008). In the mid-1900s, the areas that had reverted to timber were cleared to farm soybeans. Changes in the meandering of the Red River and forest cover since 1938 can be seen in Figure 6. In the mid-2000s, one of the country's largest natural gas fields, Haynesville shale, was discovered. Large-scale drilling of wells has fragmented much of the Red River Valley.

Overall European settlement brought introduced animals and plants into the Valley. The river was channelized, dredged, and leveed. The Great Red River Raft was completely removed, and timber clearing was conducted on a large scale. Prairies were plowed, swamps were drained, and fire was eliminated. Large mammals such as the bison, elk, cougar, and wolf were extirpated.

The effects of global climate change might gradually increase at Red River NWR over the next 100 years. Within the 15 year time-frame of this plan, smaller impacts may be seen. According to the report "Global Climate Change Impacts in the United States" (2009), it is expected there will be higher temperatures, less rainfall, particularly in winter and spring, increased storm intensity, and frequency, and more drought throughout the Southeast. It is anticipated that temperatures will increase by at least 4.5oF by 2080, and fire severity will increase 10 to 30 percent within the next 50 years. Within the next 15 years, increasing impacts of higher temperatures will likely cause the spread of invasive species and small changes to native plant and animal distributions. Migratory birds will probably breed and winter a little further north. More southern, tropical species, (i.e., black-bellied whistling ducks, wood storks) will extend their ranges into Louisiana. Invasive species such as *Salvinia*, water hyacinth, tallotree, etc., will become more established and extend their ranges further north. The source of these impacts is difficult to isolate as caused either in part or in full by global climate change, but is anticipated nevertheless. This HMP addresses these short-term anticipated impacts of invasive species and community shifts through habitat management objectives. Impacts including increased drought, fire severity, and storm intensity cannot be influenced by the scope of this HMP.

Table 2. Historical timeline for the area surrounding Red River NWR

Time	Event
10,000 BC	First evidence of American Indians living in the Red River Valley
500 BC	Caddo people began to settle, build villages, and cultivate plants
1300 AD	Caddo settlements widely dispersed across river tributaries in Red River Valley
1542-1543	First known European explorers, de Soto-Moscoso, travel through Red River Valley
Late 1600s,	European diseases expose Caddo people, leading to decreased populations and settlements by early 1800s
1714	French establish outpost at Natchitoches
1806	Freeman and Custis expedition of Red River indicate prairies, canebrakes, and cedar groves along the river
1833	Captain Shreve begins clearing the Great Red River Raft
1873	Navigation along the Red River permanently established
1892	Channelization of the Red River begins
1908	Dredging of the Red River begins
Early 1900s	Large scale timber clearing occurs
1964	Initiation of the Red River Waterway project
1970s	Soybean prices skyrocket, causing timber clearing for agriculture
1994	Red River Waterway project, consisting of five lock and dams, completed
2000s	Haynesville gas field discovered; numerous wells drilled

III. Resources of Concern

IDENTIFICATION OF REFUGE RESOURCES OF CONCERN

Priorities associated with wildlife and habitat management for the Refuge System are determined through directives, policies, and legal mandates. Resources of concern include species, species groups, and/or communities that support refuge purposes as well as Service trust resource responsibilities (including threatened and endangered species and migratory birds). Resources of concern are also native species and natural, functional communities such as those found under historic conditions that are to be maintained and, where appropriate, restored on a refuge (601 FW 3.10B(1)).

Resources of concern for Red River NWR were selected after taking into account the conservation needs identified within international, national, regional, or ecosystem goals/plans; state fish and wildlife conservation plans; and previously approved refuge resource management plans as identified in the comprehensive conservation planning policy (602 FW 3.4C(1)(e)) as well as Chapter I of this HMP. The species/communities selected as resources of concern from these plans support the following Refuge System mandates:

- Support refuge purposes and the Refuge System mission;
- Conserve biological integrity, diversity, and environmental health (giving special consideration to rare, declining, or unique natural communities, species, and ecological processes within the refuge boundary and the WGCP);
- Fulfill Service trust resource responsibilities;

Resources of concern identified for Red River NWR include:

- Wintering waterfowl
- Migrating shorebirds
- Migrating rails
- Bottomland hardwood forests

WINTERING WATERFOWL

This suite of species has been selected as a resource of concern because it: (1) Supports the refuge purpose; (2) contributes to landscape level conservation priorities (NAWMP, WGCP); and (3) fulfills Service trust resource responsibilities (Migratory Bird Treaty Act). Red River NWR is located in the confluence of the Central and Mississippi Flyways, which are critical ecoregions for migrating and wintering dabbling ducks, wood ducks, and geese in North America (Reinecke et al. 1989), as well as southern breeding populations of wood ducks. Red River NWR was given the WGCP step-down objective of 1,012 acres (1.9 million DEDs) of moist-soil habitat and 259 acres of unharvested rice (6.2 million DEDs) by the LMVJV. The refuge's agricultural fields and moist-soil units attract tens of thousands of mallards, teal, gadwall, and wood ducks during the winter.

MIGRATING SHOREBIRDS

This suite of species has been selected as a resource of concern because it: (1) Supports the refuge purpose; (2) contributes to landscape level conservation priorities (NAWMP, WGCP); and (3) fulfills Service trust resource responsibilities (Migratory Bird Treaty Act). Red River NWR is located in the confluence of the Central and Mississippi Flyways. Shorebirds utilize the refuge during spring and fall migration. However, shorebird habitat is most limited during the autumn when water is scarce. The U.S. Shorebird Conservation Plan for the Lower Mississippi Valley and WGCP calls for 520 ha of shorebird habitat in Louisiana (Elliot and McKnight 2000). One of the primary objectives of the plan is for public lands to provide early summer/fall habitat for migrating shorebirds. The potential to manage moist-soil units at Red River NWR for shorebirds is very good.

MIGRATING RAILS

This suite of species has been selected as a resource of concern because it: (1) Supports the refuge purpose; (2) contributes to landscape level conservation priorities (NAWMP, WGCP); and (3) fulfills Service trust resource responsibilities (Migratory Bird Treaty Act). Rails are secretive birds dependent on wetland habitat with emergent vegetation (Eddleman 1988). Three species of rails that are species of concern and are known to utilize Red River NWR during some part of the year are the sora, yellow rail, and king rail. Both king and yellow rails are listed as threatened or endangered by various states. Of these three, king rails have suffered the greatest decline in populations. The loss of wetlands is thought to be the primary factor (Meanley 1992). Soras are also reported as having declined in numbers according to Breeding Bird Surveys (Melvin and Gibbs 1996). Yellow rails are one of the least studied rails (Bookhout 1995) and are listed on Audubon's Watchlist (Butcher et al. 2007). Yellow rails, king rails, and soras have been observed during both spring and fall migration on the refuge. The potential to benefit migrating rails is significant.

WINTERING WOODCOCK

American woodcock (*Scolopax minor*) has been selected as a resource of concern because it: (1) Contributes to landscape level conservation priorities (NAWMP, WGCP); and (2) fulfills Service trust resource responsibilities (Migratory Bird Treaty Act). Woodcock are considered a high-priority species by Partners in Flight (Rich et al. 2004) due to declining populations (Krementz and Jackson 1999). The opportunity to provide wintering woodcock habitat on Red River NWR is good due to moist bottomland hardwood forests in close proximity to open fields.

HABITAT REQUIREMENTS OF RESOURCES OF CONCERN

WINTERING WATERFOWL

Red River NWR is located within the WGCP. North American waterfowl have seasonally dynamic life-cycle needs that are fulfilled by use of a diversity of habitats and foods throughout their annual range, which, for most species, is continental in scale in contrast to resident wildlife. Indeed, habitat (*both* its quantity and quality) is the primary template for ecological strategies of waterfowl (and all wildlife) and a critical determinant of their survival and productivity. Hence, sustaining viable and harvestable populations of waterfowl depends on conservation and management of habitats throughout the flyways of North America. Concerning wintering habitat, dabbling ducks need a diversity of wetlands including the following: (1) Natural wetlands

(both moist-soils and bottomland hardwood forest), (2) flooded crop land, and (3) refuge (i.e., sanctuary) (Reinecke et al. 1989).

Two natural wetland habitats that ducks have used historically in the region are bottomland hardwood forests and moist-soil habitats (i.e., early successional grass-sedge and other herbaceous vegetated wetlands). These natural wetlands are critical foraging and resting habitats. Both hardwood bottomlands and moist-soil habitats are rich in high-energy natural seeds (e.g., acorns in oak bottomlands; grass-sedge seeds, roots, tubers, etc., in moist-soil areas) and aquatic invertebrates. Trees significant as hard mast producers are members of the red oak family, chiefly Nuttall oak, willow oak, water oak, and cherrybark oak and hickory family. Soft mast important to ducks includes tupelo, elms, and ashes. Invertebrates associated with the litter layer in forests provide an invaluable food source for waterfowl (Heitmeyer 1988). Several species of waterfowl heavily utilize flooded forested habitat in winter for resting and foraging for acorns, other fruits, various seeds, and invertebrates. Wood ducks seek these habitats almost exclusive of other habitats. Mallards, gadwall, and wigeon all utilize flooded forested habitat as one of the complex of preferred habitats (Fredrickson and Heitmeyer 1988). These areas are vital to waterfowl for pair bonding, loafing, sanctuary, thermal cover, and feeding (Reinecke et al. 1989). Ducks like openings in the woods to allow them easy access. Small groups of trees (3-5) that dominate canopy coverage can be removed to provide the openings that ducks prefer for landing (USFWS 2005).

Moist-soil habitats historically occurred in bottomland hardwood forests where openings created by disturbance allowed sunlight to reach the ground. Native plants such as smartweed, millets, and others provide a wide array of basic nutritional components for waterfowl. Most research has focused on estimating seed production and studies have shown that, under intensive management, species of barnyard grass (*Echinochloa* spp.), sprangletop (*Leptochloa* spp.), flatsedge (*Cyperus* spp.), smartweed (*Polygonum* spp.), and panicum (*Panicum* spp.) can produce more than a 1,000 pounds/acre of seed (Fredrickson and Taylor 1982). However, we know far less about production that might be occurring under current conditions in the LMV. Reinecke et al. (1989) suggested an average of 400 pounds/acre of seed might be reasonable because of site and staff limitations. More recently, the LMVJV Waterfowl Working Group used available moist-soil seed estimates of nearly 500 pounds/acre reported by Kross (2006) to increase the value of this habitat to 1,883 DEDs per acre. Regardless of the quantity of seed produced, moist-soil impoundments are highly recommended as a means of diversifying habitat (Fredrickson and Taylor 1982, Reinecke et al. 1989) and supplying food with nutrients not generally available in agricultural grains. Dabbling ducks, such as mallards, teal, gadwall, and pintails, prefer foraging in water depths of 0.5 to 12 inches, and foods covered by more than 18 inches of water are inaccessible to ducks (Strader and Stinson 2005). Migrating and wintering waterfowl concentrate in the MAV from September through early April (Strader and Stinson 2005); therefore, the refuge will provide habitat during this critical period.

Only 20 percent of bottomland hardwood forests remain today (Tiner 1984). Due to significant landscape level loss of natural wetlands, farming for waterfowl is extremely important. Because waterfowl populations today are unable to acquire all of their nutritional requirements from natural wetlands, high carbohydrate crops provide vital energy to sustain ducks throughout the winter. High-energy foods such as corn, rice, milo, millet, and soybeans are critically important to waterfowl during cold periods and for migration and subsequent reproduction. Nesting dates and clutch size are thought to be directly correlated with the amount of nutrition obtained on the wintering grounds (Ringelman 1990).

Waterfowl need sanctuary from human disturbance. Winter is an important season in the life of waterfowl. It is a biological preparatory period during which many ducks and geese pair and perform other life functions (e.g., females of some species, such as the mallard, undergo a prebasic molt to acquire their breeding-season plumage) in readiness for reproduction. Disturbance-free habitat enables some species of waterfowl to prepare biologically for spring migration and reproduction (Reinecke et al. 1989, Strickland and Tullos 2009). Disturbance can interrupt resting and feeding bouts resulting in a loss of energy and lowering of body weight (Henry 1980; Heitmeyer and Raveling 1988; Kahl 1991). In Louisiana, Paulus (1984) found that increased foraging time by gadwalls was insufficient to counterbalance disturbance factors.

MIGRATING SHOREBIRDS

Shorebirds migrate long distances from breeding to wintering grounds, stopping along the route to build up fat reserves. Because adults migrate before juveniles, the fall migration period is extended. Fall migration in north Louisiana will occur from July through October. Because shorebird habitat is most limited during the fall migration (Elliot and McKnight 2000) Red River NWR will focus its shorebird management during this time. Most shorebirds prefer shallowly flooded wetlands with water depths of < 10 cm (Helmert 1992). Different species tolerate varying amounts of vegetation within these wetlands. The majority of shorebird habitat used will have less than 25 percent vegetative cover (Helmert 1992). For example, plovers, least terns, western and semipalmated sandpipers prefer little vegetation in favor of mudflats. However, larger sandpipers such as upland and pectoral sandpipers will utilize wetlands with short-to-medium height vegetation.

Management of shorebird habitat involves providing habitat anytime from July to October. If impoundments are dry during the spring, then flood 10-15 cm for 2-3 weeks following shallow disking (Elliot and McKnight 2000). If the fields are flooded throughout spring, then they will be slowly drawn down (or let evaporation do the work) in late summer. Ideally, several impoundments can be drawn down in a staggered fashion to ensure habitat is available throughout the migration period (Helmert 2000).

MIGRATING RAILS

Rail habitat is characterized by robust emergent, non-woody vegetation interspersed with open water (Valente 2009). Although relatively little is known about the habitat needs of migrating rails, recent work has shed some light on the subject. Perkins et al. (2009) captured rails during migration in the LMRV. The average water depth in which rails were captured was 10.1 cm. Rails were found in millet, sedges, smartweed, and harvested and unharvested rice. Perkins et al. (2009) recommend managers provide shallowly flooded moist-soil with emergent vegetation in late August for fall migration. Darrah and Krementz (2008) looked at habitat requirements for breeding king rails. They found breeding king rails to be correlated with high open water-vegetation interspersion with little woody vegetation. Interspersion (defined at its greatest as 50:50 ratio of plant and water cover) was found to be highly correlated with density of breeding rails (soras, least bitterns, American bitterns, Virginia rails) in New York (Rehm and Baldassarre 2007). Shorebird management will certainly conflict with habitat management for rails (Perkins et al. 2009); therefore, rail management will have to be conducted on separate impoundments. Rails have been documented using Red River NWR during both spring and fall. Yellow rails have been recorded on the refuge as late as April 30. Researchers looked for king rails during the winter of 2009-10 and only one bird was found in November (Butler, personal comm.). All indications are that the birds are utilizing the refuge during migration.

WINTERING WOODCOCK

Woodcock spend their winter in the southeastern United States where their diurnal and nocturnal habitat needs are met. They forage almost exclusively on worms, requiring them to migrate in winter to areas where soils have not become frozen. Diurnal habitat is characterized by a high number of woody stems per acre in mixed hardwood-pine and bottomland hardwood habitats (Horton and Causey 1979, Krementz and Pendleton 1994). Straw et al. (1986) found woodcock preferred diurnal habitat to have 5,200-7,400 saplings/ha, 12-17 percent bare ground, and 75-84 percent canopy cover. Nocturnal habitat is often herbaceous fields and other open areas. Berdeen and Krementz (1998) found woodcock used fallow fields and clearcuts more often than pastures. They also determined that fields were characterized by a high percentage of bare soil, greater foliage volume from .8 to 2 meters in height, and larger than 5.5 ha in size. Woodcock need nocturnal and diurnal habitat to be close, under a half mile (Berdeen and Krementz 1998, Krementz and Jackson 1999).

IV. Habitat Management Goals and Objectives

For habitats that require active management, goals and objectives were developed in the refuge's CCP, which are expanded upon or combined in this HMP to fulfill the refuge purposes. A habitat management goal is a broad, qualitative statement that is derived from the established purposes and vision of the refuge. Goals and objectives pertain to resources of concern identified in Chapter III.

BOTTOMLAND HARDWOOD FOREST HABITAT GOAL

Restore, enhance, and manage healthy bottomland hardwood forests and associated habitat in order to support a natural diversity of plant and animal species that will foster the ecological integrity of the Red River Valley Ecosystem.

➤ Objective 4.1.1:

In Management Units HQ4, Dill6, Pin1, BP8, BP9, BP10, SLL2, LC13, LC14, LC15, and LC16, implement adaptive management to maintain and work towards a basal area of 60-90 ft²/acre, for a canopy cover between 60-80 percent, 30-60 percent mid-story cover, 30-40 percent understory cover, and 20-50 percent ground cover, with regeneration of hard mast producing species (e.g., oaks and water hickory) present on 30-50 percent of inventory plots (LMVJV 2007) supporting CCP Objectives A-4, A-7, B-2.

Resource of Concern: Wintering woodcock and wintering waterfowl

Rationale: This objective will achieve a diverse forest with a thick understory, well-developed mid-story, and plenty of canopy dominants to produce hard and soft mast, provide snags, and regeneration. Wintering waterfowl benefit from the promotion of mast producing tree species. Wintering woodcock will benefit from the dense understory for diurnal habitat. Newly thinned areas with patch cuts will provide nocturnal habitat.

Adaptive Management Monitoring Elements:

1° Habitat Response Variables	Probable Methods
<ul style="list-style-type: none">Forest overstory structure and compositionForest mid-story and understory structureBottomland hardwood forest health and productivity for wildlife	<ul style="list-style-type: none">Forest cruise/inventory sampling (traditional parameters, e.g., BA, overstory CC, stocking, species composition, mid-story cover; 1x/15 yrs, 2-5% sample)Annual hard mast survey
1° Wildlife Response Variables	Probable Methods
<ul style="list-style-type: none">Wintering waterfowlWintering woodcock presence	<ul style="list-style-type: none">Wintering waterfowl countsWoodcock evening surveys

➤ Objective 4.1.2:

In Management Units HQ4, Pin1, BP8, BP9, BP10, LC13, LC14, LC15, and LC16, where regeneration is highly likely in mature forest, maintain < 60 percent canopy cover on 5-10 percent of the bottomland hardwood forest to allow regeneration of shade intolerant trees (e.g., sweetgum, Nuttall oak, and willow oak), and leave 4 to 6 super-emergent trees per acre as a seed source (LMVJV 2007) supporting CCP Objectives A-4, A-7, B-2.

Resource of Concern: Wintering woodcock and wintering waterfowl

Rationale: Promoting regeneration of the forest ensures the perpetuity of bottomland hardwood forest. Wintering woodcock benefit from patch cuts for nocturnal habitat and ensuing thick understory for diurnal habitat.

Adaptive Management Monitoring Elements:

1° Habitat Response Variables	Probable Methods
<ul style="list-style-type: none">▪ Forest overstory structure and composition▪ Forest mid-story and understory structure▪ Bottomland hardwood forest health and productivity for wildlife	<ul style="list-style-type: none">▪ Forest cruise/inventory sampling (traditional parameters, e.g. BA, overstory CC, stocking, species composition, mid-story cover; 1x/15 yrs, 2-5% sample)▪ Annual hard mast survey
1° Wildlife Response Variables	Probable Methods
<ul style="list-style-type: none">▪ Wintering waterfowl▪ Wintering woodcock presence	<ul style="list-style-type: none">▪ Wintering waterfowl counts▪ Woodcock evening surveys

➤ Objective 4.1.2:

In Management Units HQ4, Pin1, BP8, BP9, BP10, LC13, LC14, LC15, and LC16, where regeneration is highly likely in mature forest, maintain < 60 percent canopy cover on 5-10 percent of the bottomland hardwood forest to allow regeneration of shade intolerant trees (e.g., sweetgum, Nuttall oak, and willow oak), and leave 4 to 6 super-emergent trees per acre as a seed source (LMVJV 2007) supporting CCP Objectives A-4, A-7, B-2.

Resource of Concern: Wintering woodcock and wintering waterfowl

Rationale: Promoting regeneration of the forest ensures the perpetuity of bottomland hardwood forest. Wintering woodcock benefit from patch cuts for nocturnal habitat and ensuing thick understory for diurnal habitat.

Adaptive Management Monitoring Elements:

1° Habitat Response Variables	Probable Methods
<ul style="list-style-type: none">▪ Forest overstory structure▪ Area (acres) in condition▪ Hardwood regeneration within target treated areas	<ul style="list-style-type: none">▪ Forest cruise/inventory sampling (traditional parameters, e.g., BA, over-story CC, stocking; 1x/15yrs, 2-5 percent sample)▪ GIS stand maps and harvest records▪ Regeneration sample plots
1° Wildlife Response Variables	Probable Methods
<ul style="list-style-type: none">▪ Wintering waterfowl abundance	<ul style="list-style-type: none">▪ Wintering waterfowl counts

➤ Objective 4.1.3:

In Management Units HQ4, Dill6, Pin1, BP8, BP9, BP10, SLL2, LC13, LC14, LC15, and LC16, work towards maintaining 2 to 4 logs/acre to provide coarse woody debris, 4 to 6 cavity trees >4" in dbh per acre, and 1 to 4 large den trees or "unsound cull" trees per 10 acres in bottomland hardwood forest to increase habitat for resident wildlife, such as amphibians, reptiles, bats, bears, and cavity-nesting birds (LMVJV 2007) supporting CCP Objectives A-4, A-7, B-2.

Resource of Concern: Wintering woodcock and wintering waterfowl

Rationale: Some of the characteristics of a mature bottomland hardwood forest are snags, den trees, and coarse woody debris (LMVJV 2007).

Adaptive Management Monitoring Elements:

1° Habitat Response Variables	Probable Methods
<ul style="list-style-type: none">▪ Forest structure components (snag, CWD, cavities)	<ul style="list-style-type: none">▪ Forest cruise/inventory sampling; 1x/15 years; 2-5 percent sample
1° Wildlife Response Variables	Probable Methods
<ul style="list-style-type: none">▪ Forest breeding birds (species composition and abundance)▪ Reptile and amphibian community (species composition and abundance)	<ul style="list-style-type: none">▪ Breeding landbird survey (point counts)▪ Anuran call survey (3 x/year/3 years)▪ Herpetofauna survey (1x/3 years, drift fence or cover board methods)

➤ Objective 4.1.4:

In Management Units HQ4, Pin1, BP8, BP9, BP10, LC13, LC14, LC15, and LC16, retain and enhance all baldcypress and water tupelo stands towards old-growth attributes including basal area >30 ft²/acre, dbh > 25 inches, and > 80 feet tree height and in mixed hardwood bottomland habitat favor baldcypress and tupelo supporting CCP Objective B-2.

Resource of Concern: Wintering woodcock and wintering waterfowl

Rationale: A characteristic of bottomland hardwood forest is the presence of large baldcypress and water tupelo trees. These trees serve as cavity trees for a variety of birds and mammals.

Adaptive Management Monitoring Elements:

1° Habitat Response Variables	Probable Methods
<ul style="list-style-type: none">▪ Area (acres) of cypress/tupelo stands▪ Tree size distribution within stand	<ul style="list-style-type: none">▪ GIS stand maps (GPS stand edges 1x/years)▪ Stand inventory (1x/15 years)
1° Wildlife Response Variables	Probable Methods
<ul style="list-style-type: none">▪ Bat use of cavity trees	<ul style="list-style-type: none">▪ Cavity checks (note high variability in response variable may limit interpretation)

MANAGED WETLANDS AND AGRICULTURE GOAL

Promote efforts to combine farming and the management of closely associated moist-soil units in order to provide essential habitat for migratory birds and other wetland-dependent species.

➤ Objective 4.2.1:

In Management Units Dill1-5, BP1-7, SLL1, and LC1-12, starting in mid-August, flood some impoundments gradually to < 18" in fall (Fredrickson 1991) and drawdown spring/summer to provide wintering waterfowl habitat. Continue a staggered flooding and drawdown for all impoundments so that there will be freshwater at all times throughout the winter supporting CCP Objective C-2.

Resources of concern: Wintering waterfowl

Rationale: Dabbling ducks prefer to forage in water less than 18 inches in depth (Fredrickson 1991). Water will be provided on different impoundments at all times from August to April to provide for blue-winged teal migrations in spring and fall and wintering

habitat for other species of dabblers. Strader and Stinson (2005) recognize that concentrations of waterfowl in the MAV occur from September through early April. The pumping of water in August should allow sufficient water to be available in September for blue-winged teal. An April drawdown will ensure water available for spring migrating teal and still allow for preferred plants to germinate including millet, smartweed, and chufa (Strader and Stinson 2005).

Adaptive Management Monitoring Elements:

1° Habitat Response Variables	Probable Methods
<ul style="list-style-type: none"> Water level by date 	<ul style="list-style-type: none"> Staff gauges (1/x days)
1° Wildlife Response Variables	Probable Methods
<ul style="list-style-type: none"> Wintering waterfowl use 	<ul style="list-style-type: none"> Waterfowl counts (bi-weekly September 15-April 01)

➤ Objective 4.2.2:

Maintain and enhance one-half of the acreage in Management Units LC1-12 and all of Management Units Dill1-5, BP1-7, and SLL1, with a grass/sedge composition of 70-80 percent cover (e.g., sprangletop, panicum, millet, toothcup, smartweed, and Carex spp.), and keep non-desirables (e.g., coffeeweed and cocklebur) to less than 20 percent to support foraging habitat for wintering waterfowl (Strader and Stinson 2005) supporting CCP Objectives C-1, C-2.

Resources of Concern: Wintering waterfowl

Rationale: Moist-soils management will be directed towards managing for preferred foods by waterfowl.

Adaptive Management Monitoring Elements:

1° Habitat Response Variables	Probable Methods
<ul style="list-style-type: none"> Crop yield 	<ul style="list-style-type: none"> GIS Mapping (annual records) Commercial yield estimates by acres produced
1° Wildlife Response Variables	Probable Methods
<ul style="list-style-type: none"> Wintering waterfowl use (DED) 	<ul style="list-style-type: none"> Waterfowl Counts (bi-weekly September 15-April 01)

➤ Objective 4.2.4:

In Management Units Dill1-5, BP1-7, SLL1, and LC1-12, keep some impoundments flooded 5-20 cm in fall (August-October) and spring (March-May) (Perkins et al. 2009) with robust herbaceous plants (i.e., cutgrass, cattails) interspersed with open water at a ratio of 50:50 (Rehm and Baldassarre 2007, Valente 2009) to provide migrating rail habitat supporting CCP Objective A-6.

Resources of Concern: Migrating rails

Rationale: Perkins et al. (2009) captured rails during migration in the LMRV. The average water depth in which rails were found was 10.1 cm. Rails were found in millet, sedges, smartweed, and harvested and un-harvested rice. Perkins et al. (2009) recommend managers provide shallowly flooded moist-soil with emergent vegetation in late August for fall migration. Rail habitat is characterized by robust emergent, non-woody vegetation interspersed with open water (Valente 2009). Rails have been documented using Red River NWR during both spring and fall. Yellow rails have been recorded on the refuge as late as April 30.

Adaptive Management Monitoring Elements:

1° Habitat Response Variables	Probable Methods
<ul style="list-style-type: none">▪ Water level by date▪ Vegetation measurements	<ul style="list-style-type: none">▪ Staff gauges (1/week)▪ Cover/frequency
1° Wildlife Response Variables	Probable Methods
<ul style="list-style-type: none">▪ Rail use	<ul style="list-style-type: none">▪ Rail counts (1 x/season)

➤ Objective 4.2.5:

In Management Units Dill1-5, BP1-7, SLL1, and LC1-12, flood some impoundments in July with < 25 percent vegetation cover to 10-15 cm (Helmers 1992, Elliot and McKnight 2000) to provide migrating shorebird habitat supporting CCP Objective A-6.

Resources of Concern: Migrating shorebirds

Rationale: Most shorebirds prefer shallowly flooded wetlands with water depths of < 10 cm (Helmers 1992). Different species tolerate varying amounts of vegetation within these wetlands. However, the majority of shorebird habitat used will have less than 25 percent vegetative cover (Helmers 1992). Management of shorebird habitat involves providing habitat anytime from July to October.

Adaptive Management Monitoring Elements:

1° Habitat Response Variables	Probable Methods
<ul style="list-style-type: none">Water level by date	<ul style="list-style-type: none">Staff gauges (1/week)
1° Wildlife Response Variables	Probable Methods
<ul style="list-style-type: none">Shorebird use	<ul style="list-style-type: none">Shorebird counts (3 x/month)

➤ Objective 4.2.6:

Maintain a minimum of 25 percent of refuge as waterfowl sanctuary and use adaptive management for yearly regulations, delineations, and modifications supporting CCP Objective A-2.

Resources of Concern: Wintering waterfowl

Rationale: Disturbance-free habitat enables some species of waterfowl to prepare biologically for spring migration and reproduction (Reinecke et al. 1989, Strickland and Tullos 2009). Disturbance can interrupt resting and feeding bouts resulting in a loss of energy and lowering of body weight (Henry 1980; Heitmeyer and Raveling 1988; Kahl 1991). In Louisiana, Paulus (1984) found that increased foraging time by gadwalls was insufficient to counterbalance disturbance factors.

Adaptive Management Monitoring Elements:

1° Habitat Response Variables	Probable Methods
<ul style="list-style-type: none">Area (acres) in sanctuaryLevel (frequency/degree) of disturbance events	<ul style="list-style-type: none">GIS mapping (annual records)Law enforcement logs
1° Wildlife Response Variables	Probable Methods
<ul style="list-style-type: none">Wintering waterfowl use	<ul style="list-style-type: none">Waterfowl counts (bi-weekly September 15-April 01)

UPLANDS GOAL

➤ Objective 4.3.1:

In Management Unit SLL3, maintain a warm-season herbaceous groundcover to provide for wintering woodcock, supporting CCP Objective A-4.

Resources of Concern: Wintering woodcock

Rationale: Wintering woodcock utilize grassy fields for displaying grounds and nocturnal habitat (Berdeen and Krementz 1998).

Adaptive Management Monitoring Elements:

1° Habitat Response Variables	Probable Methods
▪ Vegetation measurements	▪ Cover/frequency
1° Wildlife Response Variables	Probable Methods
▪ Use by wintering woodcock	▪ Woodcock evening surveys

V. Habitat Management Strategies

MOIST-SOIL MANAGEMENT STRATEGIES

POTENTIAL STRATEGIES

Preferred moist-soil plants for foraging waterfowl are typically heavy seed producing annuals, such as wild millets, smartweeds, sprangletop, other grasses, and sedges. Soil disturbance and moisture are critical for the production of these desirable plants. Failure to disturb the soil (i.e., disking) will allow the invasion of perennials, both herbaceous and woody, that out-compete annual plants and greatly reduce waterfowl food production. Therefore, it is critical that the moist-soil areas be maintained using whatever means available if the refuge is to meet its waterfowl foraging objectives (Strader and Stinson 2005).

Moist-soil habitat management generally requires active management of soil and hydrology to promote productive and diverse stands of moist-soil plants. Management actions include drawdown timing and duration, mowing, disking, or chemicals to keep units in early successional stages (Strader and Stinson 2005).

These actions are used to maximize waterfowl food production and usage.

Desirable moist-soil vegetation at Red River NWR consists mostly of *Leptochloa*, *Echinochloa*, toothcup, and some *Cyperus* species.

Drawdown and flooding should be spaced out over time across the impoundments in order to provide habitat for shorebirds and waterfowl throughout fall and winter. The variable timing of a drawdown will also produce different moist-soil plants. Some impoundments should be flooded from late August through early September to provide water for migrating blue-winged teal, pintail, and shorebirds. Drawdown should be conducted by April 15; however, later drawdown may be necessary to control unwanted vegetation (Strader and Stinson 2005). Ideal depths for foraging dabbling ducks are less than 12 inches; if water depths exceed 18 inches, food will be out of reach (Strader and Stinson 2005).

MANAGEMENT STRATEGY PRESCRIPTION

To meet Objectives 4.2.1 and 4.2.2 in Management Units Dill1-5, BP1-7, SLL1, and LC1-12 for wintering waterfowl, the following strategies will be used to manage moist-soil habitat:

- Every 2-5 years, disk impoundment (when sufficiently dry to drive tractor) to reduce succession by woody plants and other undesirable vegetation.
- Annually, place boards in water control structures in August-October to hold water or if not sufficient rainfall, pump water to achieve < 18 inches depth.
- Drawdown during spring/summer.
- Monitor vegetation growth for percent cover of undesirable plants. If undesirables exceed 20 percent cover, manipulate vegetation through mechanical (i.e., disking) or chemical means.
- Maintain records by date for water management actions, water elevations, vegetation, and wildlife response.

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- Use sampling techniques in Strader and Stinson (2005) to determine percent cover of plant species and seed production to determine if management actions need to be changed to meet objectives.

To meet Objectives 4.2.1 and 4.2.2 in Management Units Dill1-5, BP1-7, SLL1, and LC1-12 for migrating shorebirds, the following strategies will be used to manage moist-soil habitat:

- Shallowly disk impoundment (when sufficiently dry to drive tractor) to reduce succession by woody plants before flooding each year.
- Annually, place boards in water control structures in July to hold water or if not sufficient rainfall, pump water to achieve < 15 cm depth for 2-3 weeks.
- Allow evaporation to occur or slowly drawdown.
- Maintain records by date for water management actions, water elevations, vegetation, and wildlife response.

To meet Objectives 4.2.1 and 4.2.2 in Management Units Dill1-5, BP1-7, SLL1, and LC1-12 for migrating rails, the following strategies will be used to manage moist-soil habitat:

- Allow emergent, robust vegetation in the form of sedges, rushes, and smartweeds to grow.
- Flood impoundments in April-May and September-November up to 10 cm.
- If necessary, mow “holes” within unit to create open water areas.
- Mow/disk to set back woody succession and other undesirable vegetation every 2-5 years.
- Maintain records by date for water management actions, water elevations, vegetation, and wildlife response.

CHEMICAL MANAGEMENT STRATEGIES

POTENTIAL STRATEGIES

The presence of exotics and invasive plant species can alter the function of ecosystems due to the loss of wildlife habitat, displacement of native species, change in carrying capacity from reducing native forage production, lower plant diversity, and increase in soil erosion and soil sedimentation. These negative effects decrease the biological integrity, diversity, and environmental health of the refuge, and therefore, require a management strategy that will control, and if possible, eradicate the exotic species.

One invasive species is on the verge of significantly impacting the biological integrity of the refuge: Chinese tallowtree. The Chinese tallowtree is a small, fast-growing tree with high reproductive capability. The tree grows in a variety of habitats, is extremely invasive, and can form monoculture stands quickly. The tallowtree will not be eradicated from the refuge, but extensive measures should be made to control its spread. Other invasive species that the refuge has good opportunity to control with conventional methods are mimosa, water hyacinth, royal paulownia, trifoliate orange, tree-of-heaven, Chinese privet, and chinaberry. Japanese honeysuckle is ubiquitous and a lost cause for treatment. All of these species have been found on the refuge.

Invasive plant control is a legal and common management action for many national wildlife refuges, but is labor intensive and costly. Significant resources should be focused on determining the extent of each invasive species on the refuge and to controlling their spread. Successful control requires careful planning, implementation, and monitoring.

Chemical pesticides will be used primarily to supplement, rather than as a substitute for, practical damage control measures of other types. Whenever a chemical is needed, the most narrowly specific pesticide available for the target organism in question should be chosen, unless considerations of persistence or other hazards would preclude that choice (7 RM 14). All chemicals will be approved through the pesticide use proposal process and will follow Integrated Pest Management Policy (569 FW 1).

The refuge has aggressively been treating exotic plants in the past few years. The mechanical removal of exotic trees has shown to be very ineffective due to stump sprouting and in the case of climbing fern, promoting its spread by machinery. Monitoring efforts have shown some chemicals to be more effective than others. Element 4 has been 97 percent effective against Chinese tallowtree, using proper applications.

Management of the moist-soil habitat in Management Units Dill1-5, BP1-7, SLL1, and LC1-12 may require the use of chemicals periodically to control undesirable vegetation, such as red vine, buttonbush, *Sesbania*, etc. Also, chemicals may be used in the prairie restoration project. Undesirable woody vegetation, such as plums, may be treated for site preparation before planting grass and forb seeds. Management of farming will require the use of chemicals to farm rice, millet, and/or milo to control competitive weeds, pests, and/or fungus.

Although these chemicals have proven to be effective, the refuge is always striving for better methods. If over time, these chemicals are shown through monitoring to lose their efficacy, other chemicals will be tried through the adaptive management process.

MANAGEMENT STRATEGY PRESCRIPTION

To meet all objectives in all Management Units for all resources of concern, the following strategies will be used to control exotic plants:

- GPS new areas of infestation by exotics annually.
- Treat Chinese tallowtree, mimosa, chinaberry, royal paulownia, Chinese privet, and other woody exotics once per year anytime except during leaf-out with 20 percent Element 4® or other suitable approved herbicide with surfactant to trees > 8 in. dbh by cut-spray application. Treat trees < 8 in. dbh but taller than 5 feet, with basal spray application 12-18 inches from ground. Treat trees shorter than 5 feet with a foliar spray of 5 percent glyphosate or other suitable approved herbicide.
- If current process becomes ineffective, use adaptive management process to find more efficient ways of treating invasives.

To meet Objective 4.2.2 in Management Units Dill1-5, BP1-7, SLL1, and LC1-12 for wintering waterfowl, the following strategies will be used to control undesirable vegetation in moist-soil habitat:

- When red vine covers greater than 20 percent of management unit, treat with RoundUp® or other suitable approved herbicide after disking in late fall.
- When *Sesbania* covers greater than 20 percent of management unit, treat with 0.5 quart/acre of Blazer® or other suitable approved herbicide before plants flower and/or reach 3 feet in height.
- Other undesirable plants such as cocklebur and buttonbush are to be treated with 2-4D or other suitable approved herbicide when coverage exceeds 20 percent of management unit.

To meet Objective 4.2.3 in Management Units LC1-12 for wintering waterfowl, the following strategies will be used to control undesirable vegetation and/or organisms while farming:

- Depending on crop, utilize those chemicals that have been approved through the pesticide use proposal permit process.
- Spray chemical when target threshold has been achieved as outlined in pesticide use proposal permit process.

PRESCRIBED FIRE MANAGEMENT STRATEGIES

POTENTIAL STRATEGIES

Prescribed burns can be applied in multiple ways by varying the season and intensity of the burn. The intensity of the burn can be manipulated by using flanking, backing, or head fires. Other variables that can affect the results of a burn include weather, fuel loads, fuel type, and fuel moisture.

Use of prescribed fire is the most cost-effective method of setting back woody succession, promoting native warm-season grasses, and promoting native cane.

Fire is a natural ecological process for the habitats of Red River NWR, and prescribed fire will be used to promote cane and herbaceous plants where appropriate habitat exists. Fire management will be applied according to protocols established in the Fire Management Plan (2011).

MANAGEMENT STRATEGY PRESCRIPTION

To meet Objective 4.3.1 in Management Unit SLL3 for wintering woodcock, the following strategies will be used:

- Burn every 1-3 years during the growing season using backing and flanking fires to allow slow, low-intensity burns.
- Vary the timing of the burns from February through October.

To meet Objectives 4.2.2, 4.2.3, 4.2.4, and 4.2.5 in Management Units Dill1-5, BP1-7, SLL1, and LC1-12 for wintering waterfowl, migrating rails and shorebirds, the following strategies will be used:

- Burn using backing and flanking fires to set back moist-soil vegetation.
- Vary the timing of the burns.

BEAVER AND HOG MANAGEMENT STRATEGIES

POTENTIAL STRATEGIES

Beavers have the potential to significantly adversely affect bottomland hardwood forests by damming sloughs and brakes (Mahadev et al. 1993). Forests inundated into the growing season quickly show signs of stress, and trees eventually die. Beavers also kill trees by girdling and felling. One study in Mississippi showed beavers on average damaged \$164/acre (1985 values) of timber by girdling and felling (Bullock and Arner 1985).

During pre-European times, beavers had a less significant impact on the extensive intact forests that were not fragmented and had not been hydrologically modified. Since European settlement, beaver numbers were controlled by trapping for the demanding fur trade. In the 1980s, annual harvests exceeded 1 million beaver pelts across the nation (Hill 1982). Due to cultural and societal changes, furs are not in demand and therefore, little trapping is conducted, causing beaver numbers to increase (Hill 1982).

Methods for control include removing beaver dams manually, with heavy equipment, or by explosives and trapping and shooting. Dams that are small enough to remove by hand within an hour will be removed manually. Also, when trapping, dams will be broken by hand to provide locations for trap sites. If a dam is so large it cannot be removed manually within an hour, it can either be removed by machinery or explosives. If the surrounding area is too wet to use heavy equipment such as an excavator, then explosives can be used. Explosives are used only by certified employees, and all state and local laws are followed.

Feral hogs are one of the most invasive, destructive, exotic species in North America. Hogs compete with turkeys, deer, and squirrels for mast (Seward et al. 2004). Hogs depredate birds and their nests, reptiles and amphibians, and deer fawns (Hellgren 1993). The rooting of hogs causes widespread damage to ecosystems including plant trampling, spread of exotic plants, erosion, and water pollution (Mungall 2001). Feral hogs are known to carry brucellosis and pseudo rabies, both of which can be transmitted to native wildlife and humans (Witmer et al. 2003). Because they are prolific, hog populations grow at an explosive rate (Seward et al. 2004).

Methods for control/eradication include trapping and shooting by Service employees, permitted individuals, and/or contractors.

MANAGEMENT STRATEGY PRESCRIPTION

To meet Objectives 4.1.1, 4.1.2, 4.1.3, and 4.1.4 in Management Units HQ4, Dill6, Pin1, BP8, BP9, BP10, SLL2, LC13, LC14, LC15, and LC16 for wintering waterfowl and wintering woodcock, the following strategies will be used to control beaver damage in bottomland hardwood forest:

- When water recedes in spring/summer, inspect refuge for areas where water is not draining, including all areas known to have beaver dams in the past.
- GPS locations of all beaver dams for future reference.
- Determine best method for removal of located dams and remove immediately.
- During winter when refuge is flooded, remove beavers.
- If time permits, set traps for beavers.

To meet Objectives 4.1.1, 4.1.2, 4.1.3, and 4.1.4 in all Management Units, the following strategy will be used to reduce hog damage in all habitat types:

- Remove all hogs at every opportunity by using trapping and shooting by Service employees, permitted individuals, and/or contractors (USFWS 2012).

FOREST MANAGEMENT STRATEGIES

POTENTIAL STRATEGIES

In this section, the methods and procedures for implementing strategies to harvest timber are specified. This HMP now incorporates what was formerly considered the Forest Management Plan.

The purpose of the forest habitat management strategy is to establish and maintain the desired forest conditions specified in the objectives. Both commercial and non-commercial silvicultural treatments can be utilized to produce the desired forest conditions. Commercial timber harvest operations are more economical and will be used to meet the forested habitat objectives of the refuge. The cost to the refuge associated with non-commercial treatments is higher than commercial treatments in terms of manpower and funding. However, non-commercial treatments will be used when commercial operations cannot meet refuge objectives and sufficient funding is available.

A combination of silvicultural methods will be utilized to meet the uneven-aged forest management objectives described in the refuge's CCP/HMP for bottomland hardwood forest. The silvicultural methods are:

1. Thinning - Intermediate cuttings that are aimed primarily at controlling the growth of stands by manipulating stand density. The objective of thinning on the refuge will be to open the forest canopy, release trees from competition and improve growth, improve regeneration, and improve species composition within a stand.

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2. **Single-Tree Selection** - Removal of a single mature individual tree or small clumps of several such trees. Openings created with this method are generally about one-quarter-acre in size. This is an uneven-aged silvicultural method that will allow for the development of a new age class of trees within the forest structure. This method favors the regeneration and development of forest tree species with higher shade tolerances.
 3. **Group-Selection** - Removal of trees from a stand in groups to create openings in the forest canopy. These openings are generally about one-half-acre in size. The increased size of the openings will encourage the regeneration of more shade intolerant tree species such as sweetgum, red oaks, pecan, green ash, etc.
 4. **Patch cuts** - Patch cuts are small clear-cuts that vary in size from 1 to 3 acres. Dependent upon the shape of the patch cuts, forest openings of this size will eliminate the effects of shading throughout most of the opening. This will benefit the regeneration of even the most shade intolerant tree species. Cavity trees or snags may be left within each patch to provide perches and nest locations for some bird species or roosts for bats. Patch cuts will provide small areas of even-aged forest scattered across an uneven-aged forested landscape that will benefit many species that need even-aged stand conditions to regenerate successfully, such as sweetgum, red oaks, cottonwood, sycamore, pecan, etc.

MANAGEMENT STRATEGY PRESCRIPTION

To meet Objectives 4.1.1, 4.1.2, 4.1.3, and 4.1.4 on forested units:

- The forester will cruise management units according to the entry schedule to assess conditions, and a site and time specific forestry prescription will be written.
- Timber harvest operations can occur any time of the year. Logging will be restricted to dry periods of the year to keep soil disturbance and damage to residual vegetation at a minimum.
- Permanent roads for commercial timber harvest operations will be limited to existing roads whenever possible. This will help reduce fragmentation of the habitat and limit disturbance to soil and plants throughout the refuge. Road edges that receive direct sunlight may provide substantial amounts of soft mast (fruit), where otherwise closed canopy forests make this important food source rare (Perry et al. 1999). Edge habitats along roads may be important for reasons stated above, but should still be limited because of concerns of increased predation and parasitism of bird nests (Robinson et al. 1995), and effects of roads on amphibian movements (Gibbs 1998, deMaynadier and Hunter 2000).
- Upon completion of prescribed timber harvest operations, each treatment area will be monitored the next year and every 5 years after to see if desired results of the management unit prescription have been met.
- To monitor the impact of timber management activities on migratory birds, a bird-monitoring program has been developed in cooperation with the LMVJV office.

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- All forest management operations on the refuge will leave a 200-foot buffer along the banks of the Red River. The 200-foot buffer along major waterways and permanent water areas will help keep logging debris out of water channels. These buffer areas will also serve as filtration strips to reduce sediment loads that may be caused by logging activities.
 - Logging is usually restricted to the summer and early fall, which are generally the driest times of the year, to reduce soil compaction and erosion potential. Logging access roads will be limited to existing woods roads left over from previous ownership whenever possible. New road construction will be kept to a minimum and must be approved by the refuge manager.
 - Treetops and other logging debris will be kept out of brakes and swales to minimize any impacts that logging activities may have on drainage. The number of crossings through swales and brakes will be kept at a minimum to prevent damage to the natural drainage of water. These crossings will be maintained and any structures, such as culverts, will be removed as soon as logging activities are completed.
 - Loader sets are areas opened up by the logging contractor for the loading of forest products onto trucks. Loader sets usually range in size from 1/4-acre to 1/2-acre in size, and soil disturbance is greater in these areas than any other areas within the timber sale. In an effort to lessen the risk of soil erosion during wet periods in loader sets, these areas may be planted with winter grasses to serve as temporary vegetative cover until normal vegetation has a chance to reclaim the site.

To meet Objectives 4.1.1, 4.1.2, 4.1.3, and 4.1.4 in Management Units HQ4, Dill6, Pin1, BP8, BP9, BP10, SLL2, LC13, LC14, LC15 and LC16 for wintering waterfowl and wintering woodcock, the following forest management strategies will be used:

- Harvest 1- to 3-acre patches on 5 to 10 percent of stand, leaving 4 to 6 large trees per acre within the small patch cuts (LMVJV 2007).
- Thin bottomland hardwood forest to meet parameters specified in Objectives 4.1.1, 4.1.2, and 4.1.3 by reducing basal area with variable rate of removal throughout management units to allow significant sunlight penetration to the understory (LMVJV 2007).
- No timber removal or management in pure baldcypress and water tupelo stands. Conduct light thinning of small (14") cypress trees when mixed in hardwood stands to create larger (24") trees, and select thinning of hardwoods to release cypress to grow to old, large trees.
- Try to establish 2 to 4, 2-acre afforestation plots of cypress/tupelo stands where possible to promote this habitat.

WATERFOWL SANCTUARY MANAGEMENT STRATEGIES

POTENTIAL STRATEGIES

Sanctuary can be applied to waterfowl habitat in different ways. Sanctuary can mean that no public use is permitted in waterfowl habitat at any time or that no waterfowl hunting can occur, but other public uses are permitted. Some refuges limit waterfowl hunting to only a certain number of days per week to limit disturbance to ducks. The size or percentage of waterfowl habitat that is sanctuary also varies. Sanctuary can be in moist-soil habitat and/or in flooded bottomland hardwood forest. Strickland and Tullos (2009) recommend that 20-25 percent of

waterfowl habitat be in sanctuary to reduce disturbance. Sanctuary should be available in all habitat types, including moist-soil, agriculture, and bottomland hardwood forest (USFWS 2004).

Eighty-five percent (10,997 acres) of the refuge is currently not open to waterfowl hunting. The majority of these acres are young reforested bottomland hardwoods. Hunting is not allowed on these areas due to safety concerns and lack of infrastructure, not primarily for waterfowl sanctuary. In the future, at least 25 percent of the refuge acreage will be sanctuary and will include both agricultural/moist-soil fields and forested acres.

MANAGEMENT STRATEGY PRESCRIPTION

To meet Objective 4.2.4 for wintering waterfowl, the following management strategy will be used:

- Keep sanctuary boundary posted and continue to enforce no waterfowl hunting in the sanctuary.

FARMING MANAGEMENT STRATEGIES

POTENTIAL STRATEGIES

Agricultural crops can significantly contribute to the nutrition and fitness of wintering waterfowl, a resource of concern on Red River NWR. Cooperative farming is an important component of the refuge meeting its waterfowl foraging habitat objective. The refuge has started to conduct some force account farming, but it is depended on funding. Cooperative farming has been and will continue to be a cost-effective mechanism to provide the high-quality “hot foods” required by wintering waterfowl. Management of a cooperative farming program reduces dependence on refuge staff and equipment. However when possible, refuge staff can supplement by force account farming small acreages.

Rice, milo/millet, and corn are the top choices as grain crops for ducks in the MAV. Rice is particularly resistant to decomposition even under flooded conditions. Milo/millet and corn also provide high-energy resources for waterfowl and can generally be kept above the water surface, but problems arise from depredation prior to flooding, as well as seed degradation after flooding. Soybeans can also be grown, although they are not the preferred crop by managers because of their rapid decomposition after flooding and low protein absorption by waterfowl.

Management Units LC1-12, consisting of 1,068 acres, will be farmed on a rotational basis with moist-soil management. Ideally one half of the acreage would be farmed one year and the other half the next year, keeping the idle half as moist-soil. This ensures that the management unit is disked every two years. Cooperative farming and/or force account farming will be determined by costs, staff resources, available equipment, etc. Capability and funding will determine which method of farming (cooperative or force account) is best to meet habitat objectives. Cooperative farming provides the refuge with 20-25 percent of the crop being unharvested for waterfowl food. Unharvested crops are then shallowly flooded (<18 inches) for wintering waterfowl. When possible, the refuge will force account farm small portions of Management Units BP1-7 with rice.

The number of duck energy days (DEDs) produced on Red River NWR using this strategy would be 5.3 million DEDs. This figure is obtained assuming that half of LC1-12 is farmed in rice and the other half managed as moist-soil. Also units Dill1-5, SLL1, and BP1-7 are managed as moist-soil. Assuming a refuge share of 25 percent, 133.5 acres of un-harvested rice would be available for waterfowl. If 100 acres of force account rice was additionally planted on Management Units BP1-7, then total DEDs would be 8.1 million in those years.

MANAGEMENT STRATEGY PRESCRIPTION

To meet Objective 4.2.3 in Management Units LC1-12 for wintering waterfowl, the following management strategies will be used:

- Annually meet with cooperative farmers to sign and review placement of crops and locations of refuge share.
- Maintain half of 1,068-acre management unit in crop production to provide a diversity of high-carbohydrate (hot) foods as flooded habitat required by wintering waterfowl.
- Flood refuge share between August and December no deeper than 18 inches
- Stagger flooding among units and throughout autumn/winter to provide freshwater throughout winter.
- Farm unit in rice, corn, and/or millet.

REFORESTATION STRATEGIES

POTENTIAL STRATEGIES

If the refuge acquires new land during the next 15 years, the decision will be made whether that land needs to be reforested according to the purposes of the refuge. Reforestation of the MAV is a well-established practice with the Service leading the way. Much of the refuge has already been reforested and presently does not have any reforestation needs. However, most of the Red River Valley has been converted to agriculture. Any lands that the refuge acquires in the future will likely be in need of reforestation.

In the past, several different methods have been used to replant forests including direct seeding (e.g., planting acorns) and planting seedlings, either by hand or by machine. Sometimes sites are prepped by sub-soiling (i.e., deep tillage) when trees are planted by hand. Planting rates have varied. The NRCS has guidelines for reforestation efforts that the Service follows (Tree Establishment Code 612).

MANAGEMENT STRATEGY PRESCRIPTION

To meet Goal 4 in future management units, the following management strategies will be used:

- Seedling species will be chosen considering flood tolerance, soil type, and historical occurrence.
- Seedlings will be obtained from the same geographic area.
- Seedlings will be planted at either 10' x 10' (435 seedlings/acre) or 12' x 12' (303 seedlings/acre).

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Appendix A: The Commercial Sale of Timber

EXECUTION OF TIMBER HARVEST

CRUISING AND MARKING TIMBER

Each management unit is assigned a year of entry. The year of entry is assigned to distribute forest management activities across the refuge throughout the duration of this HMP. A habitat and timber cruise will be conducted for each management unit. The cruise may be conducted using fixed plot and point sampling techniques. Most cruise sampling will be conducted using a fixed radius plot of 1/5-acre for saw timber, 1/20-acre plots for pulpwood, and 1/100-acre plots for regeneration and herbaceous groundcover. Point samples utilizing 10, 15, or 20 factor prisms may be used at various times for collecting timber volumes. The following data will be collected during each management unit cruise:

1. Timber volumes including basal area for sawtimber and pulpwood;
2. Species composition of woody vegetation;
3. Tree ages;
4. Canopy conditions;
5. Presence of vines, Spanish moss, and switchcane;
6. Herbaceous groundcover;
7. Number and size of den, cavity, and cull trees per acre;
8. Tree and shrub species regeneration;
9. Species composition of each canopy layer (overstory, midstory, understory, and groundcover);
10. Presence of woody debris.

Volume tables for each management unit will be expressed in 2-inch diameter classes for both sawtimber and pulpwood. Doyle form class 80 will be used to express volume sawtimber (MBF) and pulpwood (cords) volumes for pine. Doyle form class 76 will be used to express volume sawtimber (MBF) and pulpwood (cords) volumes for bottomland hardwoods. The exception will be green ash and water tupelo volumes, which will utilize Doyle form class 70.

Treatment prescriptions will contain the following information:

1. Management unit map ;
2. Stand map designating various timber stands within the management unit;
3. Description of management unit including vegetation profile, soil types, hydrology, and other physiological features;
4. Identification of resources of concern in the HMP.
5. Timber data including tree species composition, sawtimber and pulpwood volumes, stocking, age, condition, and basal area;
6. Wildlife habitat parameters including plant composition of overstory and understory, number of cavity and den trees, presence of vines, Spanish moss, and switchcane; number of dead snags; presence of woody debris; and evidence of wildlife activity (e.g., bat roosts, eagle nests, browsing of plants, wildlife tracks, etc.);
7. Composition of woody plant regeneration;

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8. Prescription of silvicultural treatment to be conducted in the management unit;
 9. Description of desired results;
 10. Map of treatment area; and
 11. Timber data for the treatment area showing what is to be removed during treatment.

After the prescription is written, it will be peer reviewed and then submitted to the Regional Office for approval. Copies of prescriptions and all other information will be kept on file in the refuge office.

To determine which trees are designated for removal, the forester will follow sound silvicultural procedures prescribed in the management unit prescription. As the forester determines which trees are to be removed, paint will be applied at breast height and at the base of trees to be removed. These two marks allow for the contractor to distinguish which trees are designated for removal during logging operations and help the forester identify the stumps of marked trees during administration of the logging contract.

Timber marking is very subjective and varies from one timber marker to another. Though the management unit prescription gives the timber marker guidelines to follow, each individual timber marker has a different opinion on how to reach the desired results of the management unit prescription. To ensure forest diversity and avoid bias, more than one person should be involved with the timber marking of treatment areas on the refuge.

During the timber marking activities, many factors are considered before selecting a tree for removal. These include species composition of the management unit, tree health and vigor, present regeneration, potential regeneration, canopy structure, number of cavities within the area, habitat value of the tree, mast production, and objectives of the management unit prescription. The management unit prescription designates how much timber volume or basal area to remove during a treatment, but the application of the prescription occurs during timber marking.

The timber sale must satisfy certain conditions to be operable by a contractor. For present market conditions, the following guidelines apply to timber sales open to formal competitive bidding; adjustments may be necessary if significant changes in the economy occur. Total sale volumes could be less in the case of a negotiated sale; however, the average volumes per acre would remain essentially unchanged.

Hardwood saw timber must have a minimum DBH of 11.0 inches and minimum merchantable length of 12 feet. The diameter of swell-buttressed species, such as baldcypress and water tupelo, shall be measured 1 1/2 feet above swell, when the swell is more than 3 feet high, instead of at DBH.

The upper limit of merchantability is defined as:

1. A minimum top diameter inside bark of 8 inches, or
2. The point at which the tree breaks into forks containing no merchantable saw logs, or
3. One or more live limbs occurring within a vertical span of 1 foot, whose sum of diameter equals or exceeds 1/3 of the stem diameter outside the bark at that point, or
4. A stem deformity.

Hardwood pulpwood must have a minimum DBH of 7 inches and minimum merchantable length of 10 feet. The upper limit of merchantability is defined as:

1. A minimum top diameter inside bark (DIB) of 4.0 inches, or
2. That point at which stem deformity prevents utilization. If at least a full 5-foot section occurs above this point, take the merchantable height to the top of this section. A usable section is one that is reasonably straight and sound and whose small end diameter equals or exceeds 4.0 inches diameter inside bark.

Trees that fork immediately above DBH will be measured below the swell resulting from the double stem. The longest utilizable stem shall be measured for the merchantable height. Trees that fork below DBH shall be considered as two separate trees, and the diameters shall be measured or estimated 3 1/2 feet above the fork.

Timber harvest operations can occur anytime of the year. By limiting harvest activities between April through June, disturbance of bird nesting and breeding activities of most bird species should be minimized. Logging will also be restricted to dry periods of the year to keep soil disturbance and damage to residual vegetation at a minimum.

LOGGING OPERATIONS

Permanent roads for commercial timber harvest operations will be limited to existing roads only. This will help reduce fragmentation of the habitat and limit disturbance to soil and plants throughout the refuge. Road edges that receive direct sunlight may provide substantial amounts of soft mast (fruit), where otherwise closed canopy forests make this important food source rare (Perry et al. 1999). Edge habitats along roads may be important for reasons stated above, but should still be limited because of concerns of increased predation and parasitism of bird nests (Robinson et al. 1995), and effects of roads on amphibian movements (Gibbs 1998, deMaynadier and Hunter 2000).

Logging operations will be allowed to use skidders, crawler tractors, and wheeled tractors to skid logs to loading areas where they are loaded onto trucks. Tree-length skidding will be allowed, but the trees must have the tops and all limbs removed before skidding. Removal of tops and limbs will reduce chances of damage to residual trees. If possible, harvest should be conducted outside of breeding season for birds (April-June), but management can be conducted during this period if necessary. Other special conditions and/or restrictions, as determined by refuge staff, may be stated in the Timber Sale Bid Invitation (Exhibit 3) and special use permit awarded to the highest bidder for the timber sale.

In order to confirm harvest procedures and address any questions, a pre-entry conference will be held between the refuge manager and/or refuge forester, permittee, and the logging contractor, if different than the permittee. The permittee is to notify the refuge when harvesting operations begin and are completed.

Close inspection and supervision of all timber sales is necessary to ensure that harvesting operations meet the conditions of the special use permit and refuge objectives. Frequent inspections of harvesting operations will ensure that only designated trees are cut, and problems are rectified before becoming major issues. Timber harvesting operations may be suspended or restricted any time that continued operation might cause excessive damage to the forest stands, soil, wildlife habitat, or cultural resources. Reasons for suspension or restriction

may include, but are not limited to, periods of high wildfire potential, insects or disease hazard, times when harvesting may interfere with essential refuge operations, during periods of heavy rains or wet conditions which may cause rutting and erosion of soils, when harvesting operations present a safety hazard, or when harvest operations reveal new or may damage existing cultural resources. Furthermore, operations may be suspended or terminated if the permittee violates the conditions of the special use permit.

When harvesting is complete, the refuge forester or designated refuge staff will inspect the site for compliance with all requirements of the contract. If any deficiencies are found, the permittee will be notified and given reasonable time to achieve compliance. If full compliance is achieved, the permittee's performance deposit will be returned in full. If not, an amount to mitigate damages will be deducted from the performance deposit and the remaining amount returned.

MONITORING

Upon completion of prescribed timber harvest operations, each treatment area will be monitored the next year and every 5 years after to see if desired results of the Management Unit prescription have been met. Monitoring will consist of the forester walking through the treated area and taking basal area measurements at several points. This will help the refuge staff to determine what changes, if any, may be needed for future forest management prescriptions.

To monitor the impact of timber management activities on migratory birds, a bird-monitoring program has been developed in cooperation with the LMVJV office. The information gathered from the bird-monitoring system assists in identifying the impacts of timber harvest on bird populations, as well as other wildlife species, before and after treatment. This information will help adapt timber management activities to the needs of the many plant and animal species utilizing the forested habitat of the refuge.

A Geographical Information System (GIS) and Global Positioning System (GPS) database is currently being developed on the refuge. The current refuge GIS database consists of various image files including Digital Orthophoto Quarter Quads (DOQQ's), Digital Raster Graphs (DRG's) of USGS topographic quad maps, and 10-, 15-, and 30-meter resolution satellite images. Feature classes, from a variety of different state and federal agencies, provide mapping layers for federal and state highways, local roads, parish boundary lines, power line and pipeline rights-of-way, reforestation projects on private and public lands, public land boundaries, and various other layers providing information about the area surrounding the refuge.

For this HMP, GIS data have been developed on a local scale to reflect the refuge management activities. To enhance the development of a GIS database that is specific to the refuge, GPS technology has and will continue to be used to establish management unit boundaries, maps, cruise lines, treatment area maps and boundaries, monitoring programs, logging access routes, refuge roads, beaver activity, forest cover types, map reforestation areas, and all other management activities related to the refuge.

To ensure the refuge is in compliance with the Forestry Best Management Practices (FBMP) manual regulations (<http://www.ldaf.state.la.us/portal/Portals/0/FOR/for%20mgmt/BMP.pdf>) concerning natural and scenic Rivers, all forest management operations on the refuge will leave a 200-foot buffer along the banks of the Red River. Logging is usually conducted during the summer and early fall, which are generally the driest times of the year, to reduce soil

compaction and erosion potential. Logging access roads will be limited to existing woods roads left over from previous ownership whenever possible. New road construction will be kept to a minimum and must be approved by the refuge manager.

The 200-foot buffer along major waterways and permanent water areas will help keep logging debris out of water channels. These buffer areas will also serve as filtration strips to reduce sediment loads that may be caused by logging activities. Treetops and other logging debris will be kept out of brakes and swales to minimize any impacts that logging activities may have on drainage. The number of crossings through swales and brakes will be kept at a minimum to prevent damage to the natural drainage of water. These crossings will be maintained and any structures, such as culverts, will be removed as soon as logging activities are completed.

ARCHAEOLOGICAL AND CULTURAL RESOURCES

The Archaeological Resources Protection Act of 1979 obligated the refuges to protect all sites of archaeological and historical significance.

It is possible that forest management activities on the refuge could disturb some unknown archaeological site. Thus to minimize the chance of such disturbances, the following actions will be taken:

1. All forest management prescriptions will be submitted to the regional archaeologist for approval prior to the start of any logging activities.
2. Logging will be limited to dry soil conditions, thus limiting soil disturbance and erosion.
3. New road construction will be limited to reduce the chance of disturbance.
4. Cease logging operations and flag any suspected archaeological sites that may be discovered during logging operations.
5. Contact the regional archaeologist if any suspected archaeological sites are discovered and follow instructions given by the regional archeologist to protect the site until a thorough investigation of the site can be conducted.

AESTHETICS

Aesthetic values fall under the category of wildlife observation, which is one of the six priority public uses of refuges designated in the National Wildlife Refuge System Improvement Act of 1997. Although aesthetic values vary from person-to-person, forest management activities will use the following guidelines to ensure that wildlife observation opportunities for the public are not impeded:

1. Keep logging loader sets at least 100 feet away from designated hiking trails.
2. Maintain a 200-foot buffer along the boundary of all major waterways where logging will not be allowed. Road construction, loader sets, and skidding of logs will also be prohibited within this buffer. All logging debris will be removed from within the buffer boundary.
3. Keep logging slash piles away from designated hiking trails.
4. Limit height of slash piles to less than 4 feet in logging areas and loader sets, unless otherwise directed for wildlife habitat improvement purposes.
5. Ensure all logging access roads are maintained and free of litter and debris while logging activities are in progress.

FOREST OPENINGS

Forest openings on the refuge will be managed as temporary openings. These are openings created during logging operations either as patch cuts or loader sets. The patch cuts, 1 to 3 acres in size, are designated during timber marking to develop temporary openings in the forest canopy large enough to encourage the development of shade intolerant plant species. Loader sets are areas opened up by the logging contractor for the loading of forest products onto trucks. Loader sets usually range in size from 1/4- to 1/2-acre in size and soil disturbance is greater in these areas than any other areas within the timber sale. In an effort to lessen the risk of soil erosion during wet periods in loader sets, these areas may be planted with winter grasses to serve as a temporary vegetative cover until normal vegetation has a chance to reclaim the site. Rotation of timber harvest areas between the forest management units will allow for temporary openings to be created throughout the refuge on a continual basis to replace older forest openings as they close up.

INSECT AND DISEASE

Insects and diseases that may affect the forested habitat on the refuge can be most effectively controlled by promoting stand conditions favoring healthy vigorous trees. Trees stressed by overstocking, flooding, drought, over-maturity, fire, etc., have an increased susceptibility to insects and diseases. Forest management activities such as thinnings and group selection cuts will help promote tree health and vigor by reducing competition and stocking as well as maintaining tree species diversity.

Most of the disease and insect damage found on the refuge presently is limited to individual trees or small groups and should not pose a threat to the health of the forest. The presence of tree diseases and insects is a normal occurrence in the forest. Many neotropical bird species forage on insects that damage trees, while other wildlife species forage on the conks and other fruiting bodies of various diseases. Portions of trees damaged by insects and diseases may eventually develop into cavities available for wildlife use.

Upon entry into a management unit, insect and disease damage will be evaluated and taken into consideration as part of the management unit cruise. In situations where insect and/or disease conditions are considered severe, the refuge forester will try to identify the problem and consult with the USDA Forest Service's forest health protection office in Pineville, Louisiana, for advice on how to effectively control the problem.

In the event of extensive disease or insect infestation, the refuge manager or forester may request an expedited treatment. This request must be approved at the Regional level and should eliminate most of the formal prescription approval process, though sound biological and silvicultural principals will still apply. The formal bidding process for such treatments may be scaled back in order to expedite the treatment.

TIMBER SALVAGE AND UNSCHEDULED HARVESTING

Salvaging damaged timber, dead, or down trees following natural events, such as ice storms, tornadoes, disease/insect outbreaks, windstorms, wildfires, etc., is a common practice in forest management. Forest management on Red River NWR will consider salvaging timber to reduce fire hazards, prevent the likelihood of insect or disease outbreaks, and provide for safety. These natural events usually provide wildlife species with

many habitat needs such as snags for cavities, new denning locations, diversifying the canopy structure, increased plant diversity on the forest floor, etc. Unscheduled harvesting may need to occur to prevent the loss of timber due to outbreaks of insects or disease. If an outbreak of insects or diseases should occur, it may be necessary to enter into a management unit ahead of the entry cycle to stop or slow the outbreak.

ADMINISTRATION OF SALES

CONDITIONS APPLICABLE TO TIMBER HARVESTING PERMITS

1. A pre-entry conference between the refuge forester and the designated permittee representative will be a requirement before the purchaser starts logging operations. The purpose of the pre-entry conference is to ensure that the purchaser completely understands what is expected of him, thus avoid misunderstanding or serious conflict.
2. If requested, satisfactory scale tickets for timber products shall be submitted to the refuge forester.
3. Bottomland hardwood species will be cut so as to leave a stump not more than 12 inches high for sawtimber and pulpwood. All stump heights are measured at the side adjacent to the highest ground. In the case of swell-butt species or trees with metal objects in the butt, stumps may be higher.
4. Whole tree skidding in sawtimber sales is prohibited, unless special conditions are permitted.
5. Ground level paint spots must remain visible after the tree has been cut. All marked trees are to be cut, unless otherwise approved by the refuge forester.
6. Trees and tops shall not be left hanging or supported by any other tree and shall be pulled down immediately after felling.
7. Tops and logging debris shall be pulled back 20 feet from public roads and lopped within 150 feet.
8. All roads, rights-of-way, fields, openings, streams, and firebreaks must be kept clear of tops and debris. The permittee shall also repair all damage to same resulting from operations conducted under this permit.
9. Littering in any manner is a violation of the Code of Federal Regulations. The entire work area shall be kept free of litter at all times. Repairs and cleanup work will be accomplished to the satisfaction of the refuge manager and/or refuge forester.
10. Additional trees removed to prepare loading sites will be paid for at bid prices. Unmarked trees, which are cut or injured through carelessness, shall be paid for at not less than double the bid price.
11. The permittee will remove temporary plugs, dams, and bridges, constructed by the permittee, upon completion of the contract. There are areas on the refuge where temporary plugs or dams in an intermittent stream would not be allowed. These areas will be indicated on sale maps.
12. Loading sets will be determined cooperatively between the refuge forester and permittee.
13. Ownership of all products remaining on a sale area will revert to the U.S. Government upon termination of the permit.
14. The refuge manager and/or forester shall have authority to temporarily close down all or any part of the harvest operation during a period of high fire danger, wet ground conditions, or for any other reason deemed necessary. An equal amount of additional time will be granted to the permittee.

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15. The U.S. Government accepts no responsibility to provide right-of-way over private lands for materials sold under this contract.
 16. The permittee and his employees will do all within their power to prevent and suppress wildfires.
 17. The decision of the refuge manager shall be final in the interpretation of the regulations and provisions governing the sale, cutting, and removal of the timber covered by this permit.
 18. When a timber sale area is adjacent to private land, all logging debris will be pulled back onto the refuge to avoid damage to private property.
 19. The permittee and his employees shall not build fires on the refuge.

CONTROL RECORDS

The primary purpose of records is to show progress made in fulfilling the habitat management plan objectives. These records include but are not limited to: management unit prescriptions, management unit geographical information system (GIS) maps, sale area GIS maps, timber sale contracts and special use permits, management unit timber volume tables, order of entry plan and progress reports, non-commercial treatments, wildlife information gathered by Management Unit, and data collected from bird counts conducted throughout the length of the HMP.

SALE FOLDERS

A sale folder will be prepared and maintained for each individual timber sale. The folder shall contain copies of all data collected for the sale. This includes tally sheets, volume estimates, maps, bid invitation, special use permits, payment records, correspondence with permittee, sale compliance inspection notes, copies of deposit checks, payment transmittal forms, etc. The sale folder shall be kept in a separate folder within the Management Unit folder for each individual Management Unit, thus keeping all information pertaining to a Management Unit within a single file.

BID INVITATIONS

Commercial timber sales are the most practical method available for creating and maintaining desired forest habitat conditions. All timber sales will be conducted in accordance with the requirements listed in the Refuge Manual, and the guidelines and specifications detailed in the Red River NWR CCP, Red River NWR Habitat Management Plan, and Management Unit prescriptions.

Small sales (estimated receipts less than \$2,500) will be negotiated as authorized by U.S. Fish and Wildlife Service policies. The refuge forester will make a reasonable effort to obtain at least three bids from potential buyers. These bids will be documented and a permit will be issued to the successful bidder.

Larger timber sales (estimated receipts more than \$2,500) will be conducted through a formal bid procedure. Invitations to bid will be prepared and administered by refuge personnel. Formal bid invitations will be mailed to all prospective bidders (Exhibit 2). Bid invitations will contain the following information:

1. A Formal Bid Information Form containing sales and estimated volume information.
2. A bid form, which the bidder fills out, signs, and returns to the refuge.

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3. Maps giving general sales location information and detailing all sales units.
 4. General conditions applicable to harvest of forest products.
 5. Special conditions applicable to the timber sale.
 6. Certificate of Independent Price Determination.
 7. Equal Employment Opportunity Clause (Form 3-176).
 8. Information on dates when prospective bidders can evaluate sales areas before bid opening.

BIDS AND PERFORMANCE DEPOSITS

For all bid sales, a bid opening date and time will be set to occur at the refuge headquarters. All bids received prior to the opening time will be kept, unopened and locked in the refuge cashier's safe until the specified opening time. Any bids received after the specified opening time will not be accepted. The refuge retains the right to reject any and all bids, particularly those that are incomplete or otherwise unacceptable.

A deposit of \$5,000 to \$10,000 in the form of a cashier's check or money order made out to the U.S. Fish and Wildlife Service must accompany all bids received through the formal bid process. The deposit amount will reflect the size of the sale and potential for damage. The amount of the deposit will be stipulated in the bid invitation. This deposit is to ensure the sincerity of the bidder's intention to purchase the offered sale at the bid price. In the event the successful bidder chooses not to purchase the offered timber, the bid deposit will be forfeited to the U.S. Government. When the successful bidder is named, all unsuccessful bidders' deposits will be immediately returned. The successful bidder's deposit will then become his performance guarantee deposit and will be retained by the government as such. Before the completion of the operation, the successful buyer will repair any and all damages caused by his operation. The performance guarantee deposit may be used to cover any un-repaired damages caused by the successful bidder, their agents, employees, or their contractors. The balance of the deposit will be refunded to the successful bidder when the sale and all related repairs are completed.

Small sales through the negotiated process will also require a performance guarantee deposit to be received by the U.S. Fish and Wildlife Service prior to any timber harvest.

SPECIAL USE PERMIT

Upon selection of a successful bidder by the refuge manager or designated representative, a special use permit will be issued containing information relevant to the timber sale, such as terms of payment, authorized activities, general and special conditions, and location map. The refuge manager or designated representative, upon receipt of payment, signs the permit, if the value is within their warranted authority. If the value is above that amount, an authorized representative of the Regional Director signs the special use permit.

PAYMENT FOR FOREST PRODUCTS AND ADMINISTRATION OF RECEIPTS

For lump sum sales, the permittee will have 10 business days after notification of award of bidding to make total or partial payment (according to what is specified in the special use permit). Under no circumstances will harvest operations begin prior to receipt of payment. The purpose of an advance payment is to encourage the permittee to begin harvesting operations as quickly as possible. All payments will be in the form of a cashier's check or money order payable to the U.S. Fish and Wildlife Service.

For pay-as-cut sales, the buyer shall provide weekly scale totals and/or scale tickets along with a weekly payment. All receipts for forest products, along with proper documentation, will be forwarded the same day as received to the U.S. Fish and Wildlife Service's Finance Center. Any receipts, that cannot be processed the same day received, will be stored in the refuge cashier's safe until processing can be completed. Presently, receipts for the sale of products of the land are deposited into the Revenue Sharing account at the Service's Finance Center. Other arrangements can only be made in accordance with policy, regulations, and laws.

Refuges are authorized to enter into timber for land exchanges. In this process, land within the approved refuge acquisition boundary may be purchased indirectly through exchange of normal timber sale volumes. Requirements for timber for land exchange sales are as follows:

1. Authority, which allows the Service to exchange timber for lands: National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-ee).
2. Lands acquired must be located within the approved refuge acquisition boundary. No preliminary project proposal or any other studies are required. The merit of the acquisition is a judgment call by the refuge manager.
3. Forest management plans are followed, and no deviation from planned schedules should be considered. No additional timber harvest is considered for the sole purpose of acquiring land.
4. The land is conveyed to the United States in exchange for refuge timber or other refuge products. The timber is transferred via special use permit, much the same as a timber sale. If timing requires the timber to be harvested prior to closing on the land, the permittee can make a performance deposit equal to the value of the deed. That deposit is refunded upon completion of the deed transfer.
5. The Service receives compensation for the timber when the third party acquires the subject property and conveys it to the United States.
6. The value of the land to be acquired, and the timber exchanged should be approximately equal or the value of the timber higher than the land. Any excess value of the timber can be made as a payment to the Service for the difference.
7. The Division of Realty will be responsible for land appraisals, title insurance, reimbursement of relocation costs, and recording fees resulting from the conveyance of the property to the United States. These miscellaneous costs will be paid from Division of Realty funds.

A sequence of steps for a hypothetical timber for land exchange is as follows:

1. The refuge manager identifies areas within the approved refuge acquisition boundary for acquisition.
2. The refuge manager and Division of Realty determine if landowner(s) are willing sellers.
3. If seller is willing to sell, the refuge manager notifies the Regional Office (Refuge Supervisor and Division of Realty).
4. Division of Realty contacts the landowner, orders the appraisal, and makes an offer to the landowner.
5. If the landowner is willing to sell, Division of Realty advises the refuge manager.
6. The refuge manager and refuge staff shall determine which upcoming timber sales, awaiting the timber sale bid process, to use in the exchange.

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7. Timber sales bids are sent out with a description of the responsibilities of the winning bidder pertaining to the timber for land exchange. This gives the bidders an opportunity to determine if they are willing to participate in the timber for land exchange. This also ensures that bidding for the timber is competitive.
 8. The refuge manager selects the winning bidder following the normal timber sale bid process. The winning bidder is now referred to as the third party.
 9. The Division of Realty advises the landowner that the third party will intercede to acquire the subject property on the Service's behalf.
 10. The Division of Realty obtains an exchange agreement with the third party. The agreement (1) identifies and states the price of the subject property, and (2) stipulates the volume and value of timber involved in the refuge's timber sale.
 11. The third party acquires the subject property at the appraised value.
 12. The third party conveys the subject property to the United States via a warranty deed. A special use permit is issued by the refuge manager, which specifies the requirements that must be followed by the third party while cutting on the refuge. The special use permit becomes part of the closing documents.
 13. The third party completes logging operation within the specified time frame, as detailed in the special use permit.

EXHIBIT 1: RED RIVER NWR TIMBER SALE 20XX-XX

SPECIAL CONDITIONS APPLICABLE TO TIMBER HARVESTING

Before starting logging operations, the refuge forester, the permit holder and his logging contractor will discuss the following special conditions. The goal of the following conditions is to protect the refuge forest from unnecessary damage. If the forest is logged carefully, it will look like a job well done, which will in turn lessen the chance of public disagreement with refuge forest management philosophy.

1. All timber marked with two spots of blue paint will be cut, except as otherwise agreed by both parties. The permit holder is subject to paying \$700 per MBF for leave pine saw timber trees which are cut or excessively damaged through carelessness. The penalty for cut or excessively damaged hardwood leave trees will be \$500 per MBF on saw timber and \$25 per cord on pulpwood-sized trees.
2. Trees are to be cut so as to leave a stump not more than 12 inches high. In the case of swell-butt trees or trees with metal objects in the butt, stumps may be higher. The lowest practicable stumps that can be left are preferred on all trees.
3. Trees and tops shall not be left hanging or supported by any other living or dead tree and shall be pulled down immediately after felling. This applies especially to pines to lessen the chance for pine beetles.
4. Access roads for the removal of trees shall be coordinated with the refuge forester. See Management Unit 2 map for present road locations. Roads, rights-of-way, and stream beds must be routinely kept clear of tops and logging debris. The permit holder shall provide and install any necessary culverts in the sale area. Roads will be maintained regularly. To avoid excessive damage following heavy rains, loggers should be prepared to stop all hauling for at least one day. Excessive or extended rains may result in overly wet ground conditions that would prevent logging for an undetermined period of time. The refuge forester expects close cooperation from all logging crews. At the completion of sale, roads will be left in at least as good as original condition. Location of

additional roads must be pre-approved by the refuge forester. Leave trees cannot be removed for access or loading sets without prior approval from the refuge forester. The permit holder shall promptly repair all damage resulting from operations conducted under this permit to the refuge forester's satisfaction.

5. There are a significant number of leave trees which can be protected by careful logging activity. Logging will be restricted to ground conditions dry enough to minimize rutting. Besides being unsightly, rutting will often damage the root systems of leave trees. Soft spots (springs, wet creek bottoms, etc.) will be avoided whenever possible. The majority of the area has ample room for skidding between leave trees without damaging leave trees. Skinning butts and damaging roots of all leave trees will be avoided as much as practicable. Whole tree skidding will be allowed where minimal damage to leave trees would be expected. Skidding of hardwoods with large crowns – potentially more damaging to leave trees – will be strictly controlled where excessive damage to leave trees is likely to occur. In general, hardwoods or pines with large crowns will be lopped prior to skidding.
6. The entire work area shall be kept free of litter at all times. Petroleum products must be properly disposed of and may not be dumped on the ground. Note: The logger agrees to remove soil contaminated by petroleum product spills from the refuge when directed by the refuge forester.
7. The refuge forester shall have the authority to temporarily close down all or a part of the operation during a period of high fire danger or wet ground conditions. An equal amount of additional time will be given to the permit holder when necessary.
8. Should the permit holder's logging operation expose any archaeological or cultural resources, the logger will immediately cease operations in that area and notify the U.S. Fish and Wildlife Service.
9. Logging contractors will do all in their power to prevent and suppress forest fires, and will be held liable for damages and suppression costs resulting from logging contractor-caused fires, except as may otherwise be allowed under state or federal laws.
10. Failure by the permit holder to meet any applicable conditions may result in penalties levied against the performance bond. The decision of the deputy project leader shall be final in interpreting regulations and provisions governing the sale, cutting, and removal of forest products under this permit.

EXHIBIT 2: BID FORM

BID FORM

Red River NWR Timber Sale 20xx-xx

The following is my bid for the stumpage offered in this invitation.

Lump sum bid for Management Unit x \$ _____

Reminder: Don't forget to include the \$10,000 good faith deposit with your bid. Without the good faith deposit, the bid will have to be automatically rejected.

I have inspected the sale area and trees designated for removal. If I am adjudged the successful bidder, I agree to accept the terms and special conditions of the permit-agreement. I also agree to give at least two weeks' notice of my desire to move on site to start cutting. However, entry onto the area with logging equipment will not be allowed until the ground is sufficiently dried out as determined by the refuge forester.

Name of Firm: _____

Address: _____

_____ Zip Code: _____

Signature of Bidder: _____ Date: _____

Telephone: _____

Comments: _____

EXHIBIT 3: BID INVITATION

North Louisiana National Wildlife Refuge Complex
11372 Highway 143
Farmerville, LA 71241
Telephone: 318-726-4222
Fax: 318-726-4667

[Date]

**Red River National Wildlife Refuge
Management Unit x
Timber Sale 20xx-xx**

BID INVITATION

The purpose of this sale is to thin the forested area in a portion of Management Unit ____ to promote general forest health and understory/midstory development for wildlife.

To locate the sale area, see maps (Figures x and x). All trees to be cut were marked with blue paint. This will be a general thinning of [insert whether it is for pine or hardwood pulpwood or sawtimber] products on +/- xx acres. [Pine or hardwood] saw timber estimates are xxx MBF and [pine or hardwood] pulpwood estimate is xx cords (not including top wood). Close merchandising of timber products could cause the pine saw timber volume to be greater than the estimate.

NOTE: Much of the sale area has flat woods which are very wet much of the year because of a high water table. Dry ground conditions will be necessary to support logging equipment and log trucks.

A permit will be issued for cutting until (insert date). Unusually wet summers and falls may allow for an extension. The extension, if granted, would be at the discretion of the deputy project leader and refuge forester.

Prospective buyers can contact refuge forester [insert forester's name] at the above phone number, if they want to arrange a visit to the sale area. There is a parking lot on the western edge of the sale area. All-terrain vehicle access will be allowed in the sale area for timber inspection purposes only. Otherwise, buyers are free to go look at the timber unescorted.

Formal sealed bids will be accepted at the refuge office until 3:00 p.m., [date], for the sale of the marked timber. Bids will be opened at 3:05 p.m., (same date) at the refuge office which is located 2.5 miles south of Rocky Branch, Louisiana, on Highway 143. The U.S. Fish and Wildlife Service reserves the right to reject any and all bids. The refuge may take up to five (5) working days before determining whether any of the bids will be accepted.

Each bidder will submit with their bid a certified or cashier's check in the amount of \$10,000 made payable to the U.S. Fish and Wildlife Service as a good faith deposit. The successful bidder's deposit will be retained by the Service and may be forfeited to the U.S. Government if

that bidder fails to accept and agree to execute the special use permit agreement. After the permit agreement is finalized, the deposit will be retained by the Service as a performance guarantee to cover any damages or claims the Service may have against the permit holder as a result of the logging operation. The balance will be returned to the permit holder upon satisfactory completion of the operation. In the past, most operators have been refunded the entire bond. The special use permit will be issued as a sale document to the buyer. The Service does not issue "timber deeds." All subsequent payments will also be made to the U.S. Fish and Wildlife Service.

NOTE: The successful bidder will be required to hold 10 percent of the lump sum in reserve for road repairs required by the refuge. The refuge forester will determine where repairs will be done. The timber buyer will pay for road repairs with this set aside money when notified by the refuge forester. As soon as the permit holder is notified that no more of the set aside funds are required for road repairs, the permit holder will be required to promptly submit payment to the U.S. Fish and Wildlife Service for the remaining set aside funds.

Bids mailed or hand delivered must be securely sealed in an envelope plainly marked:

"Bid: Red River NWR Timber Sale 20xx-xx"

If you have any questions about this packet, feel free to call (forester's name) at 318-726-4222, extension 25, for additional information. If you are not planning on submitting a bid, a negative reply would be greatly appreciated.

EXHIBIT 4: CERTIFICATE OF INDEPENDENT PRICE DETERMINATION

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service

CERTIFICATE OF INDEPENDENT PRICE DETERMINATION
(101-45.4926 Fed. Prop. Mgt. Reg.)

- (a) By submission of this bid proposal, each bidder or offeror certifies, and in the case of a joint bid or proposal each party thereto certifies as to its own organization, that is in connection with this sale:
1. The prices in this bid proposal have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices, with any other bidder or offeror or with any competitor;
 2. Unless otherwise required by law, the prices which have been quoted in this bid or proposal have not been knowingly disclosed by the bidder or offeror and will not knowingly be disclosed by the bidder or offeror prior to opening, in the case of a bid, or prior to award, in the case of a proposal, directly or indirectly to any other bidder or offeror or to any competitor; and

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3. No attempt has been made or will be made by the bidder or offeror to induce any other person or firm to submit or not to submit a bid or proposal for the purpose of restricting competition.
- (b) Each person signing this bid or proposal certifies that:
1. He is the person in the bidder's or offeror's organization responsible within that organization for the decision as to the prices being bid or offered herein and that he has not participated, and will not participate, in any action contrary to (a) (1) through (a) (3), above; or
 2. He is not the person in the bidder's or offeror's organization responsible within that organization for the decision as to the prices being bid or offered herein, but that he has been authorized in writing to act as agent for the persons responsible for such decision in certifying that such persons have not participated, and will not participate, in any action contrary to (a) (1) through (a) (3), above, and as their agent does hereby so certify; and
 3. He has not participated, and will not participate, in any action contrary to (a) (1) through (a) (3), above.
- (c) This certification is not applicable to a foreign bidder or offeror submitting a bid or proposal for a contract, which requires performance or delivery outside the United States, its possessions, and Puerto Rico.
- (d) A bid or proposal will not be considered for award where (a) (1), (a) (3), or (b), above, has been deleted or modified. Where (a) (2), above, has been deleted or modified, the bid or proposal will not be considered for award unless the bidder or offeror furnishes with the bid or proposal a signed statement which sets forth in detail the circumstance of the disclosure and the head of the agency, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

EXHIBIT 5: EQUAL EMPLOYMENT OPPORTUNITY CLAUSE

During the performance of this contract, the contractor agrees as follows:

- (1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.
- (2) The contractor will, in all solicitations or advancements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

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- (3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
 - (4) The contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
 - (5) The contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
 - (6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

Appendix B: Environmental Action Statement

U. S. FISH AND WILDLIFE SERVICE

ENVIRONMENTAL ACTION STATEMENT FOR CATEGORICAL EXCLUSION

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA), and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and determined that the following proposed action is categorically excluded from NEPA documentation requirements consistent with 40 CFR 1508.4, 516 DM 2.3A, 516 DM 2 Appendix 1, and 516 DM 6 Appendix 1.4.

Proposed Action and Alternatives. The proposed action is the approval and implementation of the Habitat Management Plan (HMP) for Red River National Wildlife Refuge (NWR). This plan is a step-down management plan providing the refuge manager with specific guidance for implementing goals, objectives, and strategies identified in the Red River NWR Comprehensive Conservation Plan (CCP) (2008).

The CCP action was the preferred alternative among three alternatives considered in the Environmental Assessment (EA) (Draft CCP/EA 2008). In the CCP, the preferred action was to manage the refuge "based on sound science for the conservation of a structurally and species diverse bottomland hardwood habitat (along with managed wetlands and associated prairies) for migratory birds and resident wildlife. A focused effort will be directed toward reducing invasive species that are threaten the biological integrity of the refuge. Wintering waterfowl habitat will be maintained through the development of important foraging habitat associated with cooperative farming efforts on the refuge and the management/manipulation of moist-soil areas" (Red River NWR CCP 2008).

The CCP has defined goals, objectives, and strategies to achieve the stated action. The actions further detailed in the HMP have been identified, addressed, and authorized by the Red River NWR CCP. These include:

- Forest Management Strategy: Selectively thin forests to achieve desired forest conditions stated in CCP objectives (CCP pages 59-60)
- Moist-soil Management Strategy: Manipulate water levels and vegetative cover in moist-soil habitat to provide wintering waterfowl habitat as stated in CCP objectives (CCP pages 63-66)
- Fire Management Strategy: Implement prescribed burning to establish grasslands (CCP pages 50, 51, 58-59)
- Chemical Management Strategy: Use approved chemicals according to label specifications and pesticide use proposals to control invasive plant species (CCP page 60)
- Waterfowl Sanctuary Strategy: Maintain no hunting areas for wintering waterfowl to rest in bottomland hardwood forest and moist-soil habitat according to CCP objective (CCP pages 47-48)
- Beaver Management Strategy: Control beaver damage to allow for healthy bottomland hardwood forests according to CCP objective (CCP pages 53-54)

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- Farming Management Strategy: Farm to provide hot foods for wintering waterfowl according to CCP objective (CCP pages 66-67).
 - Reforestation Strategy: Plant trees on cleared lands when appropriate to restore bottomland hardwood forest according to CCP objective (CCP pages 58-59).

Categorical Exclusion(s). Categorical Exclusion Department Manual 516 DM 6, Appendix 1, Section 1.4 B (10), which states “the issuance of new or revised site, unit, or activity-specific management plans for public use, land use, or other management activities when only minor changes are planned. Examples could include an amended public use plan or fire management plan.”

Consistent with Categorical Exclusion (516 DM 6, Appendix 1, Section 1.4 B (10)), the HMP is a step-down management plan which provides guidance for implementation of the general goals, objectives, and strategies established in the CCP, serving to further refine those components of the CCP specific to habitat management. This HMP does not trigger an Exception to the Categorical Exclusions listed in 516 DM 2, Appendix 2.

Minor changes or refinements to the CCP in this activity-specific management plan include:

- Habitat management objectives are further refined by providing numerical parameter values that more clearly define the originating objective statement.
- Habitat management objectives are restated so as to combine appropriate objectives or split complicated objectives to provide improved clarity in the context of the HMP.
- Specific habitat management guidance, strategies, and implementation schedules to meet the CCP goals and objectives are included (e.g., location, timing, frequency, and intensity of application).
- All details are consistent with the CCP and serve to provide the further detail necessary to guide the refuge in application of the intended strategies for the purpose of meeting the habitat objectives.

Permits/Approvals

Items that are found in the EAS accompanying the final CCP:

- Executive Orders 11988/11990 - April 14, 2008
- Floodplain Management and Protection of Wetlands, April 14, 2008
- Form DI-711, Intergovernmental Notice of Proposed Action, April 14, 2006
- National Historic Preservation Act, Protection of Cultural Resources, April 14, 2006

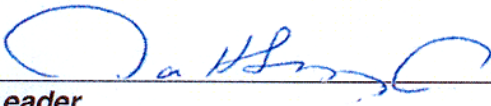

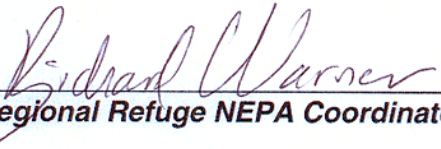
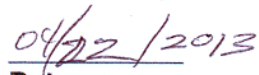
Public Involvement/Interagency Coordination. The HMP is a step-down of the approved CCP for Red River NWR. The development and approval of the CCP included appropriate NEPA documentation and public involvement. An Environmental Assessment was developed (Draft CCP/EA 2008) which proposed and addressed management alternatives and environmental consequences. Public involvement included public notification (Notice of Intent: Federal Register 71 FR 12710, March 13, 2006) and news releases, public scoping (public meetings May 15, 2006, Shreveport, LA, and May 17, 2006, Natchitoches, LA) and public review (30-day availability period: April 14, 2008-May 14, 2008). Approximately 15 members of the public attended the public meetings. Written comments were submitted by three members of the general public. Refer to CCP for specific comments and Service response.

Supporting Documents. Supporting documents for this determination include relevant office file material and the following key references:

U.S. Fish and Wildlife Service. 2011. Red River National Wildlife Refuge, Fire Management Plan.

U.S. Fish and Wildlife Service. 2008. Red River National Wildlife Refuge, Comprehensive Conservation Plan.

U.S. Fish and Wildlife Service. 2008. Red River National Wildlife Refuge, Environmental Assessment for the Draft Comprehensive Conservation Plan.

 _____ Project Leader	 _____ Date
 _____ Regional Refuge NEPA Coordinator	 _____ Date

Habitat Management Plan for Red River National Wildlife Refuge

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