

MOIST-SOIL AND CROPLAND MANAGEMENT PLAN

FOR

BAYOU COCODRIE NATIONAL WILDLIFE REFUGE

Concordia Parish, Louisiana

Southeast Region





Bayou Cocodrie National Wildlife Refuge

Moist-Soil and Cropland Management Plan



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

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CHAPTER I. INTRODUCTION

Bayou Cocodrie National Wildlife Refuge (NWR) (Figure 1) has been unable to meet the waterfowl objective outlined in the 2004 Comprehensive Conservation Plan (CCP) (U.S. Fish and Wildlife Service 2004). Therefore, the U.S. Fish and Wildlife Service (Service) is proposing to modify management activities to increase waterfowl foraging habitat for Bayou Cocodrie NWR as outlined in the Environmental Assessment (EA) for the Moist-Soil and Cropland Management Plan and Companion Amendment to CCP for Bayou Cocodrie NWR (U.S. Fish and Wildlife Service 2013c), Moist-Soil and Cropland Management Plan (U.S. Fish and Wildlife Service 2013b), and Compatibility Determination (CD) for Cropland Management (Cooperative and/or Force Account) (U.S. Fish and Wildlife Service 2013a). The draft EA, the draft plan, and the draft CD were provided to the public for review and comment to help improve waterfowl management activities at Bayou Cocodrie NWR.

SCOPE AND RATIONALE

The Moist-Soil and Cropland Management Plan is a habitat specific step-down plan from the CCP that consists of the processes and procedures involved in accomplishing the proposed management objectives and strategies set for migratory waterfowl on up to 188 acres in the early successional impoundments on Bayou Cocodrie NWR. The guidelines developed for Bayou Cocodrie NWR through this plan would be incorporated into the more comprehensive Habitat Management Plan (HMP), which is currently being developed for the refuge and is scheduled for completion by 2014. When completed, the HMP will fully incorporate and replace the Moist-soil and Cropland Management Plan. It is important to note that the proposal is to shift unharvested cropland acres from St. Catherine Creek NWR to Bayou Cocodrie NWR. There will be no net increase in cropland acres on the two refuges.

LEGAL MANDATES

Bayou Cocodrie NWR was authorized by Congress on November 16, 1990, through Public Law 101 593 (Section 108, House Report 3338), to protect some of the last remaining, least disturbed bottomland hardwoods in the Lower Mississippi Valley. Congress stated the refuge purpose as follows:

The Bayou Cocodrie National Wildlife Refuge is established and shall be managed for the purposes of (1) conservation and enhancement of wetlands; (2) general wildlife management as a unit of the National Wildlife Refuge System; and (3) fish and wildlife-oriented recreational activities.

Expanding on the primary purpose, objectives were defined in the June 1992 Environmental Assessment and Land Protection Plan prepared by the U.S. Fish and Wildlife Service. The management objectives include:

- Providing wintering habitat for migratory waterfowl;
- Establishing habitat for a natural diversity of wildlife;
- Providing habitat for non-game birds (neotropicals);
- Establishing a Research Natural Area; and
- Providing opportunities for environmental education, research, interpretation, and other wildlife-dependent recreation.

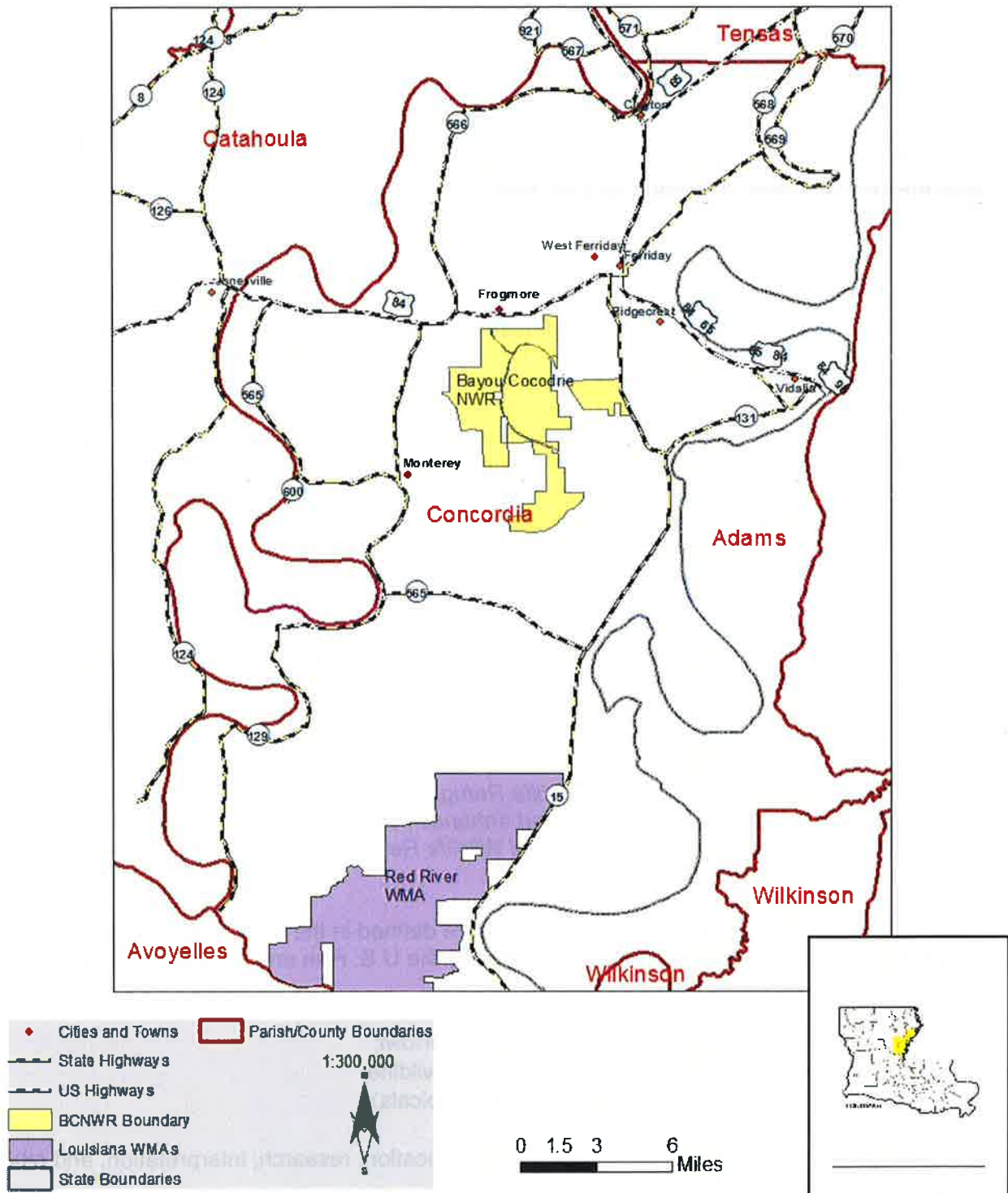
Figure 1. General location map, Bayou Cocodrie NWR



US Fish and Wildlife Service

Bayou Cocodrie National Wildlife Refuge

BAYOU COCODRIE NWR LOCATOR MAP



For consistency across the National Wildlife Refuge System, there are a number of laws, policies, and directives that guide our management. The statutory authority for conducting habitat management planning on National Wildlife Refuges is derived from the National Wildlife Refuge System Administration Act of 1966 (Refuge Administration Act), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Refuge Improvement Act).

Cropland and moist-soil management would be conducted within the policies of the U.S. Fish and Wildlife Service using best management practices, including crop rotation, no-till farming (when applicable), filter strips, crop scouting, and limited and selective use of pesticides and fertilizers. No genetically modified crops would be planted in 2013, during the period the Service is completing an environmental review relative to the use of these crops.

RELATIONSHIP TO OTHER PLANS

The moist-soil and cropland management at Bayou Cocodrie NWR is specifically related to multiple refuge and landscape level plans including the refuge's CCP, North American Waterfowl Management Plan (Canadian Wildlife Service and U.S. Fish and Wildlife Service 1986) and subsequent update (Canadian Wildlife Service, U.S. Fish and Wildlife Service and Institute of Ecology of Mexico 1994), and Partners in Flight Bird Conservation Plan for the Mississippi Alluvial Valley (Twedt *et al.* 1999), as well as the current EA for Moist-Soil and Cropland Management Plan and Companion Amendment to CCP for Bayou Cocodrie NWR (U.S. Fish and Wildlife Service 2013b), the CD for cropland management on the refuge (U.S. Fish and Wildlife Service 2013a), and the HMP currently under development (anticipated for 2014).

In response to the Refuge Improvement Act, a CCP was completed for Bayou Cocodrie NWR in September 2004 to guide management actions and direction for the refuge for 15 years (2006 – 2019) (U.S. Fish and Wildlife Service 2004). The CCP outlined a vision for the refuge and provided goals and objectives to guide refuge management and step-down management plans. The refuge has been unable to meet waterfowl targets outlined in the CCP, requiring a change in management approach in order to better serve landscape waterfowl objectives.

A Biological Review (U.S. Fish and Wildlife Service 2012) was completed subsequent to the CCP. Recommendations from that review, along with guidance from a number of national and regional planning documents (e.g., North American Waterfowl Management Plan [Canadian Wildlife Service and U.S. Fish and Wildlife Service 1986] and subsequent update [Canadian Wildlife Service, U.S. Fish and Wildlife Service and Institute of Ecology of Mexico 1994] and Partners-In-Flight Plan Bird Conservation Plan for the Mississippi Alluvial Valley [Twedt *et al.* 1999]), were used to prioritize species, provide more specific management guidance, and review the effectiveness of current management.

Since implementation of the CCP, the refuge has not been able to meet its CCP objective of 10,000 migrating and wintering waterfowl. Support of 10,000 migrating and wintering waterfowl during the 110-day winter period would require 1.1 million duck energy days (DEDs) of foraging habitat. Average annual numbers of waterfowl supported by the refuge have been 3,500. Under current management without unharvested crops, the refuge can only produce an average of just over 400,000 DEDs. To meet the 10,000 waterfowl objective, a change in management approach is required to better serve landscape waterfowl objectives. The addition of cropland management was recommended in the Biological Review. The purpose of this Moist-soil and Cropland Management Plan is to improve management capabilities to allow the refuge to

successfully achieve the goals and objectives of the CCP as they relate to wintering waterfowl, namely management of early successional wetlands and the inclusion of cropland management.

An EA (U.S. Fish and Wildlife Service 2013b) was developed to analyze alternatives, proposing that the refuge could best serve landscape waterfowl population objectives through moist-soil and cropland management. This type of management change would require an amendment to the 2004 CCP, a new CD for cropland management, and a step-down management plan that detailed cropland management on the refuge. The Service developed several documents for public review and comment: draft EA for Moist-Soil and Cropland Management Plan and Companion Amendment to CCP for Bayou Cocodrie NWR (U.S. Fish and Wildlife Service 2013b), the draft Moist-Soil and Cropland Management Plan (U.S. Fish and Wildlife Service 2013c), and a draft Compatibility Determination (CD) for Cropland Management (U.S. Fish and Wildlife Service 2013c).

Bayou Cocodrie NWR staff are also developing a HMP, which is a step-down plan that would provide more specific, comprehensive guidance for all habitat management activities on the refuge and facilitate the selection of prescriptions for implementing the goals and objectives of the CCP. The HMP is expected to be completed in 2014 and would fully incorporate and replace this Moist-Soil and Cropland Management Plan.

CHAPTER II. BACKGROUND, INVENTORY AND DESCRIPTION OF HABITAT

LOCATION

Bayou Cocodrie NWR is located in Concordia Parish in east central Louisiana, about 10 miles from the Mississippi River. The City of Ferriday, Louisiana, is the nearest city, located about 4 miles northeast of the refuge (Figure 1).

Since establishment, Bayou Cocodrie NWR has grown to 14,668 acres. It is one of the largest contiguous forest blocks remaining in the immediate area and contributes significantly to various conservation planning efforts in the Lower Mississippi River Valley.

PHYSICAL OR GEOGRAPHIC SETTING

Bayou Cocodrie NWR lies within the Lower Mississippi River Valley, a 25-million acre area that was once dominated by forested wetlands and served as productive habitat for fish and wildlife. Annual overbank flooding from the Mississippi River and its tributaries provided shallow flooding that made foraging habitat accessible on a broad scale for migrating and wintering waterfowl, as well as, provided spawning habitat for fish. As flood waters receded in late spring, young fish and crawfish were stranded in small pools where wading birds and other predators found an abundance of food resources. The moist-soil conditions and recently deposited rich, alluvial sediments supported a productive, diverse plant and animal community. The plants produced abundant fruit and seeds that served as foraging habitat for waterfowl the following winter when seasonal flooding returned. Wintering waterfowl food consisted primarily of fruit and mast produced by trees, seeds from annual plants, and invertebrates found in the deep leaf litter of the forest floor.

The construction of thousands of miles of levees and navigation structures interrupted the annual wet-dry cycle and facilitated the clearing and conversion of nearly 20 million acres to row-crop agriculture and other development (Tiner 1984). Today, the landscape of the Lower Mississippi River Valley is much dryer and remaining forest patches are fragmented. Despite the fragmentation, the geographic region provides important habitat for migratory birds. It is the focus area of the Lower Mississippi Valley Joint Venture (LMVJV) and other planning efforts that have set habitat and/or population objectives for a number of bird groups, including waterfowl, shorebirds, and forest breeding birds. Public lands, including many national wildlife refuges, serve as forested islands in the highly fragmented landscape. Intensive management of water and foraging habitat is conducted on many of the refuges in the Lower Mississippi River Valley and, cumulatively, play an important role in the health and maintenance of continental waterfowl populations.

MANAGEMENT UNIT DESCRIPTIONS

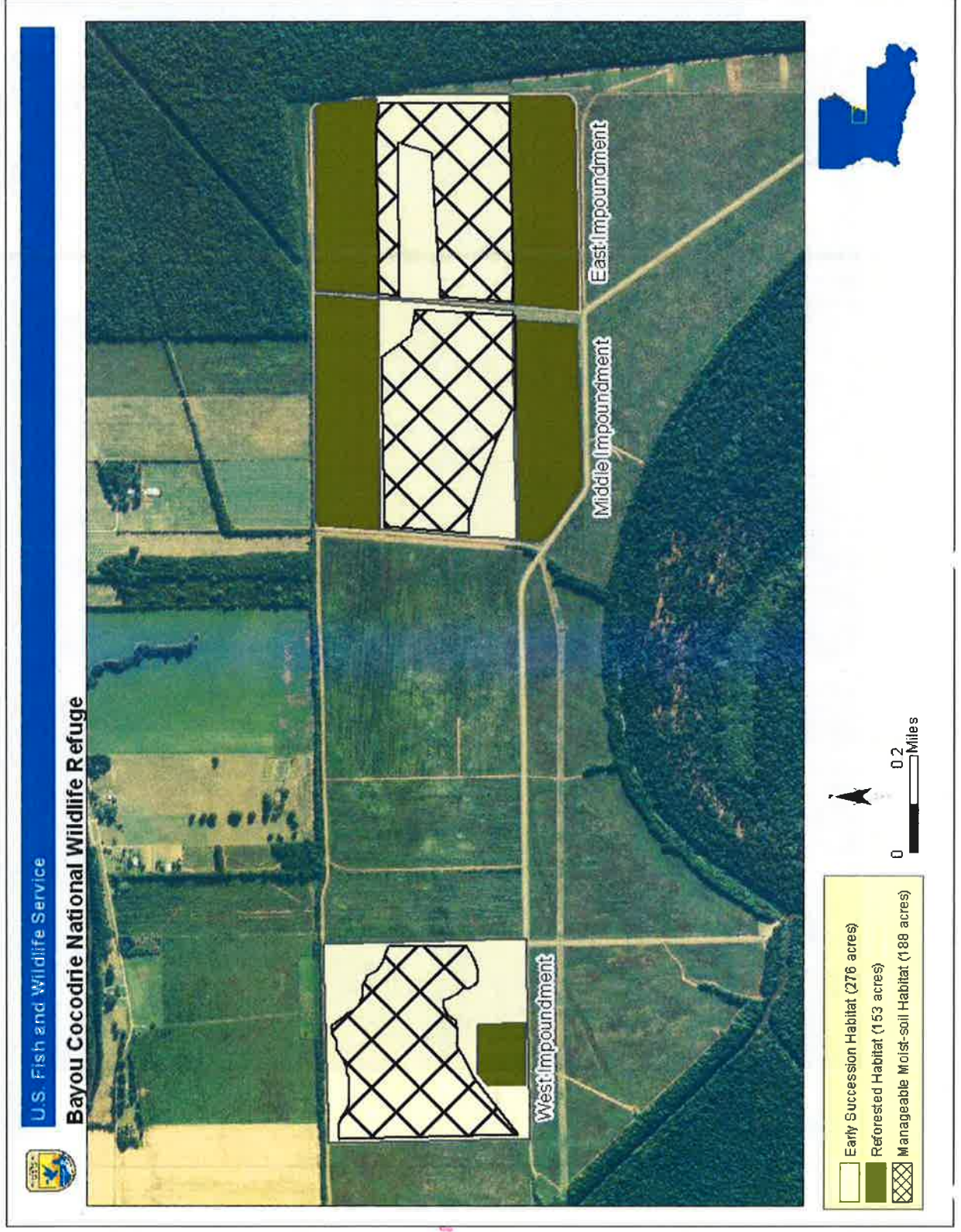
A vast majority of the refuge is forested wetlands (about 11,200 acres of mature bottomland hardwood forest). Another 2,366 acres of former row-cropped fields have been reforested since refuge acquisition. About 429 acres are impounded with levees divided into 3 units and designated at one time as early successional wetlands. About 153 acres were later reforested and are now classified as greentree reservoir, leaving only about 276 acres in early successional habitat. Of the 276 acres, about 188 acres are easily flooded and can be consistently managed for waterfowl (manageable acres). The remaining acres are maintained in

early successional habitat and managed as nocturnal habitat for American woodcock (*Scolopax minor*). Altogether, waterfowl management is conducted on approximately 1,113 acres of seasonally flooded wetlands: 772 acres of forested habitat, 153 acres of greentree reservoirs, and 188 acres of early successional wetlands managed for moist-soil (Figure 2). The 3 leveed units managed for waterfowl habitat are the East, Middle, and West impoundments located in the Headquarters Unit of the refuge (Figure 3). The manageable area in each of the units is based on elevations and the ability to easily manipulate water and vegetation: West Impoundment, 64 acres; Middle Impoundment, 67 acres; and the East Impoundment, 57 acres. To simplify discussion in this document, all impoundments were generally assumed to have an area of 60 acres for the management of water and plants.

Figure 2. Managed seasonal wetlands, Bayou Cocodrie NWR



Figure 3. Water management impoundments, Bayou Cocodrie NWR



CHAPTER III. RESOURCES OF CONCERN

Priorities associated with wildlife and habitat management for the National Wildlife 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 U.S. Fish and Wildlife 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 Bayou Cocodrie NWR related to moist-soil and cropland management were selected after taking into account the conservation needs identified within international, national, regional, and ecosystem goals/plans; State fish and wildlife conservation plans; recovery plans for threatened and endangered species; and previously approved refuge resource management plans, including the refuge's 2004 CCP and recommendations identified through the biological review (USFWS, 2012). Two species of concern listed in the Biological Review Report were wintering waterfowl and American woodcock, both of which heavily utilize early successional habitats.

3.1 WINTERING WATERFOWL

3.1.1 Significance

Wintering waterfowl was selected as a priority Resource of Concern due to the refuge's location within a priority planning area for the LMVJV as well as it being identified specifically within the refuge's purpose, it supports the National Wildlife Refuge System mission, it supports the Migratory Bird Treaty Act, and it supports the CCP. Bayou Cocodrie NWR is also located in the Mississippi Flyway, which is a key ecoregion for migrating and wintering dabbling ducks in North America (Reinecke *et al.* 1989). No waterfowl habitat step-down objectives were ever established by the LMVJV for Bayou Cocodrie NWR, however, the CCP provides objectives of 440 acres (480,000 duck-use days) of moist-soil habitat and 10,000 migrating and wintering waterfowl. The refuge attracts moderate amounts of migrating mallards (*Anas platyrhynchos*), teal (*A. spp.*), gadwall (*A. strepera*), and wood ducks (*Aix sponsa*) during the winter. Waterfowl utilize not only the moist-soil habitat but also the seasonally-flooded bottomland hardwood forest on the refuge. Flooded timber provides other attributes to wintering waterfowl that early succession habitat may not provide, such as, better thermal cover, protective cover, roosting sites, other suites of invertebrate assemblages, and acorns (Fredrickson and Heitmeyer 1988).

3.1.2 Identification of Habitat Requirements

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. 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 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-soil and bottomland hardwood forest), (2) flooded croplands, and (3) refuge (i.e., sanctuary) (Reinecke *et al.* 1989).

Two natural wetland habitats that waterfowl have used historically in the Lower Mississippi River Valley are bottomland hardwood forests and moist-soil habitats (i.e., early successional grass-sedge and other herbaceous vegetated wetlands). These natural wetlands are key foraging and resting habitats for waterfowl. Both bottomland hardwood and moist-soil habitats are rich in high-energy natural seeds (e.g., acorns in oak bottomlands; grass-sedge seeds, roots, and tubers in moist-soil areas) and aquatic invertebrates. Significant acorn producers are members of the red oak family, primarily Nuttall oak (*Quercus nuttallii*), willow oak (*Q. phellos*), water oak (*Q. nigra*), and cherrybark oak (*Q. falcata pagodifolia*). Soft mast important to waterfowl includes water tupelo (*Nyssa aquatica*), elms (*Ulmus* spp.), red maple (*Acer rubrum*), and ashes (*Fraxinus* spp.). Invertebrates associated with the litter layer in forests provide an invaluable food source for waterfowl (Heitmeyer 1988). Several species of waterfowl heavily utilize flooded forest habitat in winter for resting and foraging for acorns, other fruits, various seeds, and invertebrates. Wood ducks seek these habitats almost exclusively. Mallards, gadwall, and widgeon (*A. americana*) all utilize flooded forested habitat as one 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).

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 provided 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, average foraging production in moist-soil habitat is frequently far less in most managed units across the Lower Mississippi River Valley. Reinecke *et al.* (1989) suggested an average of 450 kilograms/hectare (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 per acre reported by Kross (2006). 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.

Only 20% of bottomland hardwood forests remain today (Tiner 1984). Due to significant landscape level loss of natural wetlands, waterfowl populations today are unable to acquire all of their nutritional requirements from natural wetlands. Farming for waterfowl has become extremely important. High carbohydrate crops such as corn, rice, milo, and millet provide critical energy to sustain ducks throughout the cold periods in winter, 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).

In an effort to standardize waterfowl foraging values, biologists and managers use the term duck energy day (DED). A DED is the amount of energy required to support an average sized duck for one day during the wintering period. The relative values of foraging habitat expressed in DEDs was developed by Reinecke and Kaminski (2012) based on commercial production of grain crops and specific research on seed availability in fields managed for moist-soil plants (Table 1). DEDs/acre is the average number of dabbling ducks that can obtain daily energy requirements from an acre of foraging habitat for a day. Unharvested grain crops provide an important food resource to the diet of wintering waterfowl and provide a high number of

DEDs/acre, particularly when compared to bottomland hardwood forests and moist-soil wetlands.

Table 1. Carrying capacity of selected foraging habitats expressed as duck energy days/acre (DEDs) for dabbling ducks in winter.

Habitat	DEDs/ac
Bottomland forest	
10% red oak	15
70% red oak	297
Moist-soil	1,868
Unharvested crops	
Rice	11,987
Corn	22,579
Milo	11,914
Millet	5,203

Note: DED values for bottomland forest, moist-soil, and millet are from Reinecke and Kaminski (2012). DED values for unharvested corn, rice, and milo are from calculations using the methodology presented by Reinecke and Kaminski (2012) and using the 5-year (2006-2010) crop yield averages for Concordia Parish (Daniels 2010): corn, 112 bushels/acre; rice, 65 bushels/acre; and grain sorghum (milo), 50 bushels/acre. The parish average for corn was further reduced by about 20% to 90 bushels/acre because planting on the refuge occurs after the recommended planting time for corn in the Parish and the heavy clay soils in the impoundments are not conducive to premium crop production. Average yields for rice, corn, and milo were all reduced by 20% to account for depredation and deterioration attributable to weather, birds, and other non-target wildlife during the period between late summer (normal harvest in September/October) and early winter when waterfowl arrive (late November and December) following Reinecke and Kaminski (2012) and actual data collected by Refuge personnel.

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 Lower Mississippi River Valley from September through early April (Strader and Stinson 2005).

Waterfowl also 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 [e.g., 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 (Heitmeyer and Raveling 1988; Kahl 1991). In Louisiana, Paulus (1984) found that increased foraging time by gadwalls was insufficient to counterbalance disturbance factors.

3.1.3 Potential Refuge Contribution to Habitat Needs

Bayou Cocodrie NWR is located 10 miles from the Mississippi River and provides a diversity of alluvial bottomland habitats, most of which possess management capabilities. Water level

management on Bayou Cocodrie NWR continues to provide habitat for wintering waterfowl and breeding wood ducks. The refuge provides approximately 153 acres of greentree reservoirs and 188 acres of intensively managed moist-soil habitat, which are protected from hunting and disturbance, and 772 acres of seasonally flooded forested swale habitat. Through a combination of seasonally flooded forested wetlands and moist-soil management, and by adding unharvested crops, the refuge would provide a diversity of waterfowl foraging habitats to meet or exceed the 10,000 waterfowl target through the winter period (1.1 million DEDs) as stated in the CCP. By adding up to 120 acres of croplands to the refuge, it would be estimated that the refuge would be able to increase from the 3,500 waterfowl currently served up to 1.6 million DEDs (~13,600 waterfowl) on a consistent basis.

CHAPTER IV. HABITAT GOALS AND OBJECTIVES

This Moist-Soil and Cropland Management Plan is a habitat specific step-down plan from the CCP that consists of the processes and procedures involved in accomplishing the proposed management objectives and strategies set to meet the wintering waterfowl foraging habitat goals for Bayou Cocodrie NWR. Each of the three management units varies in size so objectives are expressed in 60-acre increments for the purposes of this plan. Actual acreages of moist-soil and cropping would vary and generally would encompass a significant part of the management unit. The habitat objectives focus on managing early succession stages, moist-soil and cropping, within the bottomland ecosystem. The refuge's CCP would be amended to update objectives A.3 Migratory Waterfowl and B.6 Managed Wetlands (see the 2013 Environmental Assessment for the Moist-Soil and Cropland Management Plan and Companion Amendment to CCP for more detailed information).

4.1 MOIST-SOIL AND CROPLAND

4.1.1 Objective B.6. Managed Wetlands

4.1.1.1 Moist-Soil

Provide 60-120 acres of moist-soil vegetation (1,868 DEDs/acre) with 50-80 percent plant composition of millets, sprangletop, annual smartweeds, and sedges (*Cyperus spp.*) and no more than 20 percent of undesirable plants (e.g., coffeeweed [*Sesbania herbacea*] and cocklebur [*Xanthium strumarium*]) to contribute to 1.6 million DEDs of winter waterfowl foraging habitat annually.

Management Unit: West, Middle, East (Figure 3)

Supporting Documents: Modified CCP Objective: A.3, *Waterfowl and Shorebirds* and Modified CCP Objective B.6, *Wetlands*, as outlined in the 2013 EA; *Management of Seasonally Flooded Impoundments for Wildlife* (Fredrickson and Taylor, 1982); *Moist-Soil Guidelines for the U.S. Fish and Wildlife Service, Southeast Region* (Strader and Stinson, 2005); and *Estimates of Duck Energy Days* (Reinecke and Kaminski, 2012)

Resource of Concern: Wintering waterfowl

Rationale: Moist-Soil plant management is implemented to create the conditions and promote the production of native seed and tuber producing plants and invertebrates sought by waterfowl. Although not particularly high in DED production, moist-soil plants produce foods that are typically high in protein and other nutritional values particularly critical for waterfowl as they complete their molt and prepare for reproductive activities. Using the standard value of 1,868 DEDs/acre (Table 1), total DED production on 60 to 120 acres of managed moist-soil would be expected to produce about 112,000 to 224,000 DEDs.

Adaptive Management Monitoring Elements:

Habitat Response Variables	Method
<ul style="list-style-type: none">• % vegetation cover (desirable/nondesirable)	<ul style="list-style-type: none">• Vegetation surveys (2 surveys/season)
Wildlife Response Variable	Method
<ul style="list-style-type: none">• Waterbird use	<ul style="list-style-type: none">• Waterbird surveys (bi-monthly surveys, October through July)

4.1.1.2 Cropland

Provide 60-120 acres of high energy foods to contribute to 1.6 million DEDs annually through planting rice, corn, milo, or millet (11,987, 22,579, 11,914, and 5,203 DEDs/acre, respectively) to provide foraging habitat for wintering waterfowl.

Management Unit: West, Middle, East (Figure 3).

Supporting Documents: Modified CCP Objective: A.3, *Waterfowl and Shorebirds* and Modified CCP Objective B.6, *Wetlands*, as outlined in the 2013 EA; *Managing Agricultural Foods for Waterfowl* (Ringelman, 1990); *Moist-Soil Guidelines for the U.S. Fish and Wildlife Service, Southeast Region* (Strader and Stinson, 2005); and *Estimates of Duck Energy Days* (Reinecke and Kaminski, 2012)

Resource of Concern: Wintering waterfowl

Rationale: Waterfowl require high energy foods to maintain body condition for migration and for thermal demands. Milo, rice, and corn are high in carbohydrates, thus can provide approximately 12,000-22,000 DEDs per acre (Table 1). Historically, before agricultural foods were available, waterfowl focused on the consumption of acorns in flooded timber and heavy seed producing annual grasses and sedges. By producing unharvested crops, refuges can effectively provide the food needed to meet energy requirements for thermal demands during winter and spring migration on a much reduced wetland landscape.

Original objectives established in the CCP (USFWS 2004) were to provide 440 acres of moist-soil habitat within the impoundments providing for 10,000 winter waterfowl. The DEDs needed to provide food for 10,000 waterfowl within a 110-day use period would be approximately 1,100,000 DEDs. Providing only moist-soil habitat cannot meet the objectives to support the wintering waterfowl objective stated in the CCP for Bayou Cocodrie NWR. To provide enough DEDs to support 10,000 waterfowl for 110 days, high energy, unharvested grain crops must also be available.

Historically, Bayou Cocodrie NWR utilized farming to meet waterfowl objectives. Due to the conversion of some cropland to reforested land and the remaining cropland to moist-soil management, farming was eliminated as a method to meet wintering waterfowl objectives. Through the grouping of refuges within a Refuge Complex in 2008, St Catherine Creek and Bayou Cocodrie NWRs are able to share land bases and resources to accomplish objectives. Because of the dynamics and frequency of flooding by the Mississippi River on St. Catherine Creek NWR, the unharvested refuge share is often lost to high water before it is consumed by

waterfowl. Moving part of this refuge share to Bayou Cocodrie NWR, which is protected from flooding by the mainline levee, minimizes the risk of losing the crops and allows both refuges to meet a combined total waterfowl foraging objective of about 5 million DEDs.

One to two of the current three early successional water Management Units or 60-120 acres of rice, corn, or milo would be produced each year on Bayou Cocodrie NWR. This would potentially provide 714,840 to 2,707,480 DEDs of unharvested crop, depending on crop type, planting and fertilization rates, and intensity of pesticide use.

Adaptive Management Monitoring Elements:

Habitat Response Variables	Method
<ul style="list-style-type: none">• Crop/acres produced	<ul style="list-style-type: none">• GIS mapping
Wildlife Response Variable	Method
<ul style="list-style-type: none">• Waterfowl use	<ul style="list-style-type: none">• Waterbird surveys (bi-monthly surveys, October through July)

CHAPTER V. HABITAT MANAGEMENT STRATEGIES

5.1 MOIST-SOIL AND CROPLAND MANAGEMENT STRATEGIES

5.1.1 Moist-Soil

Preferred moist-soil plants for foraging waterfowl are typically heavy seed producing annuals, such as wild millets, smartweeds, sprangletop, other grasses, and sedges. Desirable moist-soil vegetation at Bayou Cocodrie NWR consists mostly of sprangletop (*Leptochloa dubia*), millets, toothcup (*Ammania coccinea*), Pennsylvania smartweed (*Polygonum pennsylvanicum*), and some *Cyperus* species.

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 timing and duration of water level drawdowns, mowing, disking, and/or chemical treatment(s) to keep units in early successional stages and to provide desirable plant species (Strader and Stinson 2005). These actions are used to maximize waterfowl food production and usage.

Disturbance is critical for the production of these desirable plants. Failure to disturb the soil (e.g., disking) would allow progression of natural plant succession to perennials, both herbaceous and woody, that out-compete annual plants and greatly reduce waterfowl food production. Therefore, it would be critical that the moist-soil areas be maintained using whatever means available if the refuge were to provide high quality moist-soil foraging habitat (Strader and Stinson 2005). Examples of undesirable plants at Bayou Cocodrie that may warrant treatment include, but are not limited to, swamp smartweed (*Polygonum hydropiperoides*), beakrush (*Rhynchospora corniculata*), cocklebur, coffeeweed, red vine (*Brunnichia ovate*), black willow (*Salix nigra*), common button bush (*Cephalanthus occidentalis*), and marshmallow (*Hibiscus spp.*). Chemical treatments can be used alternatively or in combination with soil disturbance to reduce woody encroachment and competition from broadleaf plants. If broadleaf plants begin to reduce desirable moist-soil plant production during the draw down phase, specific herbicides could be applied aerially or by ground application to set back undesirable growth.

Hydrology and soil moisture are other factors that determine wetland plant species occurrence. Drawdowns and flooding would be variable across time and space in order to provide habitat diversity for shorebirds and waterfowl use throughout fall and winter. This variability in timing across impoundments would stratify the availability of resources and extend the period of desirable habitat conditions. It would also produce different moist-soil plants and provide diverse conditions for various species and guilds of waterbirds.

Flooding of the impoundments would be staggered from as early as August through January to provide water for migratory and resident waterbirds. Flooding in August-October will provide water for early migrating waterfowl such as blue-winged teal and resident and migrating wood ducks. Peak flooding should occur during late December through mid-January to coincide with peak waterfowl numbers. Staggered flooding through peak waterfowl season will allow foods to become available and persist through the season.

Spring drawdowns (February-April) should function similarly to flood-ups, but water levels should slowly decrease to concentrate invertebrates for foraging waterfowl, wading birds, and

shorebirds. Summer drawdowns (May-July) should be slow and focus on vegetation response by producing desirable foods for the following season. Late season drawdowns provide conditions suitable for undesirable broadleaf plants (e.g. cocklebur and coffeebean) to germinate and potentially dominate fields dedicated to moist-soil production. Therefore, plants should be controlled with careful water level manipulation or herbicides.

Providing moist-soil vegetation is critical for nutritional diversity in the diets of wintering waterfowl. One to two of the current three early successional water management units or about 60-120 acres of moist-soil habitat should be produced each year. This will provide approximately 112,080-224,160 DEDs of moist-soil (1,868 DEDs/ac) vegetation. If land suitable for impoundment development is acquired in the future, additional acres should contribute towards moist-soil plant production.

5.1.2 Cropland

Agricultural crops can significantly contribute to the energy demands and fitness of wintering waterfowl. Rice, corn, and milo are the top choices of grain crops for ducks in the Lower Mississippi River Valley. However, some considerations should be evaluated before planting. Using DED values from Table 1, corn provides the highest energy foods for waterfowl at 22,579 DEDs/acre. Milo is a hardy plant, needing less moisture to mature than corn or rice. Milo is the least expensive crop to produce, but produces only 11,914 DEDs/ac, which is significantly less than corn. Rice, which averages 11,987 DEDs/acre, requires relatively flat elevations to achieve maximum production, as flooding needs to be uniform throughout the impoundment. Significant elevation changes (>1 foot) can reduce production when growing rice. In addition, pumping the water essential for rice during dry periods of the growing season can increase the cost of growing this crop. However, the flood conditions required to grow rice provides permanent water for other waterbirds and allows moist-soil plants to germinate and produce a mixture of rice and native wetland plants within a stand called "dirty rice". In comparison, the process of growing milo and corn requires the impoundment to be kept dry, providing little habitat value to wetland dependent wildlife throughout the growing season. When growing any of these crops problems may arise from severe weather or depredation from deer, feral hogs, and birds prior to late fall flooding and/or waterfowl arrival.

The description in DEDs allows for annual variation with regard to methods, acres managed, and desired vegetation. The objective is set to assure that the original CCP objective of 10,000 migrating and wintering waterfowl is met or exceeded and to contribute to an overall objective for the Refuge Complex of ~5 million DEDs.

If the entire 120 acres were planted to corn, the highest yielding crop, the refuge's maximum foraging potential would increase to nearly 2.9 million DEDs, or 26,304 waterfowl for 110 days. It must be understood, however, the objective of cropland management on Bayou Cocodrie NWR is not to maximize DED production, but rather to provide a diversity of quality foraging resources for waterfowl to meet habitat objectives. Through various methods, including reduced cropping acres, selection of the crop type, reduced use of pesticides and fertilizer, and tolerance of some crop depredation, the potential will be maintained around 1.6 million DEDs annually.

For example, rice is another preferred crop that adds the potential of providing habitat for wading birds and marshbirds throughout the growing season and winter. Experience has shown that growing rice as a refuge crop with selective and reduced use of herbicides and

fertilizer also produces significant quantities of other desirable grasses. The objective of refuge grown rice would be to provide about 12,000 DEDs per acre by winter flooding or about 50% of the DED production reported by Reinecke and Kaminski (2012). Millet, another preferred, quick maturing crop, produces about 5,203 DEDs/acre. A half rice/half millet combination on 120 acres would result in the production of about 1.2 million DEDs when coupled with DED production from other managed wetlands on the refuge. Numerous other viable options are available, depending on the crop selected and level of farming intensity to meet objectives.

Two methods for producing crops currently exists, cooperative and force account farming. Cooperative farming is an important component in the process of meeting waterfowl objectives on refuges throughout the Lower Mississippi River Valley. Historically, Bayou Cocodrie NWR utilized cooperative farming to meet waterfowl objectives. Due to the reforestation of some cropland and management of the remaining lands to promote moist-soil plants, cooperative farming and eventually all farming was eliminated as a method to provide crops to meet wintering waterfowl objectives. However, without the use of cropland management, the refuge has been unable to meet waterfowl objectives, requiring the evaluation of the re-establishment of cropland management on the refuge. Through the grouping of refuges within a Refuge Complex, refuges are able to share land bases and resources to accomplish objectives. Because of frequency of late flooding by the Mississippi River on St. Catherine Creek NWR, refuge shares for cooperative farming at St Catherine Creek NWR would be used to provide crops at Bayou Cocodrie NWR, as long as the cooperative farming program exists and the farmer is in agreement. Refuge staff has conducted small amounts of force account farming in the past, but the feasibility is highly dependent upon the availability of funding for staff, seed, fertilizer, and pesticides to produce a crop. Cooperative farming has been, and will continue to be, a cost-effective mechanism to provide the high energy food. Management of a cooperative farming program reduces dependence on refuge staff and equipment to meet the waterfowl foraging habitat objective.

Cooperative farming has been conducted on St. Catherine Creek NWR since it was established with the current crop acreage of 1,950. The accepted farm share in the Cooperative Farming Agreement is 80% harvested by the farmer and 20% left unharvested for waterfowl. Using this ratio, the farmer leaves 390 acres of crop in the field as the refuge share. The proposal is to plant 60 to 120 acres of the refuge share at Bayou Cocodrie NWR, and the remaining 270 to 330 acres of unharvest crop would be planted at St. Catherine Creek NWR. The average crop production reported by the Louisiana State University AgCenter for Concordia Parish during the 5-year period 2006 through 2010 was 112 bushels/acre for corn, 65 bushels/acre for rice, and 50 bushels/acre for grain sorghum (milo). For DED production, the parish average for corn was reduced by 20% due to planting on the refuge typically occurs after the recommended planting dates and the heavy clay soils of the area proposed for planting. The anticipated crop yield for corn on the refuge is estimated to be 90 bushels/acre. There is no parish average for millet production.

The soils within the impoundments are Alligator and Sharkey clays. These soils are fine textured, heavy clay that are poorly drained and have low permeability and clay sub-soils. This water holding capability justified the area's development into wetland impoundments, which have served as moist-soil units and agricultural fields in recent history. These soil types are highly restrictive to development because of their shrink-swell characteristic.

All crops planted on Bayou Cocodrie NWR would remain unharvested. Cropland and moist-soil management would be conducted within the policies of the U.S. Fish and Wildlife Service using

best management practices, including crop rotation, no-till farming (when applicable), filter strips, crop scouting, and limited and selective use of pesticides and fertilizers. No genetically modified crops would be planted in 2013 during the period the Service is completing an environmental review relative to the use of these crops.

5.2 MOIST-SOIL AND CROPPING MANAGEMENT PRESCRIPTIONS

5.2.1 Moist-Soil

To contribute to Objective B.6 in impoundments East, Middle, and West for wintering waterfowl, the listed strategies would be used to manage moist-soil habitat.

- Annually remove boards from structures to produce a desired drawdown rate across impoundments from as early as February through July to achieve desired vegetation.
- Disk impoundments every 2-3 years to set back plant succession and to address invasion by undesirable and/or woody plants. Disking may be done by staff or incorporated into the cooperative farming schedule. Disking may be sufficient but, in some instances, a combination of herbicide/mow/disk treatments may be necessary. Disking would function as a tool to reduce succession, but also double as site preparation for crop production.
- Monitor vegetation growth throughout the summer for percent cover of undesirable plants. Minimize undesirable vegetation (e.g., cocklebur and coffeeweed) with periodic flooding and flushing. If undesirables exceed 20% cover, manipulate vegetation through mechanical (mowing/disking) or with chemical methods.
- 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.
- Provide appropriate Pesticide Use Proposals (PUPs) annually for chemicals to be applied for moist-soil purposes.
- Using best management practices and label rates, aerial or ground apply herbicides necessary to reduce undesired vegetation. Herbicides for broadleaves may include, but are not limited to Aim, 2,4-D, Grandstand, Blazer, and Diablo (dicamba).
- Annually, place boards in water control structures in August through October to hold water or if not sufficient rainfall, pump water to achieve <18 inches water depth staggering water levels between impoundments through peak waterfowl use (mid-January). Where shallow water flooding is not feasible along the higher elevations of the East and West impoundments, provide saturated soil conditions from January through February.

5.2.2 Cropland

To contribute to Objective B.6 in impoundments East, Middle, and West for wintering waterfowl, the listed management strategies would be used.

- Annually remove boards within impoundment(s) to be cropped no earlier than March 1 to allow a drying period sufficient enough to allow for heavy equipment to prepare site and to plant crops.
- If cooperative farming is utilized, the refuge would annually evaluate and meet with the farmer to establish/update the cooperative farm plan and agreement.

-
- Ensure that the farmer adheres to the Cooperative Farming Agreement and plants and maintains approximately 60-120 acres (1-2 impoundments) of unharvested rice, milo, and/or corn as the refuge's share. To minimally achieve the 1.1 million DED objective needed to meet the CCP goal using crops only, the refuge would need to produce at least 92 acres of rice or milo, 48 acres of corn, or any mixture of equal value (DED values from Table 1). Inclusion of DEDs produced in other managed wetland habitats on the refuge will reduce those acres by about 15%.
 - If cooperative farming is not used, the refuge would provide one staff (term/FTE) to focus on planting and maintaining crops.
 - If needed, utilize disking/mowing/spraying annually for crop site preparation and to set back succession for impoundments no earlier than March and no later than June 15th.
 - Best management practices (e.g., crop rotation, no-till farming [when applicable], filter strips, soil tests, and crop scouting) will be used to assure good farming practices are used on refuge lands.
 - Provide appropriate Section 7 Consultations and Pesticide Use Proposals (PUPs) annually for chemicals required to be used in the refuge farming program.
 - Annually, place boards in water control structures in August through October to hold water or if not sufficient rainfall, pump water to achieve <18 inches water depth staggering water levels between impoundments through peak waterfowl use (mid-January). Where shallow water flooding is not feasible along the higher elevations of the East and West impoundments, provide saturated soil conditions from January through February.

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**FINAL ENVIRONMENTAL ASSESSMENT
FOR
MOIST-SOIL AND CROPLAND MANAGEMENT PLAN
AND
COMPANION AMENDMENT FOR THE 2004 CCP
FOR
BAYOU COCODRIE NWR**

**Final Environmental Assessment
for
Moist-Soil and Cropland Management Plan and
Amendment to 2004 Comprehensive Conservation Plan
for
BAYOU COCODRIE NATIONAL WILDLIFE REFUGE
Concordia Parish, Louisiana**

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Chapter 1 Purpose and Need for Action

Introduction

This Environmental Assessment (EA) evaluates the potential impacts of implementing cropland management activities on Bayou Cocodrie National Wildlife Refuge (NWR) and amending Comprehensive Conservation Plan (CCP) objectives A.3. Waterfowl and Shorebirds, and B.6. Wetlands and strategies to more effectively and efficiently manage the natural resources of Bayou Cocodrie NWR (Figure 1) and better meet waterfowl population objectives for the refuge. Documents related to this EA include the draft Compatibility Determination (CD) for cropland management on Bayou Cocodrie NWR, the Companion Amendment for the 2004 CCP and the draft Moist-Soil and Cropland Management Plan.

Congress authorized the establishment of Bayou Cocodrie NWR on November 16, 1990, through Public Law 101-593 (Section 108, House Report 3338) to protect some of the last remaining, least disturbed bottomland hardwoods in the Lower Mississippi Valley. In establishing the refuge, Congress stated the following purposes:

The Bayou Cocodrie National Wildlife Refuge is established and shall be managed for the purposes of:

- *conservation and enhancement of wetlands;*
- *general wildlife management as a unit of the National Wildlife Refuge System, including management of migratory birds; and*
- *fish and wildlife-oriented recreational activities.*

Expanding on the primary purpose, management objectives were defined in the June 1992 Environmental Assessment and Land Protection Plan prepared by the Service to include:

- provide wintering habitat for migratory waterfowl,
- establish habitat for a natural diversity of wildlife,
- provide habitat for non-game migratory birds (neotropicals),
- establish a Research Natural Area, and
- provide opportunities for environmental education, research, interpretation, and other wildlife-dependent recreation.

To date, 14,668 acres have been acquired within the 24,496 acre acquisition boundary. In 2004, the staff of Bayou Cocodrie NWR developed a CCP to outline the goals, objectives, and strategies that would be used to achieve the purposes established by Congress. Through nearly a decade of management, it has been determined that some portions of the goals and objectives within the 2004 CCP are not achievable as previously presented. Adjustments must be made to certain objectives and/or their strategies in order to make them compatible with one another and with refuge capabilities.

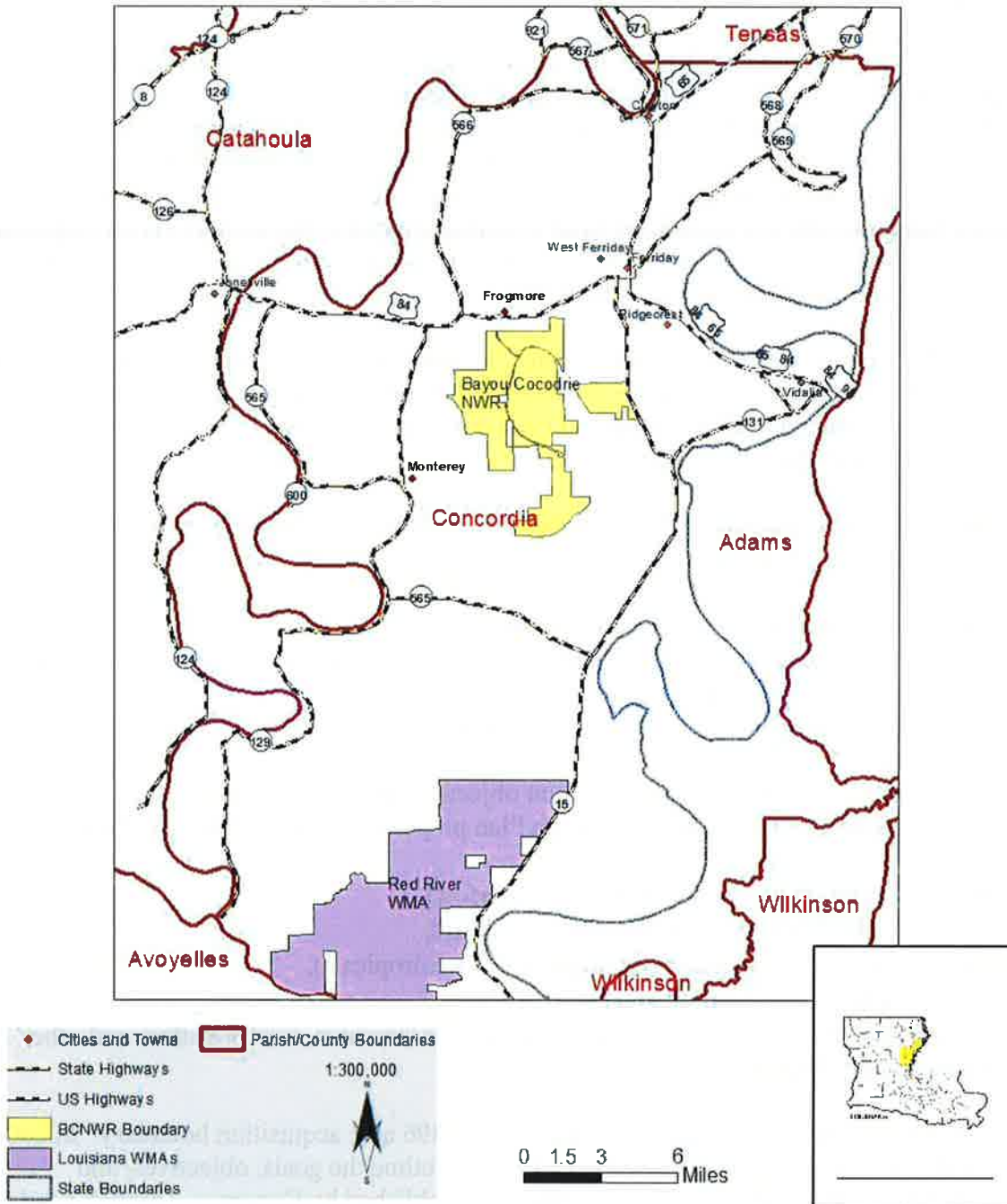
Figure 1. Location of Bayou Cocodrie NWR



US Fish and Wildlife Service

Bayou Cocodrie National Wildlife Refuge

BAYOU COCODRIE NWR LOCATOR MAP



Purpose and Need

The purpose of the EA is to ensure that Bayou Cocodrie NWR continues to conserve and enhance wetlands, wildlife diversity, and migratory birds; contributes to wildlife population goals and objectives in Partners in Flight plan, Louisiana Black Bear Protection Plan, North American Waterfowl Management Plan, American Woodcock Management Plan, and other plans for the Lower Mississippi Valley; conserves, manages, and restores the values and functions of the refuge's bottomland hardwoods to sustain the biological diversity characteristic of the ridge and swale topography of the Lower Mississippi Valley; while also supporting appropriate and compatible wildlife-dependent recreational activities.

Since the refuge cannot meet the current waterfowl annual population target of 10,000 under current management (as outlined in Objective A.3 of the 2004 CCP), the EA is needed to modify refuge management activities through a step-down management plan, compatibility determination and companion CCP amendments.

It is important to note that the proposed action includes up to 120 acres of cropping annually on Bayou Cocodrie NWR. This will be a shift of unharvested crops (and DEDs) from St. Catherine Creek NWR. Unharvested crops at St. Catherine Creek NWR are often flooded by the Mississippi River too deep for waterfowl to access well before the end of the waterfowl winter period. The shift of unharvested grain crops to Bayou Cocodrie NWR will be a more efficient and effective use of the unharvested crops and will result in Bayou Cocodrie NWR being able to meet the wintering waterfowl foraging habitat objective published in its CCP (U.S. Fish and Wildlife Service 2004). There will be no net change in total cropland acres or DEDs on the two refuges.

Cropland and moist-soil management would be conducted within the policies of the U.S. Fish and Wildlife Service using best management practices, including crop rotation, no-till farming (when applicable), filter strips, crop scouting, and limited and selective use of pesticides and fertilizers. No genetically modified crops would be planted in 2013 during the period the Service is completing an environmental review relative to the use of these crops.

Chapter 2 Management Alternatives

This chapter discusses the alternatives considered for amending two CCP objectives and associated strategies to more effectively and efficiently manage the wetland resources to achieve specific migratory waterfowl objectives set for Bayou Cocodrie NWR.

There are 1,113 acres of managed seasonally flooded wetlands on the refuge (Figure 2). A large majority of Bayou Cocodrie NWR is a mature bottomland hardwood forest. Another 2,366 acres of former row-cropped fields have been reforested since the acquisition of the refuge. Approximately 772 acres of the forest have water management capabilities due to the installation of water control structures. About 429 acres of former row-cropped fields have been impounded with levees divided into 3 units and designated at one time as early succession wetlands. About 153 acres within these impoundments were later reforested and classified as greentree reservoir, leaving only about 276 acres in early succession habitat. Of the 276 acres, about 188 acres are easily flooded and can be consistently managed for waterfowl (Figure 3). The remaining 88 acres are maintained in early succession and managed as nocturnal habitat for woodcock and other grassland birds. Altogether, waterfowl management is conducted on approximately 1,113 acres of seasonally flooded wetlands: 772 acres of forested habitat, 153 acres of greentree reservoirs, and 188 acres of early succession wetlands managed for moist-soil/cropland. These 3 impounded units managed for waterfowl habitat are the East, Middle, and West Impoundments located in the Headquarters Unit of Bayou Cocodrie NWR. The manageable area in each of the units is based on elevations and the ability to easily manipulate water and vegetation: West Impoundment, 64 acres; Middle Impoundment, 67 acres; and the East Impoundment, 57 acres. To simplify discussion in this document, it is generally assumed that all impoundments are 60 acres.

Three alternatives were analyzed, as listed.

- Alternative A: Continue Current Management (No Action Alternative)
- Alternative B: Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)
- Alternative C: Focus on Reforestation

2.1 Alternative A: Continue Current Management (No Action Alternative)

Alternative A continues management at levels and activities similar to the past and in pursuit of the 2004 CCP. Specific to the alternatives being considered, objectives A.3, B.5, and B.6 would remain the same, as outlined.

Objective A.3: Waterfowl and Shorebirds

Provide habitat to support approximately 10,000 migrating waterfowl, 12,000 migrating shorebirds, and other important associated migratory bird populations, including woodcock.

Strategies:

- ***Conduct shorebird and other waterbird counts using International Shorebird Survey protocol on 10-day intervals during migration and wintering periods. Conduct mid-winter waterfowl surveys.***
- ***Assess food quality and quantity on the refuge during periods of peak shorebird movement.***
- ***Assess food quality and quantity on and off the refuge during peak periods of waterfowl use.***
- ***Develop impoundment units with a moist-soil component to support waterfowl and shorebird use.***
- ***Assess wintering and foraging habitat on and off refuge during peak periods of woodcock use.***

Assessments of forage production, as well as waterfowl and shorebird counts have shown that the listed management strategies, within currently available wetland habitats, will not meet the stated objective of 10,000 migrating waterfowl and 12,000 migrating shorebirds. Regular bird surveys have produced peak records of up to 6,000 waterfowl and up to 500 shorebirds. The sustained seasonal average populations are estimated at 3,500 waterfowl and 200 shorebirds.

Under this alternative, Bayou Cocodrie NWR would continue wetland management using the current strategies. It is expected that waterfowl and shorebird use within the refuge will remain consistent with that of the past decade. Though annual fluctuations are common, Bayou Cocodrie NWR can expect to consistently support a daily average of up to 3,500 migrating waterfowl throughout the 110 day wintering period and 200 shorebirds during peak fall migration, numbers well below the CCP objectives.

Objective B.5: Reforestation

Reforest, at a minimum, 7,000 acres of open areas and manage forest conditions to achieve structurally complex, mid succession forest conditions and decrease effects of fragmentation. Reforestation efforts via partnerships and interagency coordination will target identified high priority areas to maximize increases in core habitat.

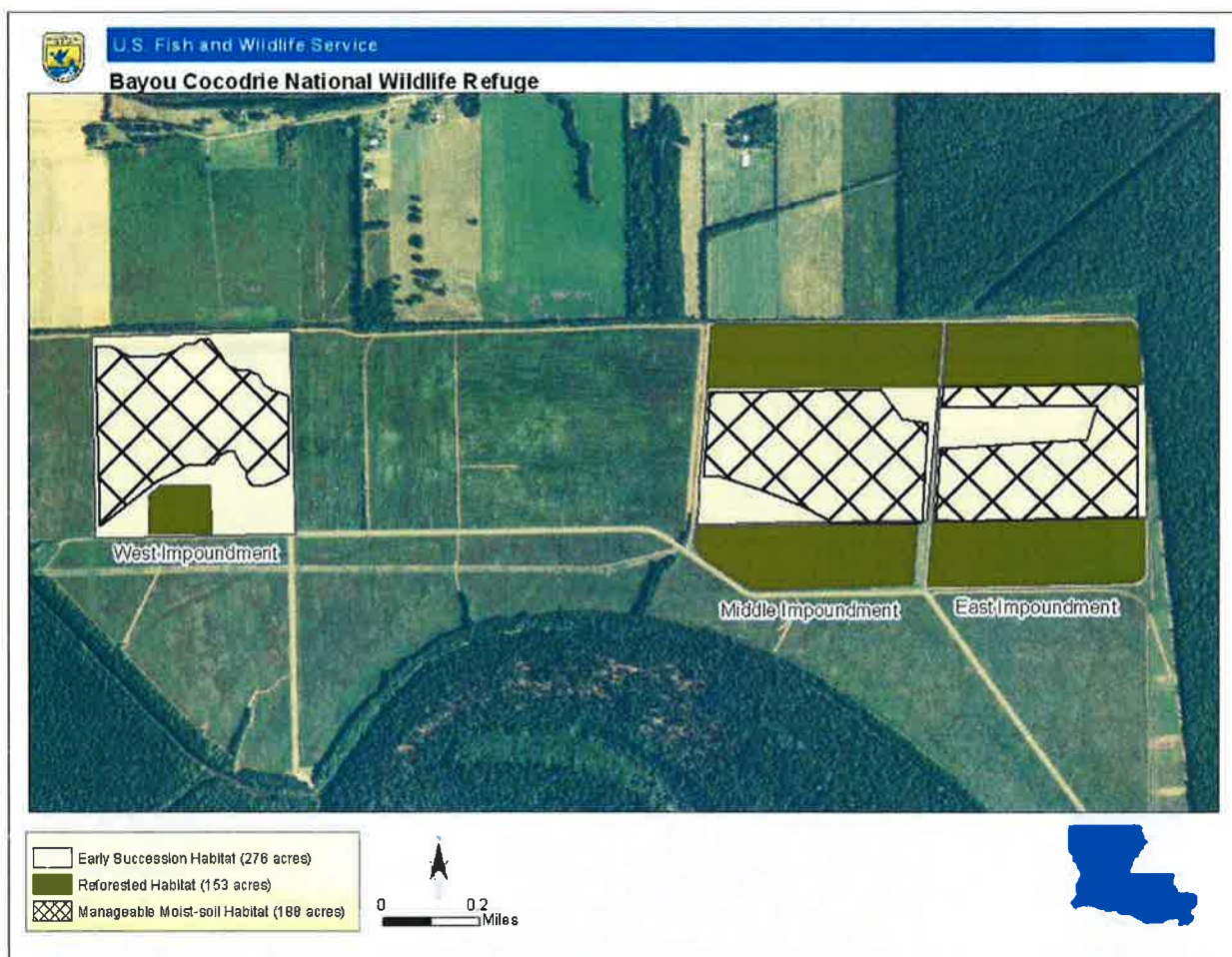
Strategies:

- ***Reforest all refuge lands except those areas identified for waterfowl management, using species appropriate to the site.***
- ***Develop and utilize forest management techniques to establish and maintain vertical and horizontal complexity.***
- ***Seek funding opportunities and partners to assist in reforesting refuge lands and target identified high priority areas for reforestation via partnerships and interagency coordination.***

Figure 2. Managed Seasonal Wetlands of Bayou Cocodrie NWR



Figure 3. Water Management Impoundments of Bayou Cocodrie NWR



In addition to the 2,366 acres that have been reforested since Bayou Cocodrie NWR's establishment, reforesting 4,634 acres would contribute to the 13,000-acre core forest block objective. This, in turn, would assist in supporting the conditions for area sensitive species that need large forest tracts. All potential sites for reforestation activities are outside the current refuge boundary, and would have to be acquired or placed in a land protection program.

Objective B.6: Wetlands

Restore and enhance 440 acres of seasonal wetlands to provide high quality migration and foraging habitat for waterfowl and shorebirds.

Strategies:

- *Manage existing impoundments for waterfowl and shorebirds.*
- *Monitor waterfowl utilization patterns and waterfowl populations.*
- *Develop and implement a Moist-Soil Management Plan.*

Bayou Cocodrie NWR has successfully enhanced wetlands management capability on 1,113 acres of wetlands (Figure 2). The enhanced wetlands include approximately 772 acres of forest wetlands, 276 acres of early succession impoundments with 188 acres being floodable, and 153 acres of greentree reservoirs. These wetlands are managed using water level manipulation and various moist-soil management techniques, including disking every 2 to 3 years.

This habitat objective was developed to directly support Bayou Cocodrie NWR's fish and wildlife population goal for waterfowl and shorebirds, Objective A.3. As stated above, assessments of forage production and waterbird counts have shown that the listed management strategies, within currently available wetland habitats, will not meet the stated objective of 10,000 migrating waterfowl and 12,000 migrating shorebirds. Based on the duck energy day (DED) values reported by Reinecke and Kaminski (2012), Bayou Cocodrie NWR staff has calculated the current forage potential of the managed wetlands to be approximately 408,205 DEDs. Evenly distributed throughout the 110-day waterfowl wintering period, this estimation predicts that Bayou Cocodrie NWR could provide foraging habitat to support an average of 3,711 wintering waterfowl (Table 1). This estimation represents the maximum potential forage production under this alternative and does not take into account any of the wetlands that may be managed toward the shorebird objective of 12,000 fall migrants. Any management directed toward fall shorebird habitat may negatively affect waterfowl habitat.

Table 1. Maximum DED potential for Alternative Action A based on DED/ac production reported by Reinecke and Kaminski (2012).

Habitat Type	Acres	DED/acre	Total	Ducks
Flooded Forest (10% red oak)	772	15	11,580	105
Greentree Reservoirs (70 % red oak)	153	297	45,441	413
Moist-soil	188	1,868	351,184	3,193
Total	1,113		408,205	3,711

2.2 Alternative B: Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

Alternative B would enhance waterfowl management capabilities through a Cropland Management Plan. Alternative B would modify two CCP objectives (A.3 and B.6) and the associated strategies to better meet waterfowl population targets, while Objective B.5 would be the same under Alternative A.

Objective A.3: Migratory Waterfowl

Annually monitor waterfowl species abundance, use period, and habitat use within Bayou Cocodrie NWR wetlands to help evaluate and enhance long-term management.

Strategies:

- ***To better understand waterfowl species abundance, use period, habitat use, and assess the waterfowl population within Bayou Cocodrie NWR early succession impoundments once every two weeks from November 15-March 31.***
- ***Apply adaptive management practices within each wetland unit to continue improvement of waterfowl management capabilities.***
- ***Conduct an annual mid-winter waterfowl survey throughout Bayou Cocodrie NWR wetlands.***
- ***Minimize unnecessary disturbance within Bayou Cocodrie NWR early succession impoundments from November 15-March 31.***
- ***Assess waterfowl forage on Bayou Cocodrie NWR prior to and during periods of waterfowl use.***
- ***Conduct surveys for woodcock every third year.***

In a recent biological review, local and regional biologists along with Bayou Cocodrie NWR staff concluded that, using current management strategies, the refuge does not have the capacity to sustain the current waterfowl and shorebird objective of 10,000 migrating waterfowl and 12,000 migrating shorebirds. A recommendation was made to adjust habitat management efforts toward meeting the waterfowl objective and supporting American woodcock (*Scolopax minor*) within Bayou Cocodrie NWR.

Under this alternative, waterfowl management would be conducted within all the managed wetland habitats of Bayou Cocodrie NWR. Woodcock management would be conducted in conjunction with waterfowl management in the early succession impoundments. The habitat management methods that would be used to achieve this waterfowl and woodcock objective are outlined in Objective B.6: Wetlands (below). Through this alternative, it would be expected that the refuge could consistently support an average of up to 14,545 wintering waterfowl annually. There would be no specific population objective for woodcock on Bayou Cocodrie NWR, as this species is difficult to survey and monitor. It was recommended in the recent biological review, that woodcock be monitored in suitable habitats throughout the refuge by conducting evening over-flight surveys or flush surveys. Surveys would be conducted every third year.

The Proposed Action would increase Bayou Cocodrie NWR's waterfowl goal from 10,000 waterfowl (1.1 million DEDs) to as much as 1.6 million DEDs (14,545 waterfowl). The description of this goal in DEDs would allow for annual variation with regard to methods, acres managed, and desired vegetation, but would provide a consistently achievable target.

Objective B.5: Reforestation

Reforest, at a minimum, 7,000 acres of open areas and manage forest conditions to achieve structurally complex, mid succession forest conditions and decrease effects of fragmentation. Reforestation efforts via partnerships and interagency coordination will target identified high priority areas to maximize increases in core habitat.

Strategies:

- *Reforest all refuge lands except those areas identified for waterfowl management, using species appropriate to the site.*
- *Develop and utilize forest management techniques to establish and maintain vertical and horizontal complexity.*
- *Seek funding opportunities and partners to assist in reforesting refuge lands and target identified high priority areas for reforestation via partnerships and interagency coordination.*

In addition to the 2,366 acres reforested since the establishment of Bayou Cocodrie NWR, reforesting 4,634 acres would contribute to the 13,000-acre core forest block objective. This, in turn, would assist in supporting the conditions for area sensitive species that need large forest tracts. All potential sites for reforestation activities are outside the current refuge boundary, and would have to be acquired or placed in a land protection program.

Objective B.6: Managed Wetlands

Contribute ~1,113 acres of quality wetland habitats as a component of the Lower Mississippi Valley Ecosystem's complex of managed moist-soil, croplands, and flooded forests and greentree reservoirs, which together provide important shelter and forage for waterfowl and other associated wildlife.

Strategies:

- *Develop and implement a Habitat Management Plan that includes potential management strategies for each managed wetland type represented on Bayou Cocodrie NWR.*
- *Provide up to 120 acres of quality moist-soil habitat to contribute to the foraging requirements of wintering waterfowl.*
- *Provide up to 120 acres of high energy foods such as milo, corn, rice, or millet to contribute to the foraging requirements of wintering waterfowl.*
- *Maintain the early succession impoundments using water level manipulation, mechanical disturbance, and chemical applications.*
- *Annually rotate management actions in the early succession wetlands to provide a diverse array of habitat conditions and vegetation communities.*
- *Enhance existing wetland habitats to mimic natural functions such as sheet flow, floodwater retention, and water quality improvement.*

Under this alternative, Bayou Cocodrie NWR would conduct management of its seasonal wetlands using the following methods: 1) holding water on a maximum of 772 acres of forested wetlands and 153 acres of greentree reservoirs through the use of water control structures, 2) maintaining up to 120 acres of early succession moist-soil habitat, and 3) producing up to 120 acres of grain crops within the early succession impoundments.

Through this proposed action, the refuge's maximum foraging potential would increase to nearly 2.9 million DEDs, 26,324 waterfowl for 110 days (Table 2). Through various methods, including reduced cropland acres, selection of different grain crops, reduced use of pesticides and fertilizer, and tolerance of some crop depredation, the refuge would strive to provide between 1.1 and 1.6 million DEDs annually. It is important to note that the proposal is to move 60 to 120 acres of unharvested crop currently produced under a Cooperative Farm Agreement at St. Catherine Creek NWR to Bayou Cocodrie NWR. There would be no net increase in crop acres between the two refuges.

Table 2. Maximum DED potential for Alternative B (Proposed Action) based on DED/acre production reported by Reinecke and Kaminski (2012) and by Concordia Parish 5-year crop yield averages (Daniels 2010).

Habitat Type	Acres	DED/acre	Total DED	Ducks
Flooded forest (10% red oak)	772	15	11,580	105
Greentree Reservoirs (70 % red oak)	153	297	45,441	413
Moist Soil	68	1,868	127,024	1,155
Cropland (corn)	120	22,597	2,711,640	24,651
Total	1,113		2,895,685	26,324

The focus of cropland management on Bayou Cocodrie NWR would not be to maximize DED production, but rather to provide a diverse array of quality foraging resources to meet or slightly exceed wintering waterfowl objectives. Several crop types are available, including corn (*Zea mays*), rice (*Oryza sativa*), milo (*Sorghum bicolor*), and millet (*Echinochloa* spp. and *Urochloa* spp.). Table 2 includes figures for average commercial corn production, the highest producing crop type available, on the entire 120 acres. Rice is another preferred crop that adds the potential of providing habitat for wading birds and marshbirds throughout the growing season.

Experience has shown that growing rice as a refuge crop with selective, minimal use of herbicides and fertilizer also produces significant quantities of other desirable grasses. The target of refuge grown crops would be to produce 1.1 to 1.6 million DEDs after accounting for depredation and reduced production due to non-commercial farming practices. Anticipated foraging habitat available for wintering waterfowl on Bayou Cocodrie NWR is 22,579 DED/acre for corn, 11,987 DED/acre for rice, and 11,914 DED/acre for milo. These values were calculated using the methodology of Reinecke and Kaminski (2012) and using average crop yields reported by Daniels (2010) for Concordia Parish, LA. Average corn yields were reduced from the reported parish average of 112 bushels/acre by about 20% to 90 bushels per acre. That reduction in yield was based on planting on the refuge is conducted after the normal planting dates for commercial production and the heavy clay soils in the early succession impoundments on the refuge, two factors that are expected to reduce corn yields. Millet, another preferred and quick maturing crop, produces an estimated 5,203 DEDs per acre (Reinecke and Kaminski 2012).

Suitable woodcock foraging habitat would also be provided through the management of the early succession impoundments. Higher portions of the impoundments may not flood but would contain sufficient soil moisture, vegetative cover, and food resources to support nocturnal foraging by woodcock. Openings near forest edges may also serve as courtship habitat.

Moist-soil plant management would be implemented to create the conditions and promote the production of native seed and tuber producing plants and invertebrates sought by waterfowl. Although not particularly high in DED production, (1,868 DEDs/acre), moist-soil plants produce foods that are typically high in protein and minerals which are critical for waterfowl as they complete their molt and prepare for reproductive activities. Using the standard value of 1,868 DEDs/acre, total DED production on 68 acres of managed moist-soil would be expected to produce about 127,024 DEDs (Table 2). Cropping in the early successional fields eliminates the need to disk to maintain early successional vegetation and favorable conditions for desirable moist-soil plants.

Waterfowl utilize high energy foods to maintain body condition for migration and to meet thermal demands. Historically, before agricultural foods were available, waterfowl focused on the consumption of acorns in flooded timber and heavy seed producing annual grasses and sedges. By producing unharvested crops, refuges can effectively provide the food needed to meet energy requirements for thermal demands during winter and spring migration on a much reduced wetland landscape.

Objectives established in the CCP (USFWS 2004) are to provide 440 acres of moist-soil habitat within impoundments to provide for 10,000 winter waterfowl. There are not 440 acres available within the impoundments. The DEDs needed to provide food for 10,000 waterfowl within a 110-day use period would be approximately 1.1million DEDs. Providing only 188 acres of moist-soil habitat produces approximately 350,000 DEDs, about 32 percent of the current goal. To provide enough DEDs to support 10,000 waterfowl for 110 days, high energy, unharvested grain crops must be available.

Historically, Bayou Cocodrie NWR utilized farming to meet waterfowl objectives. Due to the conversion of some cropland to reforested lands and a commitment of the remaining cropland to moist-soil management, farming was eliminated as a method to meet wintering waterfowl objectives.

One to two of the current three management units or 60-120 acres of milo, corn, or rice would be produced each year on Bayou Cocodrie NWR. Sixty acres of corn would provide 1.35 million DEDs, leaving 120 acres for moist-soil production. Sixty acres of rice and 60 acres of milo would produce a total of over 1.4 million DEDs, leaving 60 acres for moist soil production. These scenarios are only two possible examples of a number of combinations of moist-soil management and cropping that can be implemented to reach the proposed target of 1.1 to 1.6 million DEDs.

2.3 Alternative C: Focus on Reforestation

Alternative C would focus on reforestation efforts and would modify CCP objectives A.3 and B.6 and associated strategies and would modify the strategies under Objective B.5.

Objective A.3: Waterfowl

Annually monitor waterfowl species abundance, use period, and habitat use within Bayou Cocodrie NWR wetlands to help evaluate and enhance long-term management.

Strategies:

- ***Conduct an annual mid-winter waterfowl survey throughout refuge wetlands.***

Objective B.5: Reforestation

Reforest, at a minimum, 7,000 acres of open areas and manage forest conditions to achieve structurally complex, mid succession forest conditions and decrease effects of fragmentation. Reforestation efforts via partnership and interagency coordination will target identified high priority areas to maximize increases in core habitat.

Strategies:

- ***Reforest all refuge lands using native species suitable for each site.***
- ***Develop and utilize forest management techniques to establish and maintain vertical and horizontal complexity.***
- ***Seek funding opportunities and partners to assist in reforesting refuge lands and target identified high priority areas for reforestation via partnerships and interagency coordination.***

Objective B.6: Managed Wetlands

Restore and enhance 276 acres of wetlands to a forested condition to provide high quality habitat for migrating and resident wildlife.

Strategies:

- ***Develop and implement a Habitat Management Plan (HMP) to incorporate wetland habitat management methods.***

Through this alternative, the existing moist-soil impoundments and any other open lands throughout Bayou Cocodrie NWR would be reforested with site specific hardwood seedlings. The waterfowl objective would be adjusted from 10,000 waterfowl (1.1 million DEDs) to approximately 1,025 waterfowl for 110 days (112,857 DEDs) (Table 3). This figure represents the maximum forage capacity after the reforested impoundments reach their mast producing potential (approximately 20-30 years).

Table 3. Maximum DED potential for Alternative C based on DED/ac production reported by Rienecke and Kaminski (2012).

Habitat Type	Acres	DED/acre	Total	Ducks
Flooded forest (10% red oak)	772	15	11,580	105
Greentree Reservoirs (70 % red oak)	153	297	45,441	413
Reforestation flooded (70% red oak)	188	279	55,836	507
Total	1,201		112,857	1025

Performing this action would contribute to the listed CCP objectives.

- B.1: Contiguous Forest. Reforestation of this area would add up to 276 acres to the contiguous forest of Bayou Cocodrie NWR,
- B.5: Reforestation. Reforestation of this area would add up to 276 acres to the reforestation total of Bayou Cocodrie NWR, and
- A.1: Songbirds, A.2: Black Bear, and A.4: Resident and Other Species.
Providing additional early succession forest habitat would provide a wide variety of wildlife species additional habitat.

Chapter 3 Affected Environment

Bayou Cocodrie NWR is located in Concordia Parish in east-central Louisiana (Figure 1). The nearest community is the city of Ferriday, Louisiana, located about 4 miles northeast of the refuge. Bayou Cocodrie NWR was established in 1990.

3.1 Physical Environment

Bayou Cocodrie NWR's geology is underlain with Pleistocene deposits of the Mississippi River which extend and dip toward the coast. A Pleistocene-age eroded subsurface exists at 50 to 150 feet below the surface, with Tertiary age sedimentary deposits beneath this subsurface (Saucier 1994). Faulting is commonly related to sediment loading and deep-seated salt movement and may provide conduits for potential cross-formation groundwater flow.

The soils within the impoundments are Alligator and Sharkey series clays. These soils are heavy clay with clay sub-soils. The soils are fine textured and poorly drained with low permeability. This water holding capability justified the area's development into wetland impoundments which have served as moist-soil units and agricultural fields in recent history. These soil types are highly restrictive to development because of their shrink-swell characteristics and low bearing strength.

Bayou Cocodrie NWR is within the Mississippi Alluvial Valley and is a part of the Lower Mississippi River Ecosystem. Nearby levees, irrigation channels, and pumps have influenced the change of riparian systems to water development projects in support of agriculture. Natural flooding assists in maintaining healthy bottomland hardwood forest habitat by recharging the forest with sediment and nutrients.

Bayou Cocodrie NWR is within the 582-square-mile Tensas-Concordia Levee area. The levee system borders the Red, Black, and Tensas Rivers and was built for flood protection. For the most part, the historic Mississippi River and backwater flooding are impeded because of the ring levee and pump systems operated on the Wild Cow Bayou in western Concordia Parish. Bayou Cocodrie functions more like a lake than a free-flowing stream due to the weir on Wild Cow Bayou (U.S. Army Corps of Engineers 1990, USDA Soil Conservation Service 1968).

Hydrology and water management influences the function of habitats on Bayou Cocodrie NWR. Bayou Cocodrie is a meandering tributary of the Tensas and Red River. Before the construction of the current levee system the Mississippi River would flood the entire parish of Concordia to some extent each spring. During other times when the Tensas, Black and Red Rivers would reach flood stage, backwater and overflow flooding would occur along Bayou Cocodrie. Since construction of the levees and pumps, Bayou Cocodrie's natural over bank flow is restricted to large flood events.

The subtropical climate is characterized by high humidity, an absence of extreme temperatures, and abundant rainfall distributed evenly throughout the year. The climate is controlled by warm, moist air from the Gulf of Mexico, and cooler, drier air from the central plains. Extended hot,

sultry summers and moderately cool winters are normal. The summers have about 85 days with highs greater than 90 degrees Fahrenheit. The winters are marked by brief cool periods with average winter highs in the mid-50s. Annual rainfall is 55 inches and the growing season is approximately 220 days in duration. Evaporation exceeds precipitation in the summer.

3.2 Vegetation

Desirable vegetation within the early succession impoundments consists primarily of sprangletop (*Leptochloa sp.*), millets (*Echinochloa spp.*), toothcup (*Ammannia coccinea*), Pennsylvania smartweed (*Polygonum pennsylvanicum*), and some sedge (*Cyperus spp.*) species. Moist-soil habitat management generally requires active management of soil and hydrology to promote productive and diverse stands of these moist-soil plants. Management actions include draw down timing and duration, mowing, disking, or chemical treatment to keep units in early succession stages and to provide desirable plant species (Strader and Stinson 2005). These actions are used to maximize waterfowl food production and usage.

Disturbance (e.g., disking) is critical for the production of these desirable plants. Failure to disturb the soil will allow the natural succession to proceed toward a dominance of perennials, both herbaceous and woody, that out-competes 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 objective (Strader and Stinson 2005). Examples of undesirable plants at Bayou Cocodrie NWR that may warrant treatment include but are not limited to swamp smartweed (*Polygonum hydropiperoides*), beakrush (*Rhynchospora corniculata*), cocklebur (*Xanthium strumarium*), coffeeweed (*Sesbania herbacea*), red vine (*Brunnichia ovate*), black willow (*Salix nigra*), common buttonbush (*Cephalanthus occidentalis*), and marshmallow (*Hibiscus spp.*). Chemical treatments can be used alternatively or in combination with soil disturbance to reduce woody encroachment and competition from broadleaf plants. If broadleaf plants begin to reduce desirable moist-soil plant production during the draw down phase, specific herbicides can be applied aerially or by ground application to set back undesirable growth.

3.3 Wildlife Resources

3.3.1 Avian Species

Avian species are extremely important wildlife resources identified on Bayou Cocodrie NWR with more than 186 species recorded within refuge boundaries (unpub. data, Ouchley 1997). The bottomland hardwood forests serve as important habitat for breeding birds throughout the year. Ouchley's surveys indicate that Bayou Cocodrie NWR may contain one of the most diverse assemblages of migratory bird species remaining in the Mississippi Alluvial Valley.

The Mississippi Alluvial Valley, which includes Bayou Cocodrie NWR, serves as the primary wintering ground for mid-continent waterfowl populations breeding in the prairies and parklands of Canada and the United States. Management efforts to improve wintering waterfowl habitat on refuge lands are underway and will increase as additional lands are purchased. Typical winter residents include mallards (*Anas platyrhynchos*), green-winged teal (*A. crecca*), and wood ducks

(*Aix sponsa*). Waterfowl species known to nest in this area include wood ducks and hooded mergansers (*Lophodytes cucullatus*).

Wading birds are abundant within Bayou Cocodrie NWR, using small lakes, impoundments, and numerous sloughs. Herons (*Ardea spp.*), egrets (*Egretta spp.*), ibis (*Plegadis spp.* and *Eudocimus albus*) and other wading birds are plentiful on the refuge. The mud banks and flats and shallow flooded edges provide habitat for shorebirds such as yellowlegs (*Tringa spp.*), sandpipers (*Calidris spp.*), plovers (*Charadrius spp.*), and snipe (*Gallinago delicata*) during spring and fall migrations.

American woodcock was selected as a Resource of Concern because it fulfills United States Fish and Wildlife Service (USFWS) trust resource responsibilities (Migratory Bird Treaty Act), contributes to the American Woodcock Management Plan, and is a focal species within the refuge's CCP. American woodcock are migratory game birds that occur throughout the forested regions of the eastern United States.

Most bottomland refuges in the Southeast are located within the woodcock management unit known as the Central Region, where woodcock populations have declined approximately 1.8% annually between 1968 and 2006 (Kelley and Rau 2006). It is widely believed that the decline in woodcock numbers during this period is due primarily to the loss of early succession forest habitat through forest maturation and land conversion. The opportunity to provide wintering woodcock habitat on Bayou Cocodrie NWR is available due to moist bottomland hardwood forests in close proximity to open fields.

3.3.2 Mammals

Mammals are numerous and observed regularly throughout the refuge. No comprehensive list of mammalian species exists for Bayou Cocodrie NWR, although it is known generally which mammals occur in this area. The area contains seven orders of mammals including pouched mammals (*Marsupialia*); insect-eaters (*Insectivora*); bats (*Chiroptera*); flesh-eaters (*Carnivora*); gnawing mammals (*Rodentia*); rabbits (*Lagomorpha*); and even-toed hoofed mammals (*Artiodactyla*).

Beaver (*Castor canadensis*) and nutria (*Myocastor coypus*) are known to utilize the early succession impoundments. Both of these species can create conflict with management goals and objectives. They often restrict water level management and compromise levee infrastructure. Control and removal efforts should remain consistent with current management.

3.3.3 Reptiles and Amphibians

Although frequently observed, much is still unknown about reptile and amphibian population levels on the refuge. At least thirty species of reptiles and amphibians and a variety of native and non-native aquatic species are known to occur on Bayou Cocodrie NWR. The diverse group of amphibians, including salamanders, toads, and frogs, is well adapted to the aquatic and terrestrial

environments, and moisture is typically important for the group's survival. Reptiles including turtles, alligators, lizards, skinks, and snakes are common.

3.4 Threatened and Endangered Species

Refuge staff and visitors frequently observe Louisiana black bear (*Ursus americana luteolus*) on the refuge. This species is listed as threatened under the Endangered Species Act. Recovery efforts proposed within the USFWS's Louisiana Black Bear Recovery Plan (U.S. Fish and Wildlife Service 1995) include identification and protection of key recovery blocks and corridors. These blocks and corridors may include public and private lands between the Tensas and Atchafalaya River basins. Bayou Cocodrie NWR falls within the identified area and has been designated as critical habitat for the Louisiana black bear. The refuge's location and habitat features are significant for the future conservation of the Louisiana black bear. The proposed corridor may include a combination of protected and managed public and private lands that will allow bears to move about with minimal disturbance. Working with private landowners adjacent to the refuge plays a major role in black bear recovery efforts by implementing land protection programs that provide an economic incentive for farmers to restore farmlands and place them in conservation easements.

Initial and unpublished studies have indicated that Bayou Cocodrie NWR's old growth trees are important roosting sites for the Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), a species of management concern (Cochran 1999).

The panther (*Puma concolor*) and the red wolf (*Canis rufus*) were former residents of the area, but there is no documentation of these species for the last 40 years.

3.5. Fishery Resources

3.5.1 Fish

These species are most commonly observed along the main stem of the bayou. Although limited, the refuge does provide an important fishery resource for local anglers. Commercial anglers often target buffalo (*Ictiobus spp.*) and catfish (*Ictalurus spp.*). Recreational anglers target crappie (*Pomoxis sp.*), bass, (*Micropterus spp.*), catfish, bowfin (*Amia calva*), and sunfishes (*Lepomis spp.*).

3.5.2 Mussels

A comprehensive mussel survey has not been completed for Bayou Cocodrie NWR. A survey was conducted at St. Catherine Creek NWR, which is located 20 miles to the southeast, where water quality and streambed substrate are likely quite different and may have limited application to Bayou Cocodrie NWR. This survey indicated the possibility of the following mussels occurring in Bayou Cocodrie NWR: fat pocketbook (*Potamilus capax*), mapleleaf (*Quadrula quadrula*), flat floater (*Anodonta suborbiculata*), paper pondshell (*Utterbackia imbecillis*), giant floater (*Pyganodon grandis*), Texas liliput (*Toxolasma texasensis*), yellow sandshell (*Lampsilis teres*), pink papershell (*Potamilus ohiensis*), and southern mapleleaf (*Quadrula apiculata*).

3.6 Cultural Resources

The body of federal historic preservation laws has grown dramatically since the enactment of the Antiquities Act of 1906. Several themes recur in these laws, their promulgating regulations, and more recent Executive Orders. They include: 1) each agency is to systematically inventory the historic properties on their holdings and to scientifically assess each property's eligibility for the National Register of Historic Places; 2) federal agencies are to consider the impacts to cultural resources during the agencies management activities and seek to avoid or mitigate adverse impacts; 3) the protection of cultural resources from looting and vandalism are to be accomplished through a mix of informed management, law enforcement efforts, and public education; and 4) the increasing role of consultation with groups, such as Native American tribes, in addressing how a project or management activity may impact specific archaeological sites and landscapes deemed important to those groups. The USFWS, like other federal agencies, are legally mandated to inventory, assess, and protect cultural resources located on those lands that the agency owns, manages, or controls. The USFWS's cultural resource policy is delineated in 614 FW 1-5 and 126 FW 1-3. In the USFWS'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 will 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 initiates consultation with the pertinent State Historic Preservation Office (SHPO) and federally recognized Tribes. No detailed archaeological or historical site investigations have been documented on Bayou Cocodrie NWR.

Cusick et al. (1995) and Saunders and Jones (2003) recorded several late 19th and early 20th century tenant farm sites and the early 20th century sharecropper community of Frogmore (16Co159). The latter is located on Brushy Bayou just north of the refuge. Frogmore consists of a former cotton plantation, a cotton gin, a store, and post office. Previous levee and road construction and agricultural activities have adversely impacted the archaeological deposits associated with many of these sites.

3.7 Socio-economic Resources

The rural character and sparse populations are characteristic of east-central Louisiana. United States Department of Commerce (USDC) census data from 2010 (USDC 2010) indicate that the parish had a population of 20,822 people, which is consistent with the 1990 population of 20,828. The parish seat, Vidalia, had a decline in population from 4,953 in 1990, to some 4,299 in 2010. Ferriday had a 1990 population of 4,111, and a 2010 population of 3,511. Population shifts in Concordia Parish, as a whole, are largely attributable to a decline in the farming, oil, and gas sectors of the economy since the early 1980s (U.S. Fish and Wildlife Service 1998).

The median household income from 2006-2010 in Concordia Parish was \$30,062, which is lower than the Louisiana median income of \$43,445 (USDC 2010). Overall, Louisiana ranks as one of the poorest states in the country. From 2009-2011, the Louisiana median household income was

ranked 42nd with \$42,946 compared to the US average of \$51,027 (USDC 2012). Louisiana Oil and gas production and agriculture have long been the main economic base in Concordia Parish and surrounding areas. Some of the major private employers in Concordia Parish include Wal-Mart, Aluminum Company of America, D&D Petroleum, Rogers Lumber International, Inc., and Ferriday Market. Other major employers include the Concordia Parish Schools, Riverland Medical Center, and Concordia Electric Cooperative (U.S. Fish and Wildlife Service 1998).

Chapter 4 Environmental Consequences

This chapter outlines the foreseeable environmental consequences of implementing each of the three management alternatives described in Chapter 2. When detailed information is available, a scientific and analytic comparison between alternatives and their anticipated consequences is presented, which is described as “impacts” or “effects.” When detailed information is not available, those comparisons are based on the professional judgment and experience of refuge staff and USFWS and State biologists.

4.1 Effects Common to all Alternatives

4.1.1 Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Bill Clinton on February 11, 1994, to focus federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities’ access to public information and participation in matters relating to human health or the environment. This assessment has not identified any adverse or beneficial effects for any alternative unique to minority or low-income populations in the affected area. None of the alternatives would disproportionately place any adverse environmental, economic, social, nor health impacts on minority or low-income populations.

4.1.2 Public Health and Safety

Each alternative has the potential to utilize aerial application of pesticides. Though the chemical may be different for each alternative, the risk of overspray is the same. The potentially affected area has been managed using aerial spray equipment in the past and would continue to be so managed into the future if required. The affected area is not adjacent to any public dwellings or high use areas. The early succession impoundments are surrounded by agricultural fields and various age classes of forest. Therefore, the risk to public health and safety is minimal.

4.1.3 Refuge Physical Environment

Impacts of each alternative on much of Bayou Cocodrie NWR’s physical environment would have similar short-term effects. Disturbance to surface soils would create an opening that would quickly begin succession. The topography of the area will remain consistent. Hydrology and vegetation would occur within the early succession impoundments. Access to the impoundments would remain restricted into the foreseeable future to minimize habitat degradation and wildlife disturbance.

Impacts to the hydrology of the early succession impoundments would be negligible. Refuge staff expects effects on local water quality to be minimal and limited to run-off due to heavy rain events that exceed the water holding capacity of the impoundments. The effect of these changes on overall water quality in the region would be anticipated to be negligible. Existing State water quality criteria and use classifications are adequate to achieve desired on-refuge conditions; thus, implementation of any of the proposed alternatives would not impact adjacent landowners or users beyond the constraints already implemented under existing State standards and laws.

Soil chemistry changes, such as the buildup of salts (salination) or accumulation of hydrogen cations (acidification), may occur as a result of irrigation and fertilizer inputs. Although remote, each of these changes has the potential to negatively affect plant growth and development. This in turn, would eventually negatively affect the habitat potential of the site. These potential impacts could be greatly reduced through a rapid flush of the affected impoundment prior to crop rotation. The process of acidification can be slowed through reduced acidic inputs and through liming.

4.1.4 Cultural Resources

Although no detailed archaeological or historical site investigations have been documented on Bayou Cocodrie NWR, the management activity proposed under each alternative is not expected pose any threat to known archeological or historic sites on and/or near Bayou Cocodrie NWR. Archaeological and historic resources would be managed to comply with all applicable laws and regulations under each of the alternatives. Should archeological or historic resources be exposed at any time, all work will cease until cleared by the Regional Archeologist.

4.1.5 Facilities

There would be similar negligible effects to refuge facilities under each of the alternatives. Levees, roads, water control structures, and water wells would receive similar use and degradation under each management strategy. Impoundment levees would sustain minimal short term impacts to surface soils and vegetation caused by passage of motor vehicles. These assets would require regular maintenance and improvement activities to accommodate continued refuge management operations.

The water well systems are relatively new and may require further development to more effectively recreate natural hydrologic conditions. Sheet flow is one such desired condition. System improvements may include installation of additional underground pipe, above ground pipe, or irrigation heads. Water control structures would also require regular maintenance in the form of vegetation and sediment removal in order to allow for proper function. The water well system would require similar maintenance and improvement under each alternative.

4.1.6 Other Management

All other management activities including refuge revenue sharing, subsurface mineral reservations, utility lines and easements, air quality, and water quality would be managed to comply with all laws and regulations under each of the alternatives.

4.2 Summary of Effects

4.2.1 Impacts to Habitat

Alternative A. Continue Current Management (No Action Alternative)

Under this alternative, impacts would be consistent with those already present through current management of the early succession wetland habitats. Soil disturbance would continue on an as needed basis, using specific management techniques, to produce desired early succession plant communities and habitat conditions. In the past, soil disturbance has been required at least once every 3 years. While this action has the potential to destroy nesting habitat for grassland, and marsh nesting birds, and other wildlife, especially small mammals, reptiles, amphibians, and insects, these impacts would be minimized by timing soil disturbance practices to avoid highest density nesting period when possible. Although soil disturbance may have immediate impacts on some nests, the maintenance of early successional habitat is necessary to provide suitable nest conditions for these species over the long term. Herbicide treatments may be used as an alternative control method for advanced succession species or to spot treat patches of undesirable or invasive plants. This method may degrade vertical nesting structure and cover habitat and may result in overspray or herbicide drift into non-target areas. Negative impacts from herbicide applications to non-target areas would be minimized by some tolerance of vertical structure and only spot spraying specific target areas when possible. Some unavoidable negative impacts may be experienced for nesting habitat to achieve the habitat priority for wintering waterfowl. Maintaining early successional habitat will be a long term benefit for species using these habitats for nesting structure. Without these disturbances the area would revert to forest over a 10 to 20-year period and preferred nesting structure for early successional species would be lost altogether.

Positive impacts of implementation of Alternative A would include providing seasonal water manipulation on up to 188 acres of quality moist-soil habitat along with 772 acres of flooded forest and 153 acres of greentree reservoirs, contributing to refuge waterfowl and shorebird objectives by continuing to support an annual average of 3,500 waterfowl and 200 shorebirds on Bayou Cocodrie NWR.

Alternative B. Enhance Waterfowl Management Capabilities through Moist-Soil and Cropland Management Plan (Proposed Action)

Under this alternative, impacts would be similar to Alternative A, but perhaps more frequent soil disturbance and a more radical change in the plant community. Soil disturbance would continue on an as needed basis to produce desired habitat conditions. In the unit (or units) being cropped

(60 to 120 acres) in a given year, the soil will typically be disked to establish a clean seedbed for planting an agricultural grain. The soil will be exposed and subject to erosion for a short period until the planted grain germinates and begins to grow. Grain crops will be managed to produce yields desired to meet waterfowl foraging habitat objectives. In the cropped unit(s), broadleaves will generally be controlled while grasses will be allowed to grow and mature to produce seeds desirable for waterfowl. The practices of disking could negatively impact on ground nesting birds and other wildlife. The negative impacts associated with these practices are short term and generally offset by the longer term benefits to maintain early successional habitat and providing foraging habitat for priority species, i.e., wintering waterfowl. The negative impacts will be minimized by using no-till farm practices when possible and, when necessary, disking outside of the peak nesting period of ground nesting birds.

Herbicide treatments may be used as an alternative control method for advanced succession species during rotations of moist-soil management, as a field preparation method prior to no-till agricultural operations, or as a treatment for patches of undesirable or invasive species. This method may degrade vertical nesting structure and cover habitat and may result in overspray or herbicide drift into non-target areas. Negative impacts from herbicide applications to non-target areas would be minimized by some tolerance of vertical structure and only spot spraying specific target areas when possible. Some unavoidable negative impacts may be experienced for nesting habitat to achieve the habitat priority for wintering waterfowl. Maintaining early successional habitat will be a long term benefit for species using these habitats for nesting structure. Without these disturbances the area would revert to forest over a 10 to 20-year period and preferred nesting structure and habitat for other early successional species would be lost altogether.

The use of chemicals in the forms of selected fertilizers, fungicides, and insecticides, may also be required to ensure a successful crop during agricultural rotations. All forms of chemical application would be based on soil sampling or field inspections and, for pesticides, triggered when the pest threshold has been met as determined by methods outlined in refuge pesticide use proposals (PUPs). These potential negative impacts are included on product labeling and would be addressed through the pesticide use proposal (PUPs) process, which is required for each chemical used on a refuge. The Service reviews all chemicals proposed for use on refuges and restricts the use of chemicals that are determined to have excessive harmful impacts to non-target natural resources. An alternative chemical may be recommended or additional restrictions may be placed on the proposed chemical to ensure minimal adverse impacts. For PUP approval, negative impacts are considered and deemed acceptable when compared to the potential benefit of the chemical's use. Overall, species composition would be expected to remain consistent with past occurrences given that the area will remain in its early succession condition.

Thorough planning based upon current best management practices (BMPs) should substantially reduce the need for chemical application and soil disturbance. Potential BMPs include crop rotation, proper initial field preparation, soil testing, filter strips, strategic water manipulation, and minimal use of pesticides and fertilizers. The addition of chemical fertilizers and pesticides would have the potential to contribute to soil acidification, trace mineral depletion, heavy metal accumulation, and water quality degradation. Because of the anticipated crop rotation schedule (planting each field only once or twice every 3 years) and implementation of best management practices, the use of these chemicals are expected to have short-term impacts to target and, in

some cases, non-target pests. These short-term, minimal impacts are unavoidable if the refuge is to meet its waterfowl objective.

Seasonal water manipulation would provide up to 1,113 acres of diverse foraging and migrating habitat, contributing to the proposed waterfowl objective. The acres under moist soil management would decrease from 188 acres to as few as 60 acres. Depending on crop selection and management timing, the numbers of shorebirds supported on the refuge would either remain consistent with current levels or decrease when compared to Alternative A. Shorebird activity would be highly variable from year to year and dependent on annual habitat management strategies. The shorebird objectives will be moved to St. Catherine Creek NWR where management capabilities are much greater.

Positive impacts of implementation of Alternative B would include the ability of Bayou Cocodrie NWR to increase its annual waterfowl target to 1.1 to 1.6 million DEDs (support up to 14,500 wintering waterfowl annually) to meet the objective set in the CCP; provide a more functional management of both St. Catherine Creek NWR and Bayou Cocodrie NWR to achieve waterfowl population objectives; and provide an alternate, preferred food resource (grains) for Louisiana black bears and habitat for waterbirds (e.g., wading birds and rails) when rice is grown.

Alternative C. Focus on Reforestation

Under this alternative, the landscape may be completely cleared of vegetation through mechanical and/or chemical methods. The soil bed may require deep disturbance followed by a fine thorough disking to prepare for tree planting. These impacts are not likely, would be of short duration, and would occur only, as necessary, during initial site preparation. Although unlikely, application of a herbicide may be used as a post planting treatment for patches of undesirable vegetation or invasive species. Seasonal water manipulation would eventually provide up to 1,113 acres of high quality floodable bottomland hardwood forest habitat. Alternative C would eliminate 188 acres of moist soil management and reforest 276 acres.

Reforestation of early successional habitat will cause long-term loss of early successional habitat and will negatively impact wildlife species dependent on that habitat. Wintering waterfowl foraging habitat in the early successional impoundments will be significantly reduced from about 350,000 DEDs if it were all moist-soil under Alternative A to only about 56,000 DEDs after the oaks begin producing significant volumes of acorns 20 to 30 years post reforestation under Alternative C. The loss of wintering waterfowl foraging habitat would approach 1.5 million DEDs when comparing Alternative B to Alternative C.

Negative impacts from herbicide applications to non-target areas would be minimized by careful selection of herbicide(s) to address specific plant control and used only as necessary to release planted species. Positive impacts of implementation of Alternative C would include contributing to other refuge habitat objectives by increasing the contiguous forest area on the Refuge by 300 acres (GIS calculation estimate) to provide habitat for forest breeding birds and supporting Louisiana black bear.

4.2.2 Impacts to Migratory Birds

Alternative A. Continue Current Management (No Action Alternative)

Under Alternative A, waterfowl and shorebirds would continue to be supported at their current levels (approximately 3,500 waterfowl for 110 days and up to 200 shorebirds per day during peak migration). The early succession impoundments would remain closed to the general public, thereby limiting disturbance and providing high quality feeding and loafing areas.

American woodcock would continue to receive incidental benefit from the management of refuge wetlands for migratory waterfowl and shorebirds. The early succession impoundments, given their close proximity to young forest habitats, vegetative ground cover, soil moisture, and abundant forage availability, could provide suitable nocturnal foraging habitat for woodcock. There have been no surveys conducted to estimate woodcock usage of the refuge. However, it was recommended during the biological review that surveys be initiated to establish baseline abundance and habitat utilization data.

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

Under this alternative, waterfowl would benefit from the production of 1.1 to 1.6 million DEDs annually. This action has the potential to support about 14,500 waterfowl for 110 days, four times as many foraging waterfowl as Alternative A. The early succession impoundments would remain closed to the general public, thereby limiting disturbance and providing high quality feeding and loafing areas.

Under this alternative, Bayou Cocodrie NWR would no longer manage acreage with a focus toward providing habitat for migrating shorebirds. Though shorebird management will no longer be an established objective, shallow water and mudflat habitat provided during slow drawdowns in spring is expected to provide excellent habitat for spring migrating shorebirds. Habitat for fall migrating shorebirds is expected to be limited to habitat edges along ditches and natural openings within the impoundments. Depending on crop selection and management timing, the numbers of shorebirds supported on the refuge would either remain consistent with current levels or decrease when compared to Alternative A. Shorebird activity would be highly variable from year to year and dependent on annual habitat management strategies. The reduction in crop acreage at St. Catherine Creek NWR would allow for increased acreage devoted to shorebird management, thereby offsetting any habitat loss at Bayou Cocodrie NWR.

Woodcock would continue to receive incidental benefit from the management of refuge wetlands for migratory waterfowl. The early succession impoundments, given their close proximity to young forest habitats, vegetative ground cover, soil moisture, and abundant forage availability, could provide suitable nocturnal foraging habitat for woodcock. There have been no surveys conducted to estimate woodcock usage of the refuge. However, it was recommended during the Bayou Cocodrie NWR biological review that surveys be initiated to establish baseline abundance and habitat utilization data.

This alternative would provide benefits for wading birds, including foraging, nesting, and cover habitat. Bayou Cocodrie NWR expects to support similar numbers of wading birds under Alternative B compared to Alternative A.

This alternative would provide similar abundance of early succession habitat for songbirds as the No Action Alternative. The quality of this habitat would depend upon annual variation in site management. Each of the three affected impoundments would be managed differently, which would provide highly diverse early succession habitat conditions. This alternative would provide some benefits, including foraging, nesting, and cover habitat. Refuge staff expects to support similar numbers of early succession songbirds through implementation of Alternative B compared to Alternative A. It is not likely that this alternative would have additional positive or negative impacts on these species compared to current management, Alternative A.

Brown-headed cowbirds (*Molothrus ater*) are a parasitic nesting species common in the area that might be benefitted by the addition of bare soil and waste grain. The impact is thought to be minimal as the crop will be left in the field unharvested and mostly unavailable to cowbirds. John Simpson (Refuge Forester, Bayou Cocodrie NWR, Ferriday, LA) reported that brown-headed cowbirds are recorded on nearly all forest breeding bird survey plots conducted on the refuge (personal communication March 2013). Songbird populations may be benefitted by the additional management activities and grain production. However, those benefits would be a minor impact associated with site prep and planting. Widespread commercial grain production is common throughout the area, including lands adjacent to the impoundments.

Alternative C. Focus on Reforestation

Under this alternative, Bayou Cocodrie NWR's maximum waterfowl foraging potential in the moist-soil impoundments would decrease from 351,184 DEDs (3,192 waterfowl for 110 days) under the No Action Alternative to 112,857 (1,025 waterfowl for 110 days). The early succession impoundments would remain closed to the general public, thereby limiting disturbance and providing high quality resting areas.

Under this alternative, Bayou Cocodrie NWR would no longer manage with a focus toward providing habitat for shorebirds. It is anticipated that shorebirds numbers would decrease compared to the No Action Alternative.

Woodcock would benefit from this alternative due to the increased abundance of nocturnal and diurnal habitats. The dense, brushy growth associated with reforestation could provide up to 300 additional acres of high quality habitat. As grasses are replaced with briar thickets, small trees, and shrubs in 5 to 10 years, these areas would become primarily diurnal habitat. Once the planted trees reach canopy closure, the area is most suitable for diurnal habitat for woodcock.

This alternative would reduce the foraging potential for water bird populations. Foraging habitat would decline as the site developed into mature bottomland hardwood forest. The forested habitat that would result from this alternative may have the potential to serve as nesting

(rookery) habitat where there is semi-permanent flooding.

This alternative would reduce early succession habitat and grassland bird abundance within Bayou Cocodrie NWR. However, forest breeding songbirds would benefit from the addition of up to 300 acres of high quality bottomland hardwood forest. It is this group of songbirds that is of greatest management concern in the Lower Mississippi River Valley due to the wholesale clearing and conversion of forested habitat to row-crop agriculture prior to 1985. The reduced acreage of open land would reduce foraging habitat for brown-headed cowbirds.

4.2.3 Impacts to Resident Wildlife

Alternative A. Continue Current Management (No Action Alternative)

Whitetail deer (*Odocoileus virginianus*), rabbits (*Sylvilagus spp.*), and raccoons (*Procyon lotor*) would continue to utilize the early succession impoundments to a limited degree as forage habitat and escape cover. Squirrels (*Sciurus spp.*) would be very infrequent visitors. Soil disturbance may temporarily degrade these uses; however, the individuals utilizing the impoundments in this manner are already frequently displaced as a result of water level manipulation or other management action. These areas would be used opportunistically by wildlife when they are available but should not be considered a permanent core area for these inhabitants. Impacts to these species under Alternative A would be neutral.

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

Deer, rabbits, and raccoons would continue to utilize the early succession impoundments opportunistically as forage habitat and escape cover. Soil disturbance may temporarily degrade these uses; however, the individuals utilizing the impoundments in this manner are already frequently displaced as a result of water level manipulation or other management action. These areas should not be considered a permanent core area for these inhabitants. These species may benefit from grain crops within the early succession impoundments due to the presence of concentrated, high energy crops in an area with minimal disturbance. Each of these species would opportunistically feed on agricultural crops, when available. Disturbance to resident wildlife would increase slightly as a result of agricultural operations, which may require more frequent management actions, such as field preparation and chemical applications. Impacts to these species under Alternative B would be anticipated to be neutral.

This alternative would provide similar abundance of early succession habitat for mammals as Alternative A. The quality of this habitat and benefit to each species would depend upon annual variation within each site. Each of the three affected impoundments would be managed differently, which would provide highly diverse habitat conditions. This alternative would provide benefits, including foraging, nesting, and cover habitat for most mammalian species inhabiting the refuge.

This alternative would provide similar abundance of early succession habitat for associated species within Bayou Cocodrie NWR compared to Alternative A. The quality of this habitat and

benefit to each species would depend upon annual variation within each site. Each of the three affected impoundments would be managed differently, which would provide highly diverse habitat conditions. This alternative would provide benefits, including foraging, breeding, nesting, and cover habitat for most species inhabiting the refuge. This alternative may have additional negative impacts on amphibian species when compared to Alternative A. Many pesticides are harmful to reptilian or amphibian reproductive success and survival. Careful consideration would be given to type and timing of pesticide treatments within the impoundments.

Alternative C. Focus on Reforestation

This alternative would reduce early succession habitats and associated mammalian abundance within the refuge. Early succession species that currently utilize the established impoundments would be gradually displaced by edge and forest interior species. Deer and rabbit populations will expand as a result of the reduced frequency of flooding and heavy cover during the first 10 years post reforestation. Populations will fluctuate thereafter depending on habitat conditions and flooding. Raccoon and squirrel populations would expand as woody structure grows and mast becomes available.

This alternative would likely result in a species composition shift away from early succession species toward forest dwelling species. This shift may be seen in the increased relative abundance of tree frogs, climbing snakes, and woodland frogs. Bullfrogs may experience declines due to the reduced flood duration capabilities of trees. The transition of these early succession habitats would occur gradually and naturally once trees have been planted. This would closely mimic the natural succession of open habitats to mature forest, a process for which the area's native species are well suited.

4.2.4 Impacts to Threatened and Endangered Species

Alternative A. Continue Current Management (No Action Alternative)

Because current management of the early succession impoundments would remain the same, there would be no change to beneficial or adverse effects on threatened or endangered species.

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

Agricultural crops play a supplemental role in the diet of black bears (Black Bear Conservation Committee 2005). Anderson (1997) notes the supplemental forage value of agricultural crops in fragmented habitats where he reports that bears were routinely observed feeding on grain crops such as corn and sorghum during the summer months. With the implementation of crops under Alternative B, positive impacts would be anticipated for black bears with increased forage.

Alternative C. Focus on Reforestation

This alternative would eventually provide up to 300 acres of bottomland hardwood forest habitat that would increase suitable forested bear habitat by adding to the existing contiguous forest. Higher portions of these reforested areas may provide additional ground denning habitat given that they would be heavily vegetated and would receive virtually no disturbance during the denning season. Thus, positive impacts would be anticipated for black bears with increased denning habitat on the refuge.

4.2.5 Impacts to Fisheries

Alternative A. Continue Current Management (No Action Alternative)

Because current management of the early succession impoundments would remain the same, there would be no change to beneficial or adverse effects on fishery resources.

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

The refuge has been leveed from the Mississippi River and the early successional impoundments have been leveed from the Bayou Cocodrie drainage and overflow except during extreme events. The impoundments do not support a backwater fishery. There are no fish within the leveed impoundments.

Additional soil disturbance and potential for soil erosion and the transport of fertilizer and pesticides from the impoundments into area waterbodies is slight and has very low potential to affect fishery resources. The early successional impoundments are relatively flat, almost no slope. Runoff from the impoundments is severely restricted such that erosion is minor to non-existent. Fertilizers and pesticides are used strictly as needed based on soil testing and crop scouting to warrant use according to labeled application.

Water held in the impoundments is released slowly to create mudflat habitat for shorebirds and to concentrate invertebrates for birds to eat rather than a rapid drawdown that either allows invertebrates to escape into the receiving waterbody or die as the impoundment quickly dries. Crawfish, among the most numerous of the macro invertebrates in the impoundments will add to the forage base for predators in the receiving waterbodies.

Oxygen levels in the water released from the impoundments may be relatively low but the low volume of water discharged from the impoundments is not expected to have a significant impact on the receiving waterbodies. No direct or indirect impacts are expected to affect fishery resources.

Alternative C. Focus on Reforestation

The refuge has been leveed from the Mississippi River and the early successional impoundments have been leveed from the Bayou Cocodrie drainage and overflow except during extreme events.

The impoundments do not support a backwater fishery. There are no fish within the leveed impoundments.

Soil disturbance and potential for soil erosion into receiving waterbodies will be reduced when compared to the No Action Alternative.

Water held in the impoundments is released slowly to concentrate invertebrates for birds to eat rather than a rapid drawdown that either allows invertebrates to escape into the receiving waterbody or die as the impoundment quickly dries. Crawfish, among the most numerous of the macro invertebrates in the impoundments, will add to the forage base for predators in the receiving waterbodies.

Oxygen levels in the water released from the impoundments may be relatively low, but the low volume of discharge is not expected to have a significant impact on the receiving waterbodies. No direct or indirect impacts are expected to affect fishery resources.

4.2.6 Soils

Alternative A. Continue Current Management (No Action Alternative)

Because current management of the early succession impoundments would remain the same, there would be no change to beneficial or adverse effects on soil resources.

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

This alternative would have the potential to negatively affect the soils within the early succession impoundments of Bayou Cocodrie NWR. However, significant impacts would not be anticipated for soils under Alternative B.

Continual use of equipment within the impoundments would have the potential to compact soil. Soil compaction would reduce infiltration and percolation of water in and through the soil, which may improve water holding capabilities within the impoundments. Inversely, compaction would likely have negative effects on plant growth and development as roots may not be able to penetrate the restrictive hard pan. These effects will be reduced through BMPs including changing disturbance type, angle of travel, and disturbance depth. Sub-soiling practices may be necessary occasionally to avoid or correct soil compaction.

Regular use of certain pesticides may result in the accumulation of toxic or harmful compounds within the soil and its associated micro-organisms. In theory, an accumulation of these compounds within the soil would gradually move through the food web. Ultimately, this could lead to greater concentrations of harmful substances at higher trophic levels. This impact will be greatly reduced through limited application of pesticides and chemical fertilizers. These products would still be used when necessary, and only as approved in the station's PUP.

Salination is characterized by the accumulation of salts within soils. This condition can be the

result of both natural and human induced actions. Irrigation is the leading cause of this accumulation; however, other inputs such as rainwater, fertilizer, and pesticides can accelerate the process. Salination would gradually reduce plant health in any of the alternatives. Planning should incorporate soil testing every 1 to 3 years and flushing the system when possible and necessary. Salination is not common in the area.

Alternative C. Focus on Reforestation

Significant cumulative impacts would not be anticipated for soils under Alternative C.

4.2.7 Water

Alternative A. Continue Current Management (No Action Alternative)

Because current management of the early succession impoundments would remain the same, there would be no change to beneficial or adverse effects on water resources.

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

This alternative may negatively affect local water quality due to drainage from the early succession impoundments, which flows through a series of water control structures, into various vegetated ditches, and ultimately into Bayou Cocodrie. Croplands within the impoundments would have the potential to increase sediment loads, as well as nutrients associated with fertilizer and contaminants associated with pesticides.

Agricultural practices on refuges are designed to minimize negative impacts by relying on BMPs including soil testing, filter strips, crop rotation, no-till farming when applicable, and minimal inputs of fertilizer and pesticides. Crop rotation would reduce pest success from year to year, thereby reducing the need for additional pesticides. Soil disturbance, though an essential part of early succession habitats, would be conducted only as needed to achieve the desired vegetative response. Filter strips and reduced soil disturbance should greatly reduce potential sediment export from the impoundments.

Minimal water quality impacts which would result from run-off and drainage following heavy rain events would be anticipated. This is especially true considering the flat terrain and restricted outlets that will restrict the flow of water and sediment from the impoundments. The effects of these management activities on overall water quality in the region would be anticipated to be negligible. Compared to the cumulative impacts of commercial farming operations in the area, up to 120 acres of grain crops using the best management practices would have a minimal effect on local and regional water quality.

Alternative C. Focus on Reforestation

The cumulative effects of these management activities on overall water quality in the region are anticipated to be negligible.

4.2.8 Impacts to Socio-Economics

Alternative A. Continue Current Management (No Action Alternative)

Because current management of the early succession impoundments would remain the same, there would be no change to beneficial or adverse effects on socio-economic resources.

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

The only management change from the No Action Alternative is the proposal to crop 60 to 120 acres annually through an existing Cooperative Farming Agreement with local farmers. There will be no net change in cropped acreage in the region. The general area of the refuge is highly developed for row crop agriculture and the crops planted on the refuge will not be harvested. Therefore there is no anticipated measurable impact associated with Alternative B.

Alternative C. Focus on Reforestation

There is no expected impact associated with Alternative C.

4.2.9 Community

Alternative A. Continue Current Management (No Action Alternative)

Because current management of the early succession impoundments would remain the same, there would be no change to beneficial or adverse effects on socio-economic resources.

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

The only management change from the No Action Alternative is the proposal to crop 60 to 120 acres annually through an existing Cooperative Farming Agreement. The general area of the refuge is highly developed for row crop agriculture and the crops planted on the refuge will not be harvested.

Adjacent landowners within the vicinity of the established impoundments must be considered in these management actions, since they may be directly or indirectly affected by the management of this area. The area directly north of the impoundments has historically been utilized as a hunting area for various species, including waterfowl. With this in mind, the impoundments would need to be managed in a way that would not create potential law infractions. Baiting charges are the most likely offence to be encountered on or adjacent to the refuge as a result of this action. Refuge staff should not conduct management actions that could be viewed as baiting during the open waterfowl hunting season. Bayou Cocodrie NWR would work closely with

State, Federal, and private partners to minimize impacts to adjacent lands and their associated natural resources; however, no indirect or direct impacts are anticipated.

Agriculture is one of the primary revenue producers in the vicinity of Bayou Cocodrie NWR. Regardless of the management alternative, there should be no impact on local farmers or grain prices. Under Alternative B, any crops grown on Bayou Cocodrie NWR would remain unharvested. The farmer may receive moderate benefits through the cooperative farming program or as a refuge contractor.

There is no anticipated measurable impact associated with Alternative B.

Alternative C. Focus on Reforestation

There is no expected impact associated with Alternative C.

4.3 Cumulative Impacts Analysis

A cumulative impact is defined as an impact on the natural or human environment, which results from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such other actions (40 Code of Federal Regulations, 1508.7). Cumulative impacts are the overall, net effects on a resource that arise from multiple actions. Impacts can “accumulate” spatially, when different actions impact different areas of the same resource. They can also accumulate over the course of time, from actions in the past, the present, and the future. A series of seemingly minor impacts could accumulate to create major problems over a period of time. Occasionally, different actions counterbalance one another, partially canceling out each other’s impact on a resource. But more typically, multiple effects add up, with each additional action contributing an incremental impact on the resource. In addition, sometimes the overall impact is greater than merely the sum of the individual impacts, such as when one more reduction in a population crosses a threshold of reproductive sustainability, and threatens to extinguish the population.

A thorough analysis of impacts always considers their cumulative aspects, because actions do not take place in a vacuum: there are virtually always some other actions that have affected that resource in some way in the past, or are affecting it in the present, or will affect it in the reasonably foreseeable future. So any assessment of a specific action’s effects must in fact be made with consideration of what else has happened to that resource, what else is happening, or what else will likely happen to it.

Refuge personnel are not aware of any past, present, or future planned actions that would result in significant cumulative impacts when added to the Proposed Action. None of the alternatives are expected to have significant cumulative adverse impacts on air quality, hydrology, water quality, floodplains, biological resources, cultural resources, climate change, or the local economy.

4.3.1 Anticipated Direct and Indirect Cumulative Impacts of the Action Alternatives on Wildlife Species

4.3.1.1 Migratory Birds

Significant cumulative impacts would not be anticipated for migratory birds, including waterfowl, shorebirds, wading birds, and songbirds.

4.3.1.1.1 Waterfowl

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

This alternative would provide waterfowl foraging habitat on Bayou Cocodrie NWR through the production of 1.1 to 1.6 million DEDs annually (10,000 to 14,500 ducks for 110 days). This alternative would provide forage diversity consisting of moist-soil vegetation, agricultural crops, flooded forest, and concentrated invertebrate communities. Through implementation of this alternative, Bayou Cocodrie NWR would not significantly impact the waterfowl population of the Mississippi Flyway especially since the addition of unharvested crops at Bayou Cocodrie NWR represents an equal reduction in unharvested crops at St. Catherine Creek NWR. However, intensive management of water and foraging habitat is currently conducted on many of the refuges and other public lands in the Mississippi Alluvial Valley and, cumulatively, play an important role in the health and maintenance of continental waterfowl populations. Significant cumulative impacts to waterfowl would not be anticipated with the implementation of Alternative B.

Alternative C. Focus on Reforestation

This alternative would provide approximately 112,857 DEDs annually (1,025 waterfowl for 110 days). The waterfowl forage potential within Bayou Cocodrie NWR would be substantially reduced compared to current management. The unharvested crop would be produced at St. Catherine Creek NWR where it is subject to annual flooding and unavailable to waterfowl. The available flooded forest habitat would contribute to the needs for forage at a much lower level, pair bonding, loafing, and cover habitat. This alternative would provide the least forage diversity, limited only to flooded forest and concentrated invertebrate communities. Waterfowl may be required to move among other available habitats outside the refuge to acquire other supplemental forage. Through implementation of this alternative, Bayou Cocodrie NWR would not significantly impact the waterfowl population of the Mississippi Flyway. Similarly, the refuge would contribute less compared to Alternative A to the cumulative effort to provide foraging habitat to support the Mississippi Flyway population of wintering waterfowl being coordinated by the Lower Mississippi Valley Joint Venture. Significant cumulative impacts to waterfowl would not be anticipated with the implementation of Alternative C.

4.3.1.1.2 Shorebirds

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

This alternative would provide less migration habitat for fall shorebirds. It would provide marginal incidental benefits including foraging, nesting, and cover habitat, particularly during the more critical fall migration period. Bayou Cocodrie NWR expects to support fewer shorebirds under this alternative compared to Alternative A. It has been determined that, should this alternative be selected, St. Catherine Creek NWR has the potential habitat availability to compensate for any loss of available shorebird habitat. Significant cumulative impacts to shorebirds would not be anticipated with the implementation of Alternative B.

Alternative C. Focus on Reforestation

Under this alternative, migratory shorebirds would no longer be a resource of concern on Bayou Cocodrie NWR. Reforestation of the existing open lands would replace the habitats suitable for shorebirds with habitat other migratory and resident species. Significant cumulative impacts to shorebirds, including American Woodcock, would not be anticipated with the implementation of Alternative C.

4.3.1.1.3 Wading Birds

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

This alternative would provide habitat for wading birds similar to the current management strategy. Significant cumulative impacts to wading birds would not be anticipated with the implementation of Alternative B.

Alternative C. Focus on Reforestation

There are numerous active rookeries in the area. Significant cumulative impacts to wading birds would not be anticipated with the implementation of Alternative C.

4.3.1.1.4 Songbirds

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

Significant cumulative impacts to songbirds would not be anticipated with the implementation of Alternative B.

Alternative C. Focus on Reforestation

While forest breeding birds would be benefitted, significant cumulative impacts would not be anticipated with the implementation of Alternative C.

4.3.1.2 Resident Wildlife

Significant cumulative impacts would not be anticipated for resident wildlife, including mammals, reptiles, amphibians, invertebrates, and Louisiana black bear.

4.3.1.2.1 Mammals

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

It is not likely that this alternative would have significant additional positive or negative impacts on these species compared to current management. Significant cumulative impacts to mammals would not be anticipated with the implementation of Alternative B.

Alternative C. Focus on Reforestation

There are no known mammalian species located within Bayou Cocodrie NWR that are solely dependent upon these early succession habitats. The transition of these early succession habitats would occur gradually and naturally once trees have been planted. This would closely mimic the natural succession of open habitats to mature forest, a process for which the area's mammalian species are well suited. Significant cumulative impacts to mammals would not be anticipated with the implementation of Alternative C.

4.3.1.2.2 Reptiles, Amphibians, and Invertebrates

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

Significant cumulative impacts to reptiles, amphibians, and invertebrates would not be anticipated with the implementation of Alternative C.

Alternative C. Focus on Reforestation

Significant cumulative impacts to reptiles, amphibians, and on vertebrates would not be anticipated with the implementation of Alternative C.

4.3.1.2.3 Fisheries

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

The refuge has been leveed from the Mississippi River and the early successional impoundments have been leveed from the Bayou Cocodrie drainage and overflow except during extreme events. The impoundments do not support a backwater fishery. There are no fish within the leveed impoundments. For the same reasons and as discussed in the previous section, no cumulative direct or indirect impacts would be expected to affect fishery resources.

Alternative C. Focus on Reforestation

The refuge has been leveed from the Mississippi River and the early successional impoundments have been leveed from the Bayou Cocodrie drainage and overflow except during extreme events. The impoundments do not support a backwater fishery. There are no fish within the leveed impoundments. For the same reasons and as discussed in the previous section, no cumulative direct or indirect impacts would be expected to affect fishery resources.

4.3.1.2.4 Threatened and Endangered Species

The only known threatened species to utilize Bayou Cocodrie NWR is the Louisiana black bear. A Section 7 Biological Evaluation was conducted in association with this assessment. It was determined that the proposed action is not likely to adversely affect this species or its critical habitat. Significant cumulative impacts to federally listed species would not be anticipated with the implementation of either action alternative.

4.3.2 Anticipated Direct and Indirect Cumulative Impacts of Action Alternatives on Bayou Cocodrie NWR Facilities, Environment, and Community

4.3.2.1 Bayou Cocodrie NWR Facilities

The impacts associated with refuge facilities would be the same for each alternative. Significant cumulative impacts would not be anticipated for refuge facilities.

4.3.2.2 Soils, Water, and Vegetation

Significant cumulative impacts would not be anticipated for soils, water, or vegetation.

4.3.2.2.1 Soils

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

This alternative would have the potential to negatively affect the soils within the early succession impoundments of Bayou Cocodrie NWR. However, significant cumulative impacts would not be anticipated for soils under Alternative B.

Alternative C. Focus on Reforestation

Impacts to soils under this alternative would be positive. No significant cumulative impacts would be anticipated for soils under Alternative C.

4.3.2.2.2 Water

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

The effects of these management activities on overall water quality in the region would be negligible. Compared to the cumulative impacts of commercial farming operations in the area, up to 120 acres of grain crops using the best management practices would have a nominal effect on local and regional water quality. Significant cumulative impacts would not be anticipated for water quality or quantity under Alternative B.

Alternative C. Focus on Reforestation

Significant cumulative impacts would not be anticipated for water quality or quantity under Alternative C.

4.3.2.2.3 Vegetation

Alternative B. Enhance Waterfowl Management Capabilities through Cropland Management Plan (Proposed Action)

This alternative would artificially keep the impoundments in a state of early succession. The plant community may consist of native moist soil vegetation including grasses, sedges, bulrushes, and herbaceous or woody vines and shrubs. It may also consist of planted crops such as corn, milo, rice, and millets. Significant cumulative impacts would not be anticipated for vegetation under Alternative B.

Alternative C. Focus on Reforestation

This alternative would be likely to produce the most natural vegetative community of the alternatives. If left to natural succession, this area would be expected to revert to mature

bottomland hardwood forest habitat. Planting native hardwood tree seedlings would accelerate this process. Significant cumulative impacts would not be anticipated for vegetation under Alternative C.

4.3.2.3 Community

Significant cumulative impacts would not be anticipated for the local community under either action alternative.

4.4 Other Past, Present, Proposed, and Reasonably Foreseeable Agricultural Uses and Anticipated Impacts

Cumulative effects on the environment result from incremental effects of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative effects may result from individually minor actions, they may, viewed as a whole, become substantial over time. Bayou Cocodrie NWR's past cropland program was similar to Alternative B (Proposed Action) with regard to type of crops grown, location of crops, agricultural methods used, and the reason for cropland management. Alternative B represents a significant decrease in cropland acres compared to the historical cropland operations on the refuge.

Reforestation as described in Alternative C would complete the refuge's trend and completely reforest all open land on the refuge.

4.5 Direct and Indirect Impacts

Direct effects are caused by an action and occur at the same time as the action. Indirect effects are caused by an action but are manifested later in time or further removed in distance, but still reasonably foreseeable. Direct and indirect impacts have already been discussed. None of the proposed management activities would lead, directly or indirectly, to a violation of federal, state, or local laws imposed for the protection of the environment; and, none of the direct or indirect impacts are anticipated to be significant. Adaptive management is a key component of each alternative. As such, the actions outlined would not establish a precedent for future actions with significant negative effects nor represent a decision in principle about future considerations. Refuge management activities would constantly be adapted as new research, data, and information become available to protect resources and minimize impacts.

4.6 Short-term Uses Versus Long-term Productivity

Under the No-Action Alternative, all 3 of the early successional impoundments at Bayou Cocodrie NWR are managed to promote moist-soil plants to provide foraging habitat for migrating and wintering waterfowl. The impoundments are also managed to provide mudflats, which serve as foraging habitat for fall migrating shorebirds. The preferred alternative is to annually plant 60 to 120 acres of a grain crop in 1 or 2 of the 3 early successional impoundments. The grain crops are not native but, from the standpoint of foraging habitat for waterfowl, are much more productive. By comparison, the preferred alternative is expected to produce an

annual gain of 100,000 to 1.2 million more DEDs annually than the No-Action Alternative and 1.0 to 1.5 million more DEDs annually than the Reforestation alternative. The increase in DEDs will support the refuge objectives, as well as, those of the Lower Mississippi Valley Joint Venture. The proposal will include a shift of unharvested crops (and DEDs) from St. Catherine Creek NWR. Unharvested crops at St. Catherine Creek NWR are often flooded by the Mississippi River too deep for waterfowl to be able to access well before the end of the winter period. The shift of unharvested crops to Bayou Cocodrie NWR will be a more efficient and effective use of the unharvested crops and will result in Bayou Cocodrie NWR being able to meet the wintering waterfowl foraging habitat objective published in its CCP (U.S. Fish and Wildlife Service 2004). There will be no net change in total cropland acres or DEDs on the two refuges.

Chapter 5 Consultation and Coordination and Public Involvement

Consultation and Coordination

Bayou Cocodrie NWR hosted a Biological Review September 27-29, 2012. The purpose of the review was to assess whether current refuge management activities were providing adequate progress toward meeting the habitat and population goals and objectives contained within the Bayou Cocodrie NWR CCP. In addition, consideration was made for new issues and opportunities that have arisen, and a list of general priority issues was generated to aid the refuge staff in meeting the stated habitat and population goals. Also, the review was designed to further aid the refuge staff in developing a station habitat management plan and objectives for populations and habitats that occur on the refuge.

Meeting participants included:

Haven Barnhill, USFWS, SE Refuge System, Regional Forester
Johnathan Bordelon, Louisiana Department of Wildlife and Fisheries, WMA Biologist
Supervisor
Tom Edwards, USFWS, SE Migratory Bird Division, Supervisory Biologist
Janet Ertel, USFWS, SE Refuge System, Regional Biologist
John Fontenot, USFWS, Private Lands Biologist
Gypsy Hanks, USFWS, North LA Refuge Complex, Biologist
Richard Keim, Louisiana State University, Professor, School of Renewable Natural
Resources
Deisha Norwood, Bayou Cocodrie NWR, Refuge Manager
Kent Ozment, Lower MS River Refuge Complex, Assistant Refuge Manager
John Simpson, Lower MS River Refuge Complex, Forester
Rob Smith, Louisiana Ecological Services Field Office, Biologist
Bob Strader, Lower MS River Refuge Complex, Project Leader
Tommy Tuma, Louisiana Department of Wildlife and Fisheries, Forestry Program
Supervisor
Dan Twedt, U.S. Geological Survey, Research Biologist
Nick Wirwa, Lower MS River Refuge Complex, Biologist

Public Involvement

The Service provided a 25-day public review and comment period (May 17 through June 10, 2013) on the draft Moist-Soil and Cropland Management Plan, the draft Compatibility Determination, and the draft Environmental Assessment. The documents were made available at the refuge's offices, on the refuge's website, and at local libraries. Press releases notifying the public of the availability of these documents were provided to local newspapers. Notices were also posted at the refuge's offices, on the refuge's website, and at local libraries; notices were mailed out to potentially interested individuals, nearby landowners, organizations, agencies, and Tribal governments. A press release was developed and distributed to the local media announcing the availability of the documents and the deadline for public comments. Written

comments were accepted by mail, email, fax, and hand delivery to the Bayou Cocodrie NWR office. The Service evaluated all comments received in development of the final Moist-Soil and Cropland Management Plan and Compatibility Determination for Bayou Cocodrie NWR. No comments were received from the public. No comments were received from the State of Louisiana. No comments were received from Native American Tribes. While one comment was received from the Environmental Protection Agency, it was not substantive. No changes to the documents were made from any comments received from the public during the public review and comment period.

See Appendix D for a summary of the public involvement and comments received.

APPENDIX A. LITERATURE CITED

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APPENDIX B. LIST OF PREPARERS

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APPENDIX C. LIST OF FIGURES AND TABLES

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Table 3. Maximum DED potential for Alternative Action C based on DED/ac production reported by Reinecke and Kaminski (2012) (page 15)

APPENDIX D. PUBLIC INVOLVEMENT

The Draft Moist-Soil and Cropland Management Plan, Draft Compatibility Determination, and Draft Environmental Assessment and Companion Amendment for the 2004 Comprehensive Conservation Plan for Bayou Cocodrie NWR were made available for public review and comment period from May 17, 2013 through June 10, 2013. The documents were made available at the refuge's offices, on the refuge's website, and at local libraries. Notices to inform interested parties of the proposed action, where and how to obtain copies of the documents, and how to provide comments were posted at the refuge offices, on the refuge's website, and at local libraries. Notification of the public was provided through direct mailing to potentially interested individuals, nearby landowners, organizations, agencies, and Tribal governments; included in the mailing were those parties receiving or providing information relative to the refuge's 2004 CCP. The Service evaluated all comments received in development of the final Moist-Soil and Cropland Management Plan and Compatibility Determination for Bayou Cocodrie NWR.

No comments were received from the public. No comments were received from the State of Louisiana. No comments were received from Native American Tribes. While one comment was received from the Environmental Protection Agency, it was not substantive. No changes to the documents were made from any comments received from the public during the public review and comment period.

APPENDIX E. PROPOSED COMPANION AMENDMENTS TO THE BAYOU COCODRIE
NATIONAL WILDLIFE REFUGE COMPREHENSIVE CONSERVATION PLAN

**Alternative B. Enhance Waterfowl Management Capabilities through Cropland
Management Plan (Proposed Action)**

Objective A.3: Migratory Waterfowl

Annually monitor waterfowl species abundance, use period, and habitat use within Bayou Cocodrie NWR wetlands to help evaluate and enhance long-term management.

Strategies:

- *To better understand waterfowl species abundance, use period, and habitat use, assess the waterfowl population within Bayou Cocodrie NWR early succession impoundments once every two weeks from November 15-March 31.*
- *Apply adaptive management practices within each wetland unit to continue improvement of waterfowl management capabilities.*
- *Conduct an annual mid-winter waterfowl survey throughout Bayou Cocodrie NWR wetlands.*
- *Minimize unnecessary disturbance within Bayou Cocodrie NWR early succession impoundments from November 15-March 31.*
- *Assess waterfowl forage on Bayou Cocodrie NWR prior to and during periods of waterfowl use.*
- *Conduct surveys for woodcock every third year.*

Objective B.6: Managed Wetlands

Contribute ~1,113 acres of quality wetland habitats as a component of the Lower Mississippi Valley Ecosystem's complex of managed moist-soil, croplands, and flooded forests and greentree reservoirs, which together provide important shelter and forage for waterfowl and other associated wildlife.

Strategies:

- *Develop and implement a Habitat Management Plan that includes potential management strategies for each managed wetland type represented on Bayou Cocodrie NWR.*
- *Provide up to 120 acres of quality moist-soil habitat to contribute to the foraging requirements of wintering waterfowl.*
- *Provide up to 120 acres of high energy foods such as milo, corn, rice, or millet to contribute to the foraging requirements of wintering waterfowl.*
- *Maintain the early succession impoundments using water level manipulation, mechanical disturbance, and chemical applications.*
- *Annually rotate management actions in the early succession wetlands to provide a diverse array of habitat conditions and vegetation communities.*

- *Enhance existing wetland habitats to mimic natural functions such as sheet flow, floodwater retention, and water quality improvement.*

Alternative C. Focus on Reforestation

Objective A.3: Waterfowl

Annually monitor waterfowl species abundance, use period, and habitat use within Bayou Cocodrie NWR wetlands to help evaluate and enhance long-term management.

Strategies:

- *Conduct an annual mid-winter waterfowl survey throughout refuge wetlands.*

Objective B.6: Wetlands

Restore and enhance 276 acres of wetlands to a forested condition to provide high quality habitat for migrating and resident wildlife.

Strategies:

- *Develop and implement a Habitat Management Plan (HMP) to incorporate wetland habitat management methods.*

APPENDIX F. FINDING OF NO SIGNIFICANT IMPACT

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) will implement a Moist-Soil and Cropland Management Plan for Bayou Cocodrie National Wildlife Refuge (NWR, refuge); finalize a Compatibility Determination for moist-soil and cropland management on the refuge; and amend the refuge's Comprehensive Conservation Plan (CCP), specifically objectives A.3. Waterfowl and Shorebirds, B.5. Reforestation, and B.6. Wetlands and the associated strategies to more effectively and efficiently meet waterfowl population objectives for the refuge and the larger landscape. Draft and final Environmental Assessments (EAs) were prepared to inform the public of the possible environmental consequences of implementing the Moist-Soil and Cropland Management Plan, Compatibility Determination, and Companion Amendment for the CCP. A description of the alternatives, the rationale for selecting the preferred alternative, the environmental effects of the preferred alternative, the potential adverse effects of the action, and a declaration concerning the factors determining the significance of effects, in compliance with the National Environmental Policy Act of 1969, are outlined below. The supporting information can be found in the draft and final EAs for the Moist-Soil and Cropland Management Plan, Compatibility Determination, and Companion Amendment for the CCP for Bayou Cocodrie NWR (U.S. Fish and Wildlife Service 2013a, 2013b, 2013c, 2013d, 2013e, and 2013f).

ALTERNATIVES

In evaluating the ability of Bayou Cocodrie NWR to meet waterfowl objectives, the Service evaluated three alternatives, as listed.

- Alternative A: The No Action Alternative would continue management at levels and activities similar to the past and in pursuit of the refuge's 2004 CCP.
- Alternative B: The Preferred Alternative would enhance waterfowl management capabilities through a Moist-Soil and Cropland Management Plan, modifying three CCP objectives and the associated strategies to better meet waterfowl population targets.
- Alternative C: Alternative C would focus management activities on reforestation.

The Service adopted Alternative B, the Preferred Alternative, as detailed in the final Moist-Soil and Cropland Management Plan and the supporting documents.

ALTERNATIVE A. CONTINUE CURRENT MANAGEMENT (NO ACTION ALTERNATIVE)

The No Action Alternative required by NEPA serves as a baseline to which the action alternatives are compared. Alternative A represents no change from current management and would continue to pursue the refuge's 2004 CCP (U.S. Fish and Wildlife Service 2004).

ALTERNATIVE B. ENHANCE WATERFOWL MANAGEMENT CAPABILITIES THROUGH A CROPLAND MANAGEMENT PLAN AND MODIFY TWO COMPREHENSIVE CONSERVATION PLAN (CCP) OBJECTIVES AND THE ASSOCIATED STRATEGIES TO BETTER MEET WATERFOWL POPULATION TARGETS (PREFERRED ALTERNATIVE)

Alternative B is the Service's Preferred Alternative, the alternative recommended for implementation. This alternative would enhance waterfowl management capabilities on the refuge and in the larger landscape through moist-soil and cropland management on the refuge as outlined in the Moist-Soil and Cropland Management Plan. This alternative would also implement a compatibility determination for moist-soil and cropland management and amend the refuge's 2004 CCP (U.S. Fish and Wildlife Service 2004).

ALTERNATIVE C. FOCUS ON REFORESTATION

Alternative C would focus on reforestation to support refuge and landscape waterfowl objectives, which would also require amending the refuge's 2004 CCP (U.S. Fish and Wildlife Service 2004).

SELECTION RATIONALE

Alternative B is selected for implementation because it was determined to best meet the purpose and need, providing the best approach for meeting refuge and landscape waterfowl population objectives. This alternative will enhance waterfowl management capabilities and include up to 120 acres of cropping annually on Bayou Cocodrie NWR. This will be a shift of unharvested crops and DEDs (Duck Energy Days) from St. Catherine Creek NWR. Unharvested crops at St. Catherine Creek NWR are often flooded by the Mississippi River and become too deep for waterfowl to access well before the end of the waterfowl winter period. The shift of unharvested grain crops to Bayou Cocodrie NWR will be a more efficient and effective use of the unharvested crops and will result in Bayou Cocodrie NWR being able to meet the wintering waterfowl foraging habitat objective published in the refuge's 2004 CCP (U.S. Fish and Wildlife Service 2004). There will be no net change in total cropland acres or DEDs on the two refuges combined.

ENVIRONMENTAL EFFECTS

Implementing the Preferred Alternative will increase soil disturbance and a more radical change in the plant community. Soil disturbance will continue on an as needed basis to produce desired habitat conditions. In the unit (or units) being cropped (60 to 120 acres) in a given year, the soil will typically be disked to establish a clean seedbed for planting an agricultural grain. The soil will be exposed and subject to erosion for a short period until the planted grain germinates and begins to grow. Grain crops will be managed to produce yields desired to meet waterfowl foraging habitat objectives. In the cropped unit(s), broadleaves will generally be controlled, while grasses will be allowed to grow and mature to produce seeds desirable for waterfowl. The practices of disking could negatively impact ground nesting birds and other wildlife. The negative impacts associated with these practices are short term and generally offset by the longer term benefits to maintain early successional habitat and providing foraging habitat for priority

species (i.e., wintering waterfowl). The negative impacts will be minimized by using no-till farm practices when possible and, when necessary, disking outside of the peak nesting period of ground nesting birds.

Herbicide treatments may be used as an alternative control method for advanced succession species during rotations of moist-soil management, as a field preparation method prior to no-till agricultural operations, or as a treatment for patches of undesirable or invasive species. This method may degrade vertical nesting structure and cover habitat and may result in overspray or herbicide drift into non-target areas. Negative impacts from herbicide applications to non-target areas will be minimized by some tolerance of vertical structure and only spot spraying specific target areas when possible. Some unavoidable negative impacts may be experienced for nesting habitat to achieve the habitat priority for wintering waterfowl. Maintaining early successional habitat will be a long term benefit for species using these habitats for nesting structure. Without these disturbances, the area would revert to forest over a 10- to 20-year period and preferred nesting structure and habitat for other early successional species would be lost altogether.

The use of chemicals in the forms of selected fertilizers, fungicides, herbicides, and insecticides, may also be required to ensure a successful crop during agricultural rotations. All forms of chemical application will be based on soil sampling or field inspections and, for pesticides, triggered when the pest threshold has been met as determined by methods outlined in refuge pesticide use proposals (PUPs). These potential negative impacts are included on product labeling and would be addressed through the PUPs process, which is required for each chemical used on a refuge. The Service reviews all chemicals proposed for use on refuges and restricts the use of chemicals that are determined to have excessive harmful impacts to non-target natural resources. An alternative chemical may be recommended or additional restrictions may be placed on the proposed chemical to ensure minimal adverse impacts. For PUP approval, negative impacts are considered and deemed acceptable when compared to the potential benefit of the chemical's use. Overall, species composition would be expected to remain consistent with past occurrences given that the area will remain in its early succession condition.

Thorough planning based upon current best management practices (BMPs) should substantially reduce the need for chemical application and soil disturbance. Potential BMPs include crop rotation, proper initial field preparation, soil testing, filter strips, strategic water manipulation, and minimal use of pesticides and fertilizers. The addition of chemical fertilizers and pesticides would have the potential to contribute to soil acidification, trace mineral depletion, heavy metal accumulation, and water quality degradation. Because of the anticipated crop rotation schedule (planting each field only once or twice every 3 years) and implementation of best management practices, the use of these chemicals are expected to have short-term impacts to target pests and, in some cases, non-target species. These short-term, minimal impacts are unavoidable if the refuge is to meet its waterfowl objective.

Seasonal water manipulation will provide up to 1,113 acres of diverse foraging and migrating habitat, contributing to the proposed waterfowl objective. The acres under moist-soil management would decrease from 188 acres to as few as 60 acres in any given year. Depending on crop selection and management timing, the numbers of shorebirds supported on the refuge

would either remain consistent with current levels or decrease when compared to Alternative A. Shorebird activity would be highly variable from year to year and dependent on annual habitat management strategies. Landscape shorebird objectives will be supported by St. Catherine Creek NWR where management capabilities are much greater.

Positive impacts of implementation of the Preferred Alternative would include the ability of Bayou Cocodrie NWR to increase its annual waterfowl target to 1.1 to 1.6 million DEDs (supporting up to 14,500 wintering waterfowl annually) to meet the objective set in the CCP; provide a more functional management strategy for both St. Catherine Creek NWR and Bayou Cocodrie NWR together to achieve waterfowl population objectives; and provide an alternate, preferred food resource (grains) for Louisiana black bears and habitat for waterbirds (e.g., wading birds and rails) when rice is grown.

COORDINATION

The management action has been thoroughly coordinated with all interested and/or affected parties. Parties contacted include those listed.

Louisiana Department of Wildlife and Fisheries

Louisiana State Historic Preservation Officer Tunica-

Biloxi Indians of Louisiana

Coushatta Tribe of Louisiana

Jena Band of Choctaw Indians of Louisiana

Chitimacha Tribe of Louisiana

Cities of Ferriday and Vidalia

Concordia Parish

Local Congressman

Interested citizens and local businesses

Conservation organizations

Local media

FINDINGS

It is my determination that the management action does not constitute a major federal action significantly affecting the quality of the human environment under the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969 (as amended). As such, an Environmental Impact Statement is not required. This determination is based on the listed factors (40 CFR 1508.27), as addressed in the EA and in the Moist-Soil and Cropland Management Plan, Compatibility Determination, and Companion Amendment for the CCP for Bayou Cocodrie NWR.

1. Both beneficial and adverse effects have been considered and this action will not have a significant effect on the human environment. (Chapter IV, Environmental Consequences)
2. The actions will not have a significant effect on public health and safety. (Chapter IV, Environmental Consequences)

3. The project will not significantly affect any unique characteristics of the geographic area such as proximity to historical or cultural resources, wild and scenic rivers, or ecologically critical areas. (Chapter IV, Environmental Consequences)
4. The effects on the quality of the human environment are not likely to be highly controversial. (Chapter IV, Environmental Consequences)
5. The actions do not involve highly uncertain, unique, or unknown environmental risks to the human environment. (Chapter IV, Environmental Consequences)
6. The actions will not establish a precedent for future actions with significant effects nor do they represent a decision in principle about a future consideration. (Chapter IV, Environmental Consequences)
7. There will be no cumulatively significant impacts on the environment. Cumulative impacts have been analyzed with consideration of other similar activities on adjacent lands, in past action, and in foreseeable future actions. (Chapter IV, Environmental Consequences, Cumulative Impacts)
8. The actions will not significantly affect any site listed in, or eligible for listing in, the National Register of Historic Places, nor will they cause loss or destruction of significant scientific, cultural, or historic resources. (Chapter IV, Environmental Consequences)
9. The actions are not likely to adversely affect threatened or endangered species, or their habitats. (Chapter IV, Environmental Consequences)
10. The actions will not lead to a violation of federal, state, or local laws imposed for the protection of the environment. (Chapter IV, Environmental Consequences)

SUPPORTING REFERENCES

- U.S. Fish and Wildlife Service. 2013a. Draft Compatibility Determination for Moist-Soil and Cropland Management Plan for Bayou Cocodrie National Wildlife Refuge. May 2013. Ferriday, Louisiana.
- U.S. Fish and Wildlife Service. 2013b. Draft Environmental Assessment and Companion Amendment for the 2004 Comprehensive Conservation Plan for the Draft Moist-Soil and Cropland Management Plan for Bayou Cocodrie National Wildlife Refuge. May 2013. Ferriday, Louisiana.
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U.S. Fish and Wildlife Service. 2013d. Compatibility Determination for Moist-Soil and Cropland Management Plan for Bayou Cocodrie National Wildlife Refuge. June 2013. Ferriday, Louisiana.

U.S. Fish and Wildlife Service. 2013e. Final Environmental Assessment and Companion Amendment for the 2004 Comprehensive Conservation Plan for the Draft Moist-Soil and Cropland Management Plan for Bayou Cocodrie National Wildlife Refuge. June 2013. Ferriday, Louisiana.

U.S. Fish and Wildlife Service. 2013f. Moist-Soil and Cropland Management Plan for Bayou Cocodrie National Wildlife Refuge. June 2013. Ferriday, Louisiana.

U.S. Fish and Wildlife Service. 2004. Comprehensive Conservation Plan for Bayou Cocodrie National Wildlife Refuge. Atlanta, GA.

DOCUMENT AVAILABILITY

A draft EA and Companion Amendment for the 2004 CCP, draft Compatibility Determination, and draft Moist-Soil and Cropland Management Plan for Bayou Cocodrie National Wildlife Refuge were developed for public review and comment. The public review and comment period was conducted from May 17, 2013 through June 10, 2013. All comments received during public review and comments were evaluated in the development of the final documents. Additional copies of the final documents are available on the web at: <http://www.fws.gov/bayoucocodrie/> and/or by contacting: Project Leader, Bob Strader, at Bob_Strader@fws.gov, or 601-442-6696.


Cynthia K. Dohner
Regional Director


Date

APPENDIX F. FINDING OF NO SIGNIFICANT IMPACT

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) will implement a Moist-Soil and Cropland Management Plan for Bayou Cocodrie National Wildlife Refuge (NWR, refuge); finalize a Compatibility Determination for moist-soil and cropland management on the refuge; and amend the refuge's Comprehensive Conservation Plan (CCP), specifically objectives A.3. Waterfowl and Shorebirds, and B.6. Wetlands and the associated strategies to more effectively and efficiently meet waterfowl population objectives for the refuge and the larger landscape. Draft and final Environmental Assessments (EAs) were prepared to inform the public of the possible environmental consequences of implementing the Moist-Soil and Cropland Management Plan, Compatibility Determination, and Companion Amendment for the CCP. A description of the alternatives, the rationale for selecting the preferred alternative, the environmental effects of the preferred alternative, the potential adverse effects of the action, and a declaration concerning the factors determining the significance of effects, in compliance with the National Environmental Policy Act of 1969, are outlined below. The supporting information can be found in the draft and final EAs for the Moist-Soil and Cropland Management Plan, Compatibility Determination, and Companion Amendment for the CCP for Bayou Cocodrie NWR (U.S. Fish and Wildlife Service 2013a, 2013b, 2013c, 2013d, 2013e, and 2013f).

ALTERNATIVES

In evaluating the ability of Bayou Cocodrie NWR to meet waterfowl objectives, the Service evaluated three alternatives, as listed.

- Alternative A: The No Action Alternative would continue management at levels and activities similar to the past and in pursuit of the refuge's 2004 CCP.
- Alternative B: The Preferred Alternative would enhance waterfowl management capabilities through a Moist-Soil and Cropland Management Plan, modifying three CCP objectives and the associated strategies to better meet waterfowl population targets.
- Alternative C: Alternative C would focus management activities on reforestation.

The Service adopted Alternative B, the Preferred Alternative, as detailed in the final Moist-Soil and Cropland Management Plan and the supporting documents.

ALTERNATIVE A. CONTINUE CURRENT MANAGEMENT (NO ACTION ALTERNATIVE)

The No Action Alternative required by NEPA serves as a baseline to which the action alternatives are compared. Alternative A represents no change from current management and would continue to pursue the refuge's 2004 CCP (U.S. Fish and Wildlife Service 2004).

ALTERNATIVE B. ENHANCE WATERFOWL MANAGEMENT CAPABILITIES THROUGH A CROPLAND MANAGEMENT PLAN AND MODIFY TWO COMPREHENSIVE CONSERVATION PLAN (CCP) OBJECTIVES AND THE ASSOCIATED STRATEGIES TO BETTER MEET WATERFOWL POPULATION TARGETS (PREFERRED ALTERNATIVE)

Alternative B is the Service's Preferred Alternative, the alternative recommended for implementation. This alternative would enhance waterfowl management capabilities on the refuge and in the larger landscape through moist-soil and cropland management on the refuge as outlined in the Moist-Soil and Cropland Management Plan. This alternative would also implement a compatibility determination for moist-soil and cropland management and amend the refuge's 2004 CCP (U.S. Fish and Wildlife Service 2004).

ALTERNATIVE C. FOCUS ON REFORESTATION

Alternative C would focus on reforestation to support refuge and landscape waterfowl objectives, which would also require amending the refuge's 2004 CCP (U.S. Fish and Wildlife Service 2004).

SELECTION RATIONALE

Alternative B is selected for implementation because it was determined to best meet the purpose and need, providing the best approach for meeting refuge and landscape waterfowl population objectives. This alternative will enhance waterfowl management capabilities and include up to 120 acres of cropping annually on Bayou Cocodrie NWR. This will be a shift of unharvested crops and DEDs (Duck Energy Days) from St. Catherine Creek NWR. Unharvested crops at St. Catherine Creek NWR are often flooded by the Mississippi River and become too deep for waterfowl to access well before the end of the waterfowl winter period. The shift of unharvested grain crops to Bayou Cocodrie NWR will be a more efficient and effective use of the unharvested crops and will result in Bayou Cocodrie NWR being able to meet the wintering waterfowl foraging habitat objective published in the refuge's 2004 CCP (U.S. Fish and Wildlife Service 2004). There will be no net change in total cropland acres or DEDs on the two refuges combined.

ENVIRONMENTAL EFFECTS

Implementing the Preferred Alternative will increase soil disturbance and a more radical change in the plant community. Soil disturbance will continue on an as needed basis to produce desired habitat conditions. In the unit(s) being cropped (60 to 120 acres) in a given year, the soil will typically be disked to establish a clean seedbed for planting an agricultural grain. The soil will be exposed and subject to erosion for a short period until the planted grain germinates and begins to grow. Grain crops will be managed to produce yields desired to meet waterfowl foraging habitat objectives. In the cropped unit(s), broadleaves will generally be controlled, while grasses will be allowed to grow and mature to produce seeds desirable for waterfowl. The practices of disking could negatively impact ground nesting birds and other wildlife. The negative impacts associated with these practices are short term and generally offset by the longer term benefits to maintain habitats in early succession and providing foraging habitat for priority

species (i.e., wintering waterfowl). The negative impacts will be minimized by using no-till farm practices when possible and, when necessary, disking outside of the peak nesting period of ground nesting birds.

Herbicide treatments may be used as an alternative control method for advanced succession species during rotations of moist-soil management, as a field preparation method prior to no-till agricultural operations, or as a treatment for patches of undesirable or invasive species. This method may degrade vertical nesting structure and cover habitat and may result in overspray or herbicide drift into non-target areas. Negative impacts from herbicide applications to non-target areas will be minimized by some tolerance of vertical structure and only spot spraying specific target areas when possible. Some unavoidable negative impacts may be experienced for nesting habitat to achieve the habitat priority for wintering waterfowl. Maintaining early successional habitat will be a long term benefit for species using these habitats for nesting structure. Without these disturbances, the area would revert to forest over a 10- to 20-year period and preferred nesting structure and habitat for other early successional species would be lost altogether.

The use of chemicals in the forms of selected fertilizers, fungicides, herbicides, and insecticides, may also be required to ensure a successful crop during agricultural rotations. All forms of chemical application will be based on soil sampling or field inspections and, for pesticides, triggered when the pest threshold has been met as determined by methods outlined in refuge pesticide use proposals (PUPs). These potential negative impacts are included on product labeling and would be addressed through the PUPs process, which is required for each chemical used on a refuge. The Service reviews all chemicals proposed for use on refuges and restricts the use of chemicals that are determined to have excessive harmful impacts to non-target natural resources. An alternative chemical may be recommended or additional restrictions may be placed on the proposed chemical to ensure minimal adverse impacts. For PUP approval, negative impacts are considered and deemed acceptable when compared to the potential benefit of the chemical's use. Overall, species composition would be expected to remain consistent with past occurrences given that the area will remain in its early succession condition.

Thorough planning based upon current best management practices (BMPs) should substantially reduce the need for chemical application and soil disturbance. Potential BMPs include crop rotation, proper initial field preparation, soil testing, filter strips, strategic water manipulation, and minimal use of pesticides and fertilizers. The addition of chemical fertilizers and pesticides would have the potential to contribute to soil acidification, trace mineral depletion, heavy metal accumulation, and water quality degradation. Because of the anticipated crop rotation schedule (planting each field only once or twice every 3 years) and implementation of best management practices, the use of these chemicals are expected to have short-term impacts to target pests and, in some cases, non-target species. These short-term, minimal impacts are unavoidable if the refuge is to meet its waterfowl objective.

Seasonal water manipulation will provide up to 1,113 acres of diverse foraging and migrating habitat, contributing to the proposed waterfowl objective. The acres under moist-soil management would decrease from 188 acres to as few as 60 acres in any given year. Depending on crop selection and management timing, the numbers of shorebirds supported on the refuge

would either remain consistent with current levels or decrease when compared to Alternative A. Shorebird activity would be highly variable from year to year and dependent on annual habitat management strategies. Landscape shorebird objectives will be supported by St. Catherine Creek NWR where management capabilities are much greater.

Positive impacts of implementation of the Preferred Alternative would include the ability of Bayou Cocodrie NWR to increase its annual waterfowl target to 1.1 to 1.6 million DEDs (supporting up to 14,500 wintering waterfowl annually) to meet the objective set in the CCP; provide a more functional management strategy for both St. Catherine Creek NWR and Bayou Cocodrie NWR together to achieve waterfowl population objectives; and provide an alternate, preferred food resource (grains) for Louisiana black bears and habitat for waterbirds (e.g., wading birds and rails) when rice is grown.

COORDINATION

The management action has been thoroughly coordinated with all interested and/or affected parties. Parties contacted include those listed.

Louisiana Department of Wildlife and Fisheries
Louisiana State Historic Preservation Officer Tunica-
Biloxi Indians of Louisiana
Coushatta Tribe of Louisiana
Jena Band of Choctaw Indians of Louisiana
Chitimacha Tribe of Louisiana
Cities of Ferriday and Vidalia
Concordia Parish
Local Congressman
Interested citizens and local businesses
Conservation organizations
Local media

FINDINGS

It is my determination that the management action does not constitute a major federal action significantly affecting the quality of the human environment under the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969 (as amended). As such, an Environmental Impact Statement is not required. This determination is based on the listed factors (40 CFR 1508.27), as addressed in the EA and in the Moist-Soil and Cropland Management Plan, Compatibility Determination, and Companion Amendment for the CCP for Bayou Cocodrie NWR.

1. Both beneficial and adverse effects have been considered and this action will not have a significant effect on the human environment. (Chapter IV, Environmental Consequences)
2. The actions will not have a significant effect on public health and safety. (Chapter IV, Environmental Consequences)

3. The project will not significantly affect any unique characteristics of the geographic area such as proximity to historical or cultural resources, wild and scenic rivers, or ecologically critical areas. (Chapter IV, Environmental Consequences)
4. The effects on the quality of the human environment are not likely to be highly controversial. (Chapter IV, Environmental Consequences)
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7. There will be no cumulatively significant impacts on the environment. Cumulative impacts have been analyzed with consideration of other similar activities on adjacent lands, in past action, and in foreseeable future actions. (Chapter IV, Environmental Consequences, Cumulative Impacts)
8. The actions will not significantly affect any site listed in, or eligible for listing in, the National Register of Historic Places, nor will they cause loss or destruction of significant scientific, cultural, or historic resources. (Chapter IV, Environmental Consequences)
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SUPPORTING REFERENCES

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Cynthia K. Dohner
Regional Director

7/24/2013
Date

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Bayou Cocodrie National Wildlife Refuge

Use: Cropland Management

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ☐

Appropriate ☒

Refuge Manager: Robert W. Strader

Date: 6/18/2013

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: Elizabeth A. Hume

Date: 6/26/13

A compatibility determination is required before the use may be allowed.

FWS Form 3-2319
02/06

Elizabeth,

You are aware that we are trying to get a Moist-soil and Cropland Management Plan and accompanying EA, etc., out for public review. The proposed plan is to grow 60 to 120 acres of unharvested grain crops (a management tool not included in the CCP) at Bayou Cocodrie NWR to meet wintering waterfowl objectives. I am seeking RO approval to release the documents for public review this week, if possible, with hope that we can farm this year. Your assistance in this effort is appreciated.

- The 2004 CCP for Bayou Cocodrie NWR set objectives for 10,000 migrating and wintering waterfowl and 12,000 fall migrating shorebirds.
- Following the moist-soil and forested wetland management objectives in the CCP, the refuge has the capability to produce 408,205 duck-energy days (DEDs) of waterfowl food that would support just over 3,700 ducks for the 110-day winter period - well below the 10,000 duck population objective.
- Waterbird surveys conducted on the refuge provide data that the refuge winters an average of 3,500 ducks and supports only about 200 shorebirds during fall migration. These numbers are consistent with the habitat data.
- The availability of even a small amount of unharvested grain (rice, corn, milo, and millet) would significantly raise DED availability on the refuge. However, cropping is a management tool that was not included in the CCP.
- We are proposing to grow 60 to 120 acres of unharvested grain crops at Bayou Cocodrie NWR through a Cooperative Farming Agreement already established at St. Catherine Creek NWR. The objective would be to produce 1.1 to 1.6 million DEDs annually, a number that should be achievable on a consistent basis and will meet or slightly exceed the Bayou Cocodrie NWR waterfowl objective.
- The total acreage cropped at St. Catherine Creek NWR is 1,950 acres, of which 20% or about 390 acres are left unharvested for waterfowl. With some frequency, a significant portion of the unharvested crop is flooded by the Mississippi River too deep to be available for dabbling ducks well before the end of the waterfowl wintering period.
- Implementation of the proposed Moist-soil and Cropland Management Plan will provide foraging habitat to meet the waterfowl objectives at both refuges while reducing the risk of losing the entire unharvested crop to flooding at St. Catherine Creek NWR.
- It is important to note that the total acreage of cropland on the two refuges will not be increased. Cropland and moist-soil management would be conducted within the policies of the U.S. Fish and Wildlife Service using best management practices, including crop rotation, no-till farming (when applicable), filter strips, crop scouting, and limited and selective use of pesticides and fertilizers (in accordance with approved PUPs). No genetically modified crops would be planted during the period the Service is completing an environmental review relative to the use of these crops.

Call with questions or to set up a briefing with others in the RO if necessary.

Reply Reply to all Forward

COMPATIBILITY DETERMINATION

Refuge Use: Moist-soil and Cropland Management (Cooperative and/or Force Account)

Refuge Name: Bayou Cocodrie National Wildlife Refuge

County: Concordia Parish, Louisiana

Date Established: November 16, 1990

Establishing and Acquisition Authority: Public Law 101-593 (Section 108 of H.R. 3338)

Purposes for Which Bayou Cocodrie National Wildlife Refuge Was Established: Congress authorized the establishment of Bayou Cocodrie National Wildlife Refuge (BCNWR) on November 16, 1990, to protect some of the last remaining, least disturbed bottomland hardwoods in the Lower Mississippi Valley. Congress stated BCNWR purpose as follows:

“The Bayou Cocodrie National Wildlife Refuge is established and shall be managed for the purposes of (1) conservation and enhancement of wetlands; (2) general wildlife management as a unit of the National Wildlife Refuge System, including management of migratory birds; and (3) fish and wildlife-oriented recreational activities.”

The National Wildlife Refuge System (NWRS) Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd et seq.) provides authority for the United States Fish and Wildlife Service (USFWS) to manage BCNWR and its wildlife populations. It directs Refuge Managers to increase recreational opportunities including hunting on National Wildlife Refuges when compatible with the purposes for which each refuge was established and the mission of the NWRS. In addition, it declares that compatible wildlife-dependent public uses are legitimate and appropriate uses of the NWRS and are to receive priority consideration in planning and management. There are six wildlife-dependent public uses: hunting, fishing, wildlife observation, wildlife photography, along with environmental education and interpretation.

Mission of the National Wildlife Refuge System: To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Other Applicable Laws, Regulations, and Policies:

Antiquities Act of 1906 (34 Stat. 225)

Criminal Code Provisions of 1940 (18 U.S.C. 41)

Emergency Wetlands Resource Act of 1986 (S.B. 740)

Endangered Species Act of 1973 (16 U.S.C. 1531 et seq. 87 Stat. 884)

Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System. March 25, 1996
Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)
Fish and Wildlife Coordination Act of 1958
Land and Water Conservation Fund Act of 1965
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715r; 45 Stat. 1222)
Migratory Bird Hunting and Conservation Stamp Act of 1934 (16 U.S.C. 718-178h; 48 Stat. 451)
Migratory Bird Treaty Act of 1918 (15 U.S.C. 703-711; 40 Stat. 755)
National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, et seq.; 80 Stat. 915)
National Wildlife Refuge Regulations for the Most Recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3)
North American Wetlands Conservation Act of 1990
Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)
Refuge Trespass Act of June 25, 1948 918 U.S.C. 41; 62 Stat. 686)
Refuge Revenue Sharing Act of 1935, as amended in 1978 (16 U.S.C. 715s; 92 Stat. 1319)

Description of Use: This compatibility determination applies to the re-establishment of cropland management through cooperative or force account farming on Bayou Cocodrie National Wildlife Refuge for the purpose of providing foraging habitat for migrating and wintering waterfowl. Currently, the use will be limited to planting no more than 120 acres within the three existing impoundments (which total approximately 200 acres) located along the northern refuge boundary. Cropland management will occur on a rotational basis among the three impoundments as a supplement to the current moist-soil management.

Availability of Resources: The land base required to conduct this activity is available and already intensively managed for the purpose of providing foraging habitat for migrating and wintering waterfowl. Based on a review of the BCNWR budget allocated for this activity, there is adequate funding to ensure compatibility and to administer this use at its proposed level.

Anticipated Impacts of the Use: Based on available information, the only threatened or endangered species that has been documented on the Bayou Cocodrie National Wildlife Refuge is the Louisiana black bear. BCNWR has also been designated as critical Louisiana black bear habitat. It is anticipated that the proposed level of cropland management is not likely to directly, indirectly, or cumulatively impact any listed, proposed, or candidate species or designated/proposed critical habitat.

Traditional cropping practices involve the manipulation of vegetation, soil, and water. If performed incorrectly, cropping can result in soil erosion, soil compaction, soil and water contamination, and general habitat degradation. However, these negative effects are also possible when conducting moist-soil management. Refuge biological and management staff have considered these potential effects, and have determined that, with adequate planning, proper use of modern equipment, and proactive monitoring, each of these threats can be reduced to an acceptable level. Details outlining the specific procedures and requirements for annual cropland

activities will be clearly outlined in each year's cooperative farming agreement, and will be agreed upon by all parties prior to commencement of any cropland activity.

Allowing the proposed levels of cropland management will have negligible impacts on BCNWR resources. Permitting this use should not be controversial.

Determination:

 X This use is compatible with the Following Stipulations

 This use is not compatible

Stipulations Necessary to Ensure Compatibility: Cropland Management will be permitted in accordance with state and federal regulations.

If adverse impacts to BCNWR resources associated with cropland activities are identified in the future, modifications to this program will be implemented to minimize impacts.

A detailed cooperative farming agreement will be issued to the farmer in a formal meeting prior to commencement of any cropland activities. That agreement will outline all details associated with cropland management each year including but not limited to chemicals that can and cannot be used, crop type, acres to be planted, timeframe of work, and applicable special conditions.

Justification: Until the year 2000, cropland management was an integral part of Bayou Cocodrie NWR's habitat management strategy. Nearly one thousand acres were farmed annually to meet refuge habitat goals. Reforestation has since claimed the majority of the original farmland base, and the remainder was devoted to moist-soil management. "General wildlife management as a unit of the National Wildlife Refuge System, including management of migratory birds" is one of the three primary purposes for the establishment of BCNWR. Over the past several years, BCNWR has fallen well short of its foraging habitat goals for migrating and wintering waterfowl. By reintroducing cropland management to provide a supplemental food source, BCNWR will be able to meet or exceed established habitat management goals.

The proposed level and methods of cropland activities are considered to be compatible with the purpose for which BCNWR was established. There has been substantial use of cropping as a wildlife management tool throughout the Service's history. Based on available information, there is no indication of long-term adverse biological impacts associated with this activity. Allowing it to be re-established is consistent with BCNWR objectives and is acceptable under current USFWS policy.

NEPA Compliance for Refuge Use Decision:

- ☐ Categorical Exclusion without Environmental Action Statement
- ☐ Categorical Exclusion and Environmental Action Statement
- ☒ Environmental Assessment and Finding of No Significant Impact
- ☐ Environmental Impact Statement and Record of Decision


Public Review and Comment: The Service provided a 25-day public review and comment period (May 17 through June 10, 2013) on the draft Moist-Soil and Cropland Management Plan, the draft Compatibility Determination, and the draft Environmental Assessment. The documents were made available at the refuge's offices, on the refuge's website, and at local libraries. Press releases notifying the public of the availability of these documents were provided to local newspapers. Notices were also posted at the refuge's offices, on the refuge's website, and at local libraries; notices were mailed out to potentially interested individuals, nearby landowners, organizations, agencies, and Tribal governments. A press release was developed and distributed to the local media announcing the availability of the documents and the deadline for public comments. Written comments were accepted by mail, email, fax, and hand delivery to the Bayou Cocodrie NWR office. The Service evaluated all comments received in development of the final Moist-Soil and Cropland Management Plan and Compatibility Determination for Bayou Cocodrie NWR. No comments were received from the public. No comments were received from the State of Louisiana. No comments were received from Native American Tribes. While one comment was received from the Environmental Protection Agency, it was not substantive. No changes to the documents were made from any comments received from the public during the public review and comment period.

Mandatory 10-Year Re-evaluation Date: June 17, 2023

Approval of Compatibility Determination: Moist-Soil and Cropland Management
(Cooperative and/or Force Account)


Deisha Norwood, Refuge Manager,
Bayou Cocodrie NWR


18 June 2013
Date


Robert Strader, Project Leader,
Lower Mississippi River Refuge Complex


6/18/2013
Date


Pam Horton, Regional Compatibility Coordinator,
Southeast Region

6/19/13
Date


Elizabeth Souheaver, Refuge Supervisor,
Area 2, Southeast Region

6/26/13
Date


David Viker, Regional Chief,
National Wildlife Refuge System,
Southeast Region

7/3/13
Date

