5. Plan Implementation and Monitoring

The CCP will serve as the primary management reference document for refuge planning, operations, and management for the next 15 years or until it is formally revised or amended within that period. The effectiveness of any management plan is dependent on a multitude of factors that change over time. This chapter describes a number of these factors in further detail, including the funding, staff, projects, compliance requirements, partnerships, monitoring, and additional planning associated with CCP implementation. Adaptive management will also be necessary to meet new, unforeseen challenges, and to take advantage of new opportunities.

As noted in the inside cover of this document, this plan does not constitute a commitment for additional staffing or increases in operational and maintenance resources. These decisions are at the discretion of Congress in overall appropriations, and in budget allocation decisions made at the national and regional levels of the Service.

5.1 Personnel and Budget Needs

Table 5-1 and 5-2 show the existing and additional staff needed to implement the projects identified later in this chapter.

5.1.1 Personnel

In fiscal year 2011, Complex had a permanent staff consisting of 27 employees, including 26 permanent full-time and one permanent part-time. In addition, we had six temporary positions, four Youth Conservation Corpsmen (YCC) and 128 volunteers contributed over 12,000 hours (See Table 5-1).

Table 5-1. Existing Personnel

Texas Mid-coast NWR Complex				
Management/Supervision	Refuge Manager	0485	GS-14	FT Permanent
Biology	Wildlife Biologist	0486	GS-13	FT Permanent
Biology	Wildlife Biologist	0486	GS-11	FT Permanent
Biology	Botanist/Ecologist	0430	GS-11	FT Permanent
Biology	Biological Technician	0404	GS-4	FT Temporary
Law Enforcement	Park Ranger/LE (2)	0025	GS-9	FT Permanent
Public Use	Outdoor	0023	GS-11	FT

Function / Program				
	Recreation Specialist			Permanent
Public Use	Training Technician	NA	GS-07	PT Permanent
Administration	Administrative Officer	0303	GS-09	FT Permanent
Administration	Fire Program Technician	0303	GS-07	FT Permanent
Administration	Administrative Assistant	0303	GS-03	PT Temporary
Fire Management	Fire Management Officer	0401	GS-12	FT Permanent
Fire Management	Prescribed Fire Specialist	0401	GS-11	FT Permanent
Fire Management	Station Manager (2)	0462	GS-7	FT Permanent
Fire Management	Fire Fighter (4)	0462	GS-5	FT Permanent
San Bernard National Wildlife Refuge				
Management/Supervision	Refuge Manager	0485	GS-12	FT Permanent
Management/Supervision	Wildlife Refuge Specialist	0485	GS-11	FT Permanent
Biology	Biological Technician	0404	GS-4	FT Temporary
Maintenance	Engineering Equipment Operator	5716	WG-10	FT Permanent
Maintenance	Maintenance Mechanic	4749	WG-09	FT Permanent
Maintenance	Laborer (2)	3502	WG-02	FT Temporary
Big Boggy National Wildlife Refuge				
Maintenance	Maintenance Mechanic	4749	WG-09	FT Permanent
Brazoria National Wildlife Refuge				
Management/Supervision	Refuge Manager	0485	GS-12	FT Permanent
Management/Supervision	Wildlife Refuge Specialist	0485	GS-09	FT Permanent
Facilities	Facilities		GS-09	FT

Function / Program				
	Operation Specialist			Permanent
Maintenance	Maintenance Mechanic	4749	WG-09	FT Permanent
Youth Program	YCC Enrollee (4)			

Table 5-2. Additional Personnel Needs beyond Current Levels

San Bernard National Wildlife Refuge				
Biology	Invasive Sp. Biologist	0404	GS-9/11	FT Permanent
Maintenance	Maintenance Worker	4749	WG-8	FT Permanent
Visitor Services	Outdoor Recreational Planner	0025	GS-7/9	FT Permanent
Biology	Biological Technician	0404	GS-5/7	FT Permanent
Brazoria National Wildlife Refuge				
Administration	Administrative Assistant (Clerk)	0303	GS-4	FT Permanent
Biology	Invasive Sp. Biological Technician	0404	G-7/9	FT Permanent
Maintenance	Maintenance Worker	4749	WG-8	FT Permanent

5.1.2 Budget

5.1.2.1 Existing Budget

Table 5-3 details the each refuge's base operational and maintenance budget in fiscal year 2011 of $3,053,687. The Complex received additional project-specific funds totaling $320,929 during 2011. The Complex used project funds to rehabilitate a 130-acre bottomland unit that had a wildfire in 2008, develop the Refuge Jr. Naturalist Program, treat invasive species, and fund a Youth Conservation Corp program among others.

Table 5-3 reflects the funds needed to maintain current levels based on FY 2011 dollars. The planning team calculated projections for staff costs as salary plus 25 percent. Long-term adjustments to the base operational budget reflect not only short-term adjustments, but also implementation of projects currently identified in the Refuge Operational Needs System (RONS) and Service Asset Maintenance Management (SAMMS) databases.

Table 5-3. 2011 Base Operational Budget for Complex

Refuge Base Operational Budget (includes administrative, maintenance, and biological staff and program costs) Full Implementation Projected	$848,934	$339,262 $702,543	$82,607	$263,184 $530,959	$1,523,987 $2,165,043
Annual Maintenance	$15,678	$73,748	$15,364	$92,185	$196,975
Public Use (includes volunteer and public use staff and program costs) Full Implementation Projected	$228,760	$74,463 $209,712		$60,072	$363,295 $504,439
Law Enforcement (includes staff and program costs)	$218,780				$218,780
Fire Program (includes staff, program, and Rx project costs; Complex-wide)	$740,650				$740,650

Special Project Funding

Vehicle Replacement	$64,406	$56,500
Rental Funds (Complex-wide)	$9,000	$15,000
Burned Area Rehabilitation Project	$19,150	
Invasive Species Projects (Complex-wide)	$24,500	$25,000
Youth Conservation Corp	$22,410	$21,400
Equipment Replacement (tractor)	$22,384	$75,000

Type 6 Fire Engine Replacement	$128,579	
BP – Emergency Restoratation – Sea turtle recovery	$23,000	$20,000
Youth Initiative (Refuge Jr. Naturalist)	$5,000	$5,000
Mottled Duck Banding	$2,500	$2,500

Refuge Operational Needs System

The Refuge Operational Needs System (RONS) is the mechanism that the refuges use to justify needed funds and personnel for new programs and projects necessary to meet legal mandates, refuge plans, and Departmental and Service directives. All refuges use this database to compete for dollars needed to adequately fund programs. Staffing levels are set through a separate mechanism and only applies to the refuges rather than the Complex office for non-law enforcement staff. RONS allocated 10 positions for Brazoria NWR, and they currently have four positions on the existing organization chart. Brazoria NWR needs three additional positions identified in the table above to fully implement this CCP. However, this Plan identifies an additional three positions, as allowed in RONS, below. In addition to the six positions, Brazoria NWR has two habitat projects for a total RONS list totaling $572,196. San Bernard NWR is allocated eight staff in RONS and currently has four staff members. San Bernard NWR has three positions (note: the fourth position is identified as a reality specialist to support Region-wide needs) and seven habitat/wildlife projects in the current RONS database for a total cost of $1,879,831. Two additional positions are identified in the approved PPP for expanding the approved acreage of the Austin Woods Conservation Project from 28,000 acres to 70,000 acres are identified below, bringing the total to $2,068,531. RONS allocated three staff to Big Boggy NWR, which currently has only one staff member. These two additional positions and two projects to control erosion bring the Big Boggy NWR RONS database total to $1,658,495. Although the staff is a recurring need, many of the habitat projects do not have recurring needs. Due to budget tightening, the availability of fire funds for prescribed burning has declined. In FY 2011, the Complex used $25,000 from the main operational account to supplement fire project funds and complete the required habitat burning. For this reason, Big Boggy NWR entered RONS projects into the system to support prescribed burning across the Complex. The section on Complex-wide needs compiles and lists all of these. See Table 5-4 for summary.

Service Asset Maintenance Management System

The Service Asset Maintenance Management System (SAMMS) is a database the refuges uses to document and justify significant maintenance projects and equipment replacement. The Brazoria NWR SAMMS database currently lists seven deferred maintenance and five capital improvement projects; totaling $1,828,984. The San Bernard NWR SAMMS project list currently has 10 deferred projects and six capital improvement projects identified for a total of $1,410,060. Big Boggy NWR has two deferred and two capital improvement projects for a total of $291,429. See Table 5-4 for summary.

5.1.2.2 Additional Budget Needs

Table 5-4 identifies budget needs, beyond current levels, as identified in the RONS and SAMMS databases as well as the Austin's Woods PPP.

Table 5-4. Staffing and Project Needs identified in SAMMS and RONS.

Brazoria National Wildlife Refuge				
Maintain and Enhance Refuge Habitats (Maintenance Worker)	FT Staff	77,650	-	77,650
Enhance Biological Monitoring (Biological Technician)	FT Staff	72,806	-	110,300
Improve Refuge Administration and Efficiency (Clerk)	FT Staff	57,962	-	57,962
Maintain wetland levees, water conveyance structure, facilities, and roads (Engineering Equipment Operator)	FT Staff	88,133		88,133
Park Ranger	FT Staff	90,184		90,184
Monitor wetland restoration efforts. (Biologist)	FT Staff	133,461		133,461
Replace Boundary and Hunt Area Signs (WO-2007735961)	Deferred Maintenance		15,000	
Rehabilitate Clay Banks Access Road (WO-2010135586)	Deferred Maintenance		15,135	
Rehabilitate Salt Lake Road (WO-2006480033)	Deferred Maintenance		172,000	
Replace culverts and water control structures on Big Slough (WO-2010122944)	Deferred Maintenance		40,000	
Widen and upgrade Otter Slough Road (WO-2010123044)	Capital Improvement		325,000	
Convert Electric Lights at Fishing Pier to Solar Voltaic (WO-2010122813)	Capital Improvement		50,000	
Drill high capacity ground water well at Moist Soil Units. (WO-2010122946)	Capital Improvement		250,000	

Project				
Replace battery room at Discovery Center with stand alone, explosion proof building	Capital Improvement		85,000	
Construct wash rack with water recovery system at Brazoria Field Office	Capital Improvement		160,000	
Plug abandoned waterwells (WO-05139591)	Deferred Maintenance		55,000	
Replace deteriorated wood/metal storage building (WO-05139587)	Deferred Maintenance		644,749	
Replace and update interpretive panels across Brazoria NWR (WO-2007735939)	Deferred Maintenance		17,100	
Maintain clear water movement capabilities to improve drainage	Habitat Management	83,000		10,000
Restore water holding capability and management on Otter Slough	Habitat Management	19,000		6,000
San Bernard National Wildlife Refuge				
Manage invasive species and increase partnerships.	FT Staff	133,461		133,461
Conduct biological monitoring and implement habitat management program.	FT Staff	90,184		90,184
Outdoor Recreation Planner (RONS and PPP)	FT Staff	110,311		110,311
Manage Austin Woods Units (identified in PPP for expansion of Austin's Woods Project to 70,000 acres)	FT Staff	120,300		120,300
Maintenance Worker (identified in PPP for expansion of Austin's Woods Project to 70,000 acres)	FT Staff	68,400		68,400
Shoreline Protection of Sargent Unit Marsh	Habitat Protection	741,875		4,000

Project				
Enhance hydrological management opportunities in Moccasin and Rail Ponds	Habitat Management	25,000		10,000
Wolfweed wetland expansion project	Habitat Management	21,000		
Terrace project for shoreline protection along eroding banks of Cowtrap marsh	Habitat Protection	145,800		
Sea Turtle Recovery Program	Wildlife Enhancement	9,000		3,000
Three-toed Box Turtle Survey	Wildlife Enhancement	1,700		
Restore eroding banks of Cow Trap Marsh	Habitat Protection	601,500		
Replace deteriorated tractor shed with structure that meet today's building standards for hurricane wind loads.	Deferred Maintenance		40,000	
Road Projects Rehabilitate Public Use Roads (WO-04135421) Rehabilitate Big Pond Road (WO-04135458) Rehabilitate Cow Trap Marsh Road (WO-97108019)	Deferred Maintenance		 386,000 39,060 42,500	
Demolition of apartment on Hudson Woods East (WO-2008803825)	Deferred Maintenance		10,000	
Replace Quonset hut used for hurricane response on Hudson Woods East	Capital Improvement		125,000	
Install 10 KW photovoltaic system at San Bernard HQ (WO-210121764)	Capital Improvement		150,000	
Rehabilitate domestic water supply well and install filtration system (WO-2010121765)	Capital Improvement		85,000	
Expand RV volunteer pad sites (WO-2010125775)	Capital Improvement		30,000	

Project				
Rehabilitate field irrigation wells Sargent (WO-2010121777) Wolfweed (WO-2010121778)	Deferred Maintenance		60,000 50,000	
Repaint metal storage, and shop buildings (3).	Deferred Maintenance		45,000	
Replace overhead doors on mechanic shop	Deferred Maintenance		7,500	
Add crushed limestone base to the tops of the Wolfweed levees.	Capital Improvement		150,000	
Replace Boardwalk surface at Bobcat Woods with recycled plastic lumber (WO-2010121779)	Deferred Maintenance	-	30,000	
Construct equipment wash facility with recovery system (WO-2010121766)	Capital Improvement	-	160,000	
Big Boggy National Wildlife Refuge				
Facilitate Habitat Management	FT-Staff	90,184		90,184
Develop and direct habitat mgmt, public use, easement acquisition and enforcement, facility maintenance, and community relations.	FT-Staff	110,311		110,311
Preserve and restore Dressing Point Island Rookery	Habitat Protection/Wildlife Enhancement	745,000		
Shoreline Protection and Restoration along the Gulf Intracoastal Waterway	Habitat Protection	713,000		
Replace deteriorated boundary posts and signs (WO-2007736003)	Deferred Maintenance		12,848	
Rehabilitate sac-create wave-barrier on Dressing Point Island (WO-05139643)	Deferred Maintenance		49,081	

Project				
Rehabilitate Roads Re-surface 2 miles dirt access roads (WO-2010121772) Resurface Hunter Access Road (WO-2010121774)	Capital Improvement		170,000 59,500	
Texas Mid-coast Complex-wide				
Average Annual Equipment Replacement Needs	Equipment Replacement-Complex	-	75,000	75,000
Support of Fire Program Projects	Habitat Management/ Restoration-Complex	63,000		63,000

5.2 Appropriate Refuge Uses and Compatibility

5.2.1 Appropriate Refuge Uses

All uses of a national wildlife refuge over which the Service has jurisdiction must be determined to be appropriate under the Appropriate Refuge Uses policy (603 FW 1). If an existing use is not appropriate, the refuge manager will deny the use without determining compatibility (see Section 5.2.2). An appropriate use of a national wildlife refuge is a proposed or existing use that meets at least one of the four following conditions:

1. The use is a wildlife-dependent recreational use as identified in the Refuge System Improvement Act (i.e., hunting, fishing, wildlife observation and photography, and environmental education and interpretation);
2. The use contributes to fulfilling the refuge purposes, the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Refuge Improvement Act was signed into law;
3. The use involves the take of fish and wildlife under state regulations;
4. The refuge manager has evaluated the use following guidelines in the Service Manual 603 FW 1.11 and found it appropriate.

5.2.2 Compatibility

In accordance with the Refuge Improvement Act of 1997, no uses for which the Service has authority to regulate may be allowed on a unit of the National Wildlife Refuge System unless it is determined to be compatible. A compatible use is a proposed or existing wildlife-dependent recreation use, or any other use of a national wildlife refuge that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge.

Compatibility determinations are not required for refuge management activities except economic activities. Examples of refuge management activities that do not require a compatibility determination include: invasive species control; prescribed burning; water level management; routine scientific monitoring, studies, surveys, and censuses; historic preservation activities; law enforcement activities; and maintenance of existing refuge facilities, structures, and improvements. Economic uses (i.e., farming, haying, grazing) of a natural resource must contribute to achieving refuge purposes and the Refuge System mission. They are also not required where statute directs mandatory approval of the activity, as in the case of facilities for national defense (603 FW 2, section 2.10).

The Service re-evaluates compatibility determinations for existing hunting, fishing, wildlife observation and photography, and environmental education and interpretation with the preparation or revision of a CCP or at least every 15 years. The Service must re-evaluate compatibility determinations for all other uses every 10 years or earlier if conditions change or significant new information relative to the use and its effects becomes available. Refuge managers must complete a written compatibility determination for each use, or collection of like-uses, signed by the manager and the Regional Refuge Chief. If the Service finds a use to be incompatible, the refuge will follow normal administrative procedures for stopping the action.

Appendix D contains 13 compatibility determinations drafted as part of this comprehensive conservation planning effort, including:

- Hunting
- Fishing
- Wildlife Observation – Brazoria
- Wildlife Observation – San Bernard
- Wildlife Photography
- Environmental Education
- Interpretation
- Cooperative Farming
- Boating including launch sites
- Hiking
- Bicycling
- Mosquito control
- Livestock Grazing

5.3 Intra-Service Section 7 (Endangered Species Act Consultation)

The Complex conducted an Intra-Service Section 7 consultation for the implementation of CCP objectives and strategies with the Clear Lake Ecological Services Field Office (see Appendix G).

5.4 Step-Down Management Plans

The Complex will accomplish the implementation of this CCP, in part, through various step-down management plans (see sections 5.3.1 and 5.3.2). Each step-down plan has its own program focus, identifying, and directing the implementation of strategies (i.e., actions, techniques, and tools) designed to achieve programmatic objectives outlined in the CCP.

5.4.1 Current Step-Down Plans

Current step-down management plans for the Complex include the following:

Biological Management Step-Down Plans

Hog Management Plan
The Complex completed the Feral Hog Management Plan in 2004. The plan addresses the need to control feral hogs on the refuges. Uncontrolled, hogs damage native vegetation, compete with native species, and enable the spread of invasive plants. The plan outlines procedures and conditions associated with issuing special use permits for trapping and hunting with the aid of hounds and opportunity for public hunting. In addition, the plan provides for aerial hunting or take by authorized staff.

Fire Management Plan
The Complex signed the Fire Management Plan in 2001. A new plan is currently awaiting review and signature. The plan outlines goals, objectives, and strategies of the fire management program on the Complex. This plan is scheduled to be completed in June 2012.

Visitor Services Step-Down Management Plans

Refuge Exhibit Plan
The Refuge Exhibit plan is prepared for individual public use areas. Only one Refuge Exhibit Plan has been prepared to date and signed in 2009. This plan details exhibit concepts for interpretation at the Discovery Center. Refuge Exhibit Plans will be addressed in the new Visitors Services Plan.

Facilities/Infrastructure Step-Down Management Plans

Hurricane Preparedness and Response Plan
The Complex reviews and approves a Hurricane Preparedness and Response Plan annually. The plan identifies preparedness throughout hurricane season and actions and responsibilities if the potential of a strike occurs. The Complex will not place protection of Service assets above the safety of Service personnel.

Safety Plan
The Complex updates the Safety Plan, a working document that requires annual review, updated every three years. The refuge updated the plan in March 2012.

Aviation Plan
The Aviation Plan outlines the use of aircraft on the Complex. The Complex signed the original plan in 2002 and an updated plan in December 2011.

Spill Prevention and Counter Measure Contingencies
San Bernard NWR is the only station with a Spill Prevention Plan. The minimum criterion for the requirement of this plan is storage of 1,600 gallons of fuel. San Bernard NWR signed the plan, which outlines the presence of storage facilities, spill prevention guidelines, and

post spill management, in 2007. With the new Otter Slough Headquarters at Brazoria NWR, a request for a Spill Plan was made through the Environmental Management Officer in 2011.

Environmental Management Plan
The Environmental Management Plan outlines all environmental issues including water quality, hazardous material, training, and greening opportunities. The Complex updates the plan annually.

5.4.2 Future Step-Down Plans

The Complex will draft the following list of step-down management plans to guide management of specific refuge programs:

<u>Biological Management Step-Down Plans</u>

Hunt Management Plan
The Complex will revise and update the existing Hunt Management Plan to include the Public Waterfowl Hunting Areas, permit waterfowl hunts, the youth deer hunt in partnership with TPWD, and the Youth Hog Hunt in partnership with Texas Youth Hunting Program. This plan is scheduled for completion in 2015.

Integrated Pest Management Plan
An integrated Pest Management Plan will describe the use of mechanical, fire and herbicide applications for the control and eradication of invasive species. This plan has been initiated is scheduled for completion in 2015.

Fisheries Management Plan
A Fisheries Management Plan will describe fishery resources and aid in the management of fish resources across refuge waters. This plan is scheduled for completion in 2017.

Habitat Management Plan
The Complex drafted the Habitat Management Plan in 2007 and scheduled finalization of this plan for 2013.

Hydrologic and Water Resources Plan
The Complex will implement a Hydrologic and Water Resources Plan, which will describe various types of water projects, to support management objectives. Water projects will encompass areas including water quantity, water quality, water rights, water infrastructure, climate change, sedimentation, and erosion. The primary goal of these projects will be to provide hydrologic information to guide management decisions related to maintenance, restoration, and enhancement of refuge habitats. This plan is scheduled for completion in 2015.

Visitor Services Step- Down Management Plans

Visitor Services Plan
The Service completed a Visitors Services review for the Complex in April of 2010. Using information from that review, the Complex will develop a Visitors Service Plan that describes how Texas Mid-coast NWR Complex will provide recreational opportunities. The plan will describe public access points, hunting, fishing, and wildlife observation opportunities that are provided by Complex, as well as descriptions of those public uses that are prohibited, such as camping.

Interpretive Plan
The Interpretive Plan describes in detail all of the areas of the refuges where interpretation may occur. The areas described include the Discovery Center, Big Slough Recreation Area, Otter Slough, Cocklebur Slough Recreation Area, San Bernard Oak, Dow Woods, and Hudson Woods. The new interpretive plan will be included in the Visitors Services Plan.

Sign Management Plan
The Sign Management Plan identifies the need and use of appropriate signage for information and law enforcement needs. This plan is scheduled for completion in 2015.

Facilities/Infrastructure Step-Down Management Plans

Oil and Gas Management Plan
The Oil and Gas Management Plan will define management objectives and ensure protection of refuge habitats and wildlife during oil and gas operations. This plan is scheduled for completion in 2015.

Law Enforcement Plan
A Law Enforcement Plan will describe the need and ensure the consistence of application for the protection of refuge resources and the safety of the public. This plan is scheduled for completion in 2015.

5.5 Refuge Projects

The planning team identified the following list of projects are needed to fulfill the goals and objectives identified in Chapter 4, Management Direction.

5.5.1 Existing Projects

5.5.1.1 Biological Management Projects

Prairie Management and Restoration
With less than 1 percent of the native coastal prairie habitats still in existence, the Complex will restore coastal prairie habitats, including their hydrological component, where applicable, and manage prairie habitats in order to enhance species diversity among both plants and animals. Current targeted areas include Brazoria NWR, northeast corner of San Bernard NWR, Buffalo Creek Unit, and Halls Bayou Unit. Management actions include

implementation of prescribed fire, control of invasive species, restoration of the hydrological component, and spreading seed or direct planting to encourage diversity. Associated research and monitoring include grassland birds, effectiveness of herbicide treatments, species diversity, fire intensity and effects, yellow and black rail use, and stable isotope analysis.

This project supports achievement of the Ecoregional Goal (4.1), Coastal Prairie Objective (Obj. 2) under Habitat Management (Goal 4.2), and the Waterfowl (Obj. 1) and Grassland and Secretive Marsh Birds (Obj. 3) Objectives under Wildlife (Goal 4. 3) as identified in Chapter 4, Management Direction.

Bottomland Management and Restoration

Although the primary focus of the Austin Woods Conservation Program is the conservation of high quality bottomland forests, restoration activities may be required. Where the hydrology has been altered to reduce holding capacity or increase surface flow water, the Service will install water control structures or fill ditches to restore water holding capacity. Rest from disturbance and allowing natural succession of hardwood species is the primary means for restoring forests. However, where haying, mowing, or agriculture repeatedly disturb the land and an over-story no longer exists, planting bare-root seedlings or young trees to encourage regrowth of hardwood species or add diversity will be completed. In addition, the refuge may apply herbicide via a ground sprayer to control invasive species in these restoration areas. Research and monitoring associated with this project include wintering forest songbird banding, spring migratory songbird banding, Swainson's and prothonotary warbler nesting, bird call point counts in late winter and spring, and flora inventory.

This project supports achievement of Objective 2 Conservation of Columbia Bottomlands Ecosystem under the Ecoregional (Goal 4.1), the Bottomland Hardwood Forest Objective (Obj. 1) under Habitat Management (Goal 4.2) and the Forest Birds Objective (Obj. 2) under the Wildlife (Goal 4.3) as identified in Chapter 4, Management Direction.

Moist-soil Management

Fresh water is extremely limiting, particularly during droughts on the coastal plain. All three refuges developed moist-soil units to provide fresh water habitat. Dual management of the rice fields gains additional moist-soil units at Brazoria NWR. Providing fresh water habitat involves management of the ponds including disking, rolling vegetation, water manipulation, herbicide application, and supplementing rainfall. Supplemental water may be obtained through purchase of water from water authorities, ground pumping through operation of wells, or diversion from natural flow. Research and monitoring associated with this project include monthly aerial winter waterfowl counts, mottled duck nesting survey, summer waterfowl banding, and shorebird counts.

This project supports achievement of the Wetlands Objective (Obj. 3) under Habitat Management (Goal 4.2) and the Waterfowl (Obj. 1) and Shorebird (Obj. 5) Objectives under the Wildlife Goal (4.3) as identified in Chapter 4, Management Direction.

Manage Colonial Waterbird Colonies
Several colonial waterbird colonies are located on or near refuge lands that require regular maintenance to protect from predators (raccoons), invasive species (red-imported fire ants), and disturbance in order to maintain productivity. The refuge completes an annual count on all refuge colonies and adjacent colonies (Hoskin's Mound and General Land Officer (GLO) islets) and hopes to partner with both Chevron-Texaco and GLO on the protection and enhancement of these colonies.

This project supports achievement of the Ecoregional Goal (4. 1) and Colonial Waterbird Colonies Objective (Obj. 4) under the Wildlife Goal (4.3) as identified in Chapter 4: Management Direction.

Manage and Protect Beach Resources
The Gulf beach of the San Bernard NWR provides a unique wildlife resource. In order to protect wildlife habitat, the refuge restricts the use of the beach to non-motorized access. Visitors may walk or bicycle along the beach, which protects the beach and dunes. The beach is accessible by boat and from Sargent Beach when the Cedar Lakes cut fills in. Posts and signs mark the no vehicle access at the cut. Monitoring associated with this project includes annual shorebird counts and 5-year plover counts.

This project support achievement of the Shorebird (Obj. 5) and Reptiles (Obj. 6) under the Wildlife Goal (4.3) as identified in Chapter 4, Management Direction.

Protection of Marsh Habitats
The refuge protects the salt marsh habitat and has conducted small restoration or erosion projects in the past. These habitats are particularly fragile to repetitive encroachment including the use of rubber-tired or tracked vehicles, cattle and feral hog trails and goose eat outs. The refuge completes small restoration projects including the planting of smooth cord grass, shoreline riprap, and plugging small, eroded channels with bags of secrete or hay bales. Protection of this habitat during oil and gas exploration activities, pipeline construction, or other encroachment is critical to enabling natural accretion and minimizing loss of marsh habitats to sea level rise. Research and monitoring associated with this project includes black and yellow rail research, monthly winter waterfowl counts, and colonial waterbird counts.

This project supports achievement of the Wetlands Objective (Obj. 3) under Habitat Management (Goal 4.2) and the Waterfowl (Obj. 1), Grassland and Secretive Marsh Birds (Obj. 3), Colonial Waterbirds (Obj. 4) and Shorebird (Obj. 5) Objectives under the Wildlife Goal (4.3) as identified in Chapter 4, Management Direction.

5.5.1.2 Visitor Services Management Projects

Provide Public Use Opportunities and Maintain Facilities Associated with Public Use Areas
Maintain the Big Slough and Cocklebur Slough auto-tour loops and associated roads, pull-offs, parking areas, observation platforms, trails, and etc. at Brazoria NWR and San Bernard

NWR as the primary public use areas offering wildlife observation, photography, interpretation, fishing, and environmental education opportunities. Maintain secondary public use areas, including Dow Woods, Hudson Woods, Betty Brown, and San Bernard Oak Trail at San Bernard NWR and Bastrop Bayou fishing pier at Brazoria NWR, along with associated trails, parking areas, piers, and interpretive signs that offer wildlife observation, photography, interpretation, and fishing opportunities.

This project supports achievement of the Visitation, Wildlife Observation, Photography, Interpretation, Fishing, Environmental Education, Law Enforcement, and Cultural Resources Objectives (Obj. 1, 2, 3, 4, 6, 7, and 10) under the Recreation Goal (4.4) and Public Use Facilities (Obj. 1) under the Facilities Goal (4.5) as identified in Chapter 4, Management Direction.

Hunting Programs

The waterfowl hunting program on the refuges provide wildlife-dependent public use opportunities. Waterfowl hunting within the Public Waterfowl Hunting Areas will continue and may expand as new compatible opportunities arise through acquisition of additional lands. The San Bernard will continue to partner with TPWD's, Stringfellow Wildlife Management Area, providing the opportunity for youth to participate in the three deer and hog hunt weekends. San Bernard and Brazoria NWRs will continue to partner with the Texas Youth Hunting Program, providing a hog hunting opportunity for youth as an introduction to hunting.

This project supports achievement of the Hunting Objective (Obj. 5) under the Public Use Goal (4.4) as identified in Chapter 4, Management Direction.

Discovery Environmental Education Program (DEEP)

Provide quality, hands-on environmental education programs through the DEEP at Brazoria NWR, Hudson Woods Unit, and San Bernard NWR, in partnership with the Texas Master Naturalist. Maintain all DEEP facilities, providing a safe and enjoyable learning environment.

This project supports achievement of the Environmental Education (Obj. 7) under the Recreation Goal (4.4) as identified in Chapter 4, Management Direction.

Volunteer Program

Volunteers contribute over 12,000 hours annually to the Complex. Public Use Programs, including Environmental Education and Outreach, extensively rely on volunteers. In addition, volunteers are an essential component in conducting research and biological censuses. RV volunteers maintain the public use areas through mowing roadways, trails and maintaining the observation decks, and other facilities.

Maintaining Volunteer Programs supports achievement of the Environmental Education (Obj. 7), Interpretation (Obj. 4), Outreach (Obj. 8), and Partnerships (Obj. 10) under the Recreation Goal (4.4) and Public Use Facilities (Obj. 1) and Administrative, Maintenance,

and Storage Facilities (Obj. 2) under the Facilities Goal (4.5) as identified in Chapter 4, Management Direction.

5.5.2 Future Projects

5.5.2.1 Biological Management Projects

Slop Bowl Marsh Restoration
Drainage, commerce, pollution, erosion, subsidence, agricultural and grazing activities alter natural wetland functions across the region. Preservation and restoration of the remaining wetland habitats is essential to maintaining plant and wildlife diversity. These areas serve a major role by providing nursery grounds for shell and fin fish, buffering storm surges, and filtering pollutants. The Complex can influence those outside the boundaries by preserving refuge wetlands, which support large populations of migratory birds, and sustainable commercial and recreational fisheries. Current targeted areas for restoration include the Slop Bowl unit located on the southern portion of Brazoria NWR. The Slop bowl marsh has degraded due to subsidence and saltwater intrusion. Management actions include implementation of prescribed fire, control invasive species, eliminate trespass grazing, restore hydrological component, reduce saltwater intrusion, and spreading seed or direct planting to encourage diversity.

This project supports achievement of the Wetlands Objective (Obj. 3) under Habitat Management (Goal 4.2) and Ecoregional (Goal 4.1), and the Waterfowl (Obj. 1) and Grassland and Secretive Marsh Birds (Obj. 3) Objectives under Wildlife (Goal 4.3) as identified in Chapter 4, Management Direction.

Treatment of Invasive species in Bottomlands, Prairies, and Wetlands
Invasive plant species spread rapidly and quickly displace native plants, degrading habitat value for wildlife. The Complex will work with partners to identify the most effective and environmentally conscious treatment methods to address existing populations specifically targeting avenues of dispersal (Rights-of-way, waterways, restoration areas, etc.) to control invasive plant species on refuge lands. Current threats to native species include Chinese tallow, deep-rooted sedge, trifoliate orange, McCartney rose, water hyacinth and others. The refuge will carefully monitor all individual treatments to assess efficacy, non-target effects, and the need or frequency of follow-up treatments.

This project supports achievement of the Bottomland Hardwood Forest (Obj. 1), Coastal Prairie Obj. 2), and Wetland (Obj. 3) Objectives under Habitat Management Goal (Goal 4.2) as identified in Chapter 4: Management Direction.

Restoration of Eagle Nest Lake Prairies
The acquisition of the Eagle Nest Lake Property brought not only quality bottomland hardwood habitat and associated wetlands, but also retired agricultural lands. The Complex will actively restore these converted prairies to native coastal prairie through a variety of techniques using local plant and seed sources, and working with partner prairie restoration organizations and experts to re-create this vanishing habitat type. Techniques may include,

but are not limited to, re-seeding, sprigging, transplanting, spreading native prairie hay for seed and mulch, prescribed fire, and treatment of invasive species. All work, including management actions will be coordinated with the NRCS office, which has a Conservation Easement on the property.

This project supports achievement of the Coastal Prairie Objective (Obj. 2) under Habitat Management Goal (Goal 4.2), and Waterfowl (Obj. 1) and Grassland and Secretive Marsh Birds (Obj. 3) Objectives under Wildlife Goal (Goal 4.3) as identified in Chapter 4, Management Direction.

Restoration of Salty Prairie and Coastal Prairie on Sargent-North

The acquisition of the McCormick/Williamson property north of the original Sargent Unit requires restoration of salty prairie and coastal prairie habitats. The Complex will actively restore these degraded prairies to native prairie through a variety of techniques using local plant and seed sources, and working with partner prairie restoration organizations and experts to re-create this vanishing habitat type. Techniques may include, but are not limited to re-seeding, sprigging, transplanting, spreading native prairie hay for seed and mulch, prescribed fire, and treatment of invasive species. In addition, small shallow water impoundments will be constructed by installing water control structures to impound freshwater for waterbirds and waterfowl. Mottled ducks and black rails will be the indicator species for prairie conditions. All work, including management actions will be coordinated with the NRCS office, which has a Conservation Easement on the property.

Erosion Control and Bank Stabilization to Protect Wetlands and Marshes

Several critical marshes, wetlands, riparian banks and islands on the Complex are currently threatened by eroding soil conditions. This erosion can lead to increased salinity and turbidity, loss of freshwater habitat, loss of nesting habitat for colonial waterbirds, and loss or degradation of submergent and emergent aquatic vegetation. Primary causes of erosion on the Complex are the GIWW and associated wakes from barges, and wind-driven waves. The Complex will employ a variety of proven techniques including geo-tubes, breakwater structures, terracing, weirs, gabions, reef domes, beneficial dredge use, and others to address specific cases of habitat loss due to erosion. We will work with partners in the conservation community to seek funding sources for priority projects.

This project supports achievement of the Wetlands Objective (Obj. 3) under the Habitat Management Goal (Goal 4.2), and the Waterfowl (Obj. 1) and Colonial Waterbird Colonies (Obj. 4) Objectives under the Wildlife Goal (Goal 4.3) as identified in Chapter 4, Management Direction.

Turkey Reintroduction in the Columbia Bottomlands

As the Austin's Woods Partnership continues to grow and its footprint expands, the Complex will explore opportunities to release transplanted wild turkeys into suitably sized and appropriately conserved habitats within our influence. The counties within our acquisition boundary are home to very few remnant populations of the eastern subspecies of wild turkey. We will reach out to TPWD game bird biologists and other conservation organizations, such as the National Wild Turkey Federation to tap into their knowledge and expertise regarding

habitat requirements, suitability, and source populations, ensuring that these efforts have the support and guidance needed to be successful.

This project supports achievement of the Bottomland Hardwood Forest Objective (Obj. 1) under the Habitat Management Goal (Goal 4.2), and the Forest Birds Objective (Obj. 2) under the Wildlife Goal (Goal 4.3) as identified in Chapter 4, Management Direction.

Development of Artificial Rookery Structures
Several important colonial waterbird rookeries exist on the Complex. As suitable habitat continues to be lost, these sites will become even more critical to nesting birds of the area. We will research, design, test, and implement artificial rookery structures to supplement these sites, allow for increased bird use, and replace deteriorating natural structures. Possible sites for this project include the Wolfweed Wetland complex, Cedar Lakes islands, and Dressing Point Island, and Otter Slough.

This project supports achievement of the Wetlands Objective (Obj. 3) under the Habitat Management Goal (Goal 4.2) and the Colonial Waterbird Colonies (Obj. 4) and Shorebirds Objectives (Obj. 5) under the Wildlife Goal (Goal 4.3) as identified in Chapter 4, Management Direction.

5.5.2.2 Visitor Services Projects

Monthly Interpretive Programs
Expand current interpretive activities to include monthly interpretive programs across the Complex. Staff, volunteers, and other partners will provide these programs to enhance opportunities for the public to experience the Mid-coast refuges. The primary goals are to increase visitation to the refuge and improve community support for the refuges.

This project supports achievement of the Visitation (Obj. 1) and Interpretation (Obj. 4) Objectives under the Recreation Goal (4.4) as identified in Chapter 4, Management Direction.

Develop Cultural Resource Interpretive Program
Existing public use facilities will interpret original Native Americans and the spread and development of Native Americans, pioneers, oil prospectors, and ranchers to the area. The purpose of these displays will be to show how people have shaped the natural environment in the past and how they continue to impact the environment today. Examples include: interpreting how the agriculture and cattle influenced development in Brazoria County or how Native Americans and settlers used the plants and animals to survive on the Gulf Coast.

This project supports achievement Cultural Resources Objective (Obj. 11) under the Recreation Goal (4.4) as identified in Chapter 4, Management Direction.

Expansion of Discovery Environmental Education Program
San Bernard NWR will expand the Discovery Environment Educational Program (DEEP) to include the school districts of Brazoria, West Columbia, Sweeny, Bay City, and Van Vleck.

There is a demand for more field trips to serve the southern portion of the county, but expansion of the program will require additional volunteers. The Complex will seek opportunities to partner with school districts, colleges, Friends, and Texas Master Naturalists to expand DEEP.

This project supports achievement of the Environmental Education Objective (Obj. 7) of the Recreation Goal (4.4) as identified in Chapter 4, Management Direction.

Otter Slough Kiosk and Trail

Quality public use facilities enhance visitor experiences and encourage visitor's to return to the refuges; building a connection between the visitor and nature. The current trails are located on the southern half of the refuge and provide a salty prairie and woodlot habitat experience. The current targeted area includes the Otter Slough unit of Brazoria NWR, which is located on the northern boundary of the refuge leading visitors through a native coastal prairie ecosystem. Management actions will include construction and maintenance of a kiosk and hiking trail near the Brazoria NWR field office to provide a quality outdoor experience to visitors during office hours.

This project supports achievement of the Public Use Facilities Objective (Obj. 1) under Facilities (Goal 4.5), and the Visitation (Obj. 1), Wildlife Observation (Obj. 2), Photography (Obj. 3), and Interpretation (Obj. 4) Objectives under Recreation (Goal 4.4) as identified in Chapter 4, Management Direction.

Expansion of Interpretive Materials

The Complex will increase interpretation through the development of an interpretive guide for the San Bernard Auto Tour Loop, Spanish translation of interpretive brochures and development of portable interpretive displays. Portable interpretive displays will suitable for use at outreach events as well as a static display. Translation of the general brochures and Big Slough Auto Tour into Spanish will enable the refuge to reach a wider audience.

This project supports achievement of the Visitation (Obj. 1) and Interpretation (Obj. 4) and Outreach (Obj. 8) Objectives under the Recreation Goal (4.4) as identified in Chapter 4, Management Direction.

Accessible Hunting Blind at Sargent Unit

The Complex currently offers no accessible waterfowl hunting locations on any of the refuges. The Sargent Unit of San Bernard NWR offers our most feasible opportunity to offer a quality waterfowl hunting experience for our mobility challenged users. The unit has all-weather access roads, fresh water and is currently open to limited permit hunting for ducks and geese. Working with possible partners in the sporting and conservation communities, we will design and construct an accessible blind and associated access on a managed wetland near the Pentagon Marsh. Construction of the managed wetland through installation of water control structures and limited earth-moving will also be necessary.

This project supports achievement of the Wetlands Objective (Obj. 3) under the Habitat Management Goal (Goal 4.2), the Hunting (Obj. 5) and Outreach Objectives (Obj. 8) under

the Recreation Goal (Goal 4.4), and the Public Use Facilities Objective (Obj. 1) under the Facilities Goal (Goal 4.5) as identified in Chapter 4, Management Direction.

Provide Educational Youth Fishing Event
In an effort to promote the Complex, fishing and outdoor recreation among area youth, we will develop an event highlighting beginning fishing tactics, equipment, and fisheries conservation. Potential freshwater venues could include Scoby Lake on the Hudson Woods Unit, and Eagle Nest Lake. By working with local conservation partners, State agencies, and sporting organizations we could deliver an opportunity for local and area youth to learn about and enjoy the sport of fishing.

This project supports the achievement of the Fishing (Obj. 6) und Environmental Education (Obj. 7), and Outreach Objectives (Obj. 8) under the Recreation Goal (Goal 4.1.4) as identified in Chapter 4, Management Direction.

5.5.2.3 Facilities/Infrastructure Management Projects

Shop and Equipment Storage Building
Throughout the refuges' history, facilities have slowly grown, and today, two field headquarters—including offices, maintenance, and storage facilities—and one Complex office provide the primary infrastructure supporting administrative, maintenance, biological, and management programs. The Brazoria NWR Field Office completed construction in January 2011 and was fully functional by the middle of February 2011, which has enabled the refuge to get out of GSA-leased space. Refuge administrative, maintenance, and storage facilities are critical for protecting government-owned equipment and staff essential to completing the refuges' mission. The proposed building will be located next to the Brazoria NWR Field Office. Management actions include construction and maintenance of a working shop and storage facility to provide support for all refuge programs.

This project supports achievement of the Administration, Maintenance, and Storage Facilities Objective (Obj. 2) under Facilities (Goal 4.1.5) as identified in Chapter 4, Management Direction.

Replacement of San Bernard NWR Field Office
The current field office at San Bernard NWR has served the Complex well, but it is in need of replacement. The mid-1980s concrete block design is inefficient to heat and cool, and the design is not visitor friendly. In addition, current and predicted staffing levels have outgrown our current office space. We seek to combine office space with the fire staff, also at San Bernard NWR, into one facility with more modern features and design elements that will create a more user and visitor friendly space that is energy efficient and accommodates anticipated staffing loads.

This project supports the achievement of the Public Use Facilities (Obj. 1) and Administrative, Maintenance, and Storage Facilities Objectives (Obj. 2) under the Facilities Goal (Goal 4.1.5) as identified in Chapter 4, Management Direction.

Replacement of Quonset Hut with Hurricane Evacuation Staging Area on San Bernard NWR

The Complex currently owns a Quonset hut building located on an inlands tract used for staging emergency response equipment (boats, heavy equipment, marsh buggies, generators, etc.) during hurricane evacuations. It is our most protected storage facility, but is in dire need of replacement. We plan to erect a new facility on refuge property that is further inland and closer to a state highway for better access. The current building resides along a tree-lined county road that could be difficult to access following a large storm event. The Complex needs a facility that is accessible and structurally sound located far enough inland to be safe from major storms, but close enough for quick response when needed to secure property, provide access, and save lives following catastrophic events.

This project supports the achievement of the Law Enforcement Objective (Obj. 9) under the Recreation Goal (Goal 4.1.4), and the Administrative, Maintenance, and Storage Facilities Objective (Obj. 2) under the Facilities Goal (Goal 4.1.5) as identified in Chapter 4, Management Direction.

5.6 Partnerships

Because the refuges exists within a dynamic ecosystem and many of its resources are of national and international importance, members of the public, organizations, and other government agencies have interests in the refuges and the work the Service does. Successful implementation of many refuge programs requires active community participation, support, and assistance. Partnerships are among the best ways for the refuge to accomplish its work and fulfill its mission, and it seeks opportunities with others to do that work, including but not limited to the following stakeholders:

- Texas Parks and Wildlife Department
- Texas General Land Office
- U.S. Army Corp of Engineers
- Brazoria County Parks
- Natural Resource Conservation Service
- Houston Audubon
- National Fish and Wildlife Foundation
- Gulf Coast Bird Observatory
- Trust for Public Land
- The Conservation Fund
- Texas Master Naturalist
- Friends of Brazoria Wildlife Refuges
- Texas RICE

5.6.1 Existing Partnerships

5.6.1.1 Prairie Restoration and Wetland Improvement

Since 2008, the Complex has been working with Texas RICE on restoring prairie habitats and improving wetland management capability. Texas RICE has secured grant funding for herbicide application on invasive species, installation of new and replacement of deteriorated water control structures, and construction of levees to hold water on prairie habitats. The

Complex treated over 6,000 acres of Chinese tallow with back-to-back herbicide applications since 2008. In addition, management improved capabilities on 450 acres of existing wetlands and captured water on 540 acres of coastal prairie.

This project supports achievement of the Ecoregional Goal (4.1), Coastal Prairie Objective (Obj. 2) under Habitat Management (Goal 4.2), and the Waterfowl (Obj. 1) and Grassland and Secretive Marsh Birds (Obj. 3) Objectives under Wildlife (Goal 4.3) as identified in Chapter 4, Management Direction.

5.6.1.2 Austin Woods Conservation Project: A Partnership Project

The Austin Woods Conservation Project involves numerous partners who are working to conserve forested habitat in the Columbia Bottomlands. Primary Partners include National Fish and Wildlife Foundation, Natural Resource Conservation Service, TPWD, The Conservation Fund, Trust for Public Land, Houston Audubon, Gulf Coast Bird Observatory, and The Nature Conservancy. By the end of 2011, the refuge will conserve an estimated 35,000 acres of bottomland forest and adjacent coastal prairie.

This project supports achievement of Objective 2 Conservation of Columbia Bottomlands Ecosystem under the Ecoregional (Goal 4.1), Bottomland Hardwood Forest Objective (Obj. 1) under Habitat Management (Goal 4.2) and the Forest Birds Objective (Obj. 2) under the Wildlife (Goal 4.3) as identified in Chapter 4, Management Direction.

5.6.1.3 Kemp's Ridley Sea Turtle Recovery

The San Bernard NWR is a partner in the Kemp's ridley sea turtle recovery program. Refuge staff are the listed contacts for the upper Texas mid-coast from the Brazos River to the Colorado River. We respond to all stranding reports within the zone as well as assist adjacent zones when requested. San Bernard NWR takes all live sea turtle strandings to the National Oceanic and Atmospheric Agency facilities in Galveston. San Bernard NWR organizes and trains staff and volunteers to conduct nesting sea-turtle patrols on zone beaches. Refuge staff excavate all nests and transport them to National Park Service facilities on Padre Island.

In coordination with the National Park Service and National Oceanic and Atmospheric Association, this project supports achievement of the Ecoregional Goal (4.1) and the Reptile (Obj. 6) under the Wildlife Goal (4.3).

5.6.1.4 Texas Master Naturalist (Cradle of Texas Chapter)

The Cradle of Texas Chapter of the Texas Master Naturalists (TMN) is a vital component of the DEEP program, providing most of the volunteers needed to conduct hands-on environmental education activities on the refuges. The TMN volunteers come to us well-trained and highly motivated, and both adults and children are inspired by the programs developed and presented by these docents. Texas Master Naturalists provide an estimated 1,200 volunteer hours supporting DEEP annually.

Maintaining partnership with the Cradle of Texas Chapter of the Texas Master Naturalist supports achievement of the Environmental Education (Obj. 7) and Partnerships (Obj. 10) under the Recreation Goal (4.4).

5.6.1.5 Friends of Brazoria Wildlife Refuges

The Friends of Brazoria Wildlife Refuges started in 1992. The organization supports the Complex through outreach, environmental education, development of public use opportunities, and habitat restoration or improvement. Outreach, including the annual Migration Celebration and taking the Birds of Prey program to local schools, is the largest project. However, they have recently assisted with the development of public use opportunities in the Dow Woods Unit of San Bernard NWR and habitat restoration with Texas RICE.

Maintaining Friends Programs supports achievement of the Environmental Education (Obj. 7), Outreach (Obj. 8), and Partnerships (Obj. 10) under the Recreation Goal (4.4)

5.6.1.6 Wildlife Research Partnerships

The Complex partners with educational institutions on multiple research projects, which benefits the management of the refuges. Recent partnerships include the population and habitat use by diamond-back terrapins, phorid fly dispersal for the control of red-imported fire ants, carbon gas storage in the soils of bottomland forests, carbon storage in saltmarsh habitats, stable isotope analysis on black and yellow rail feathers, and benthic invertebrate sampling. The Complex will continue to partner with institutions where populations are not adversely impacted and the information gathered would benefit management decisions in the future.

This project supports achievement of the Ecoregional (4.1), Habitat Management (4.2), and Wildlife (4.3) Goals as identified in Chapter 4, Management Direction.

5.6.1.7 Gulf Coast Bird Observatory

The Complex regularly partners with the Gulf Coast Bird Observatory (GCBO) to conduct research and bird censuses both on and off refuges, and assist in outreach opportunities. Recently, Special Use Permits have been issued for conducting Rasberry crazy ant research on one of the bottomland units, capture and banding loggerhead shrikes, shorebird surveys, and capture and banding oyster catchers.

This partnership and the projects support achievement of the Ecoregional (4.1) Goal and Bird Objectives (1, 2, 3, 4 & 5) under the Wildlife (4.3) Goal as identified in Chapter 4, Management Direction.

5.6.1.8 Forest Bird Study Group

For the past 10 years, the Forest Bird Study Group, a group of experienced bird banders and volunteers with ties to the local birding club, Friends Group, and GCBO, have partnered with

the Complex conducting monthly winter songbird banding at the Big Pond Unit. The project, initiated by United States Geological Surveys, has carried on for 10 years, collecting data on wintering forest songbirds. In addition, the group assists in the annual Migration Celebration by catching and banding songbirds during the two-day event.

This partnership project supports achievement of the Ecoregional (4.1) Goal, the Forest Bird Objective (2) under the Wildlife (4.3) Goal, and the Outreach (Obj. 8) under the Public Use Goal (4.4) as identified in Chapter 4, Management Direction.

5.7 Memorandums of Understanding and Other Agreements

5.7.1 Brazoria County

A Memorandum of Agreement exists between Brazoria County and the Complex. In accordance with the agreement, the Service may assist Brazoria County with Wildland Fire Response and during all-risk (Hurricane) situations. Only the Counties Emergency Management Coordinator can make requests for assistance from the refuges.

5.7.2 Local Landowners

The Complex has Memorandums of Agreement with four adjacent landowners for management purposes. The agreements enable the Service the ability to burn across private lands during regularly scheduled prescribed burns. These agreements are essential for in-holdings and increase the opportunity to provide quality wildlife habitat on adjacent lands.

5.8 Monitoring and Evaluation

Monitoring helps the Complex track the progress of implementing the CCP. The results of monitoring show how the refuges achieve objectives and measures progress toward accomplishing goals. Table 5-5 displays proposed inventory and monitoring projects for fish, wildlife, and their habitats. Table 5-6 displays proposed monitoring indicators for public use. These proposed monitoring plans will be refined as various step-down management plans are drafted or revised.

5.9 Plan Amendment and Revision

Periodic review and change of this CCP will be necessary. As knowledge of refuge resources, user groups, and use evolves, the Complex may identify changes in management. Fish and wildlife populations, user groups, adjacent land users, and other management considerations change with time—often in unforeseen ways. The Complex may encounter challenges in trying to implement some portions of the CCP. Plan revision is a necessary part of the adaptive management approach used by the Service. This means that the Complex can adjust objectives and strategies identified to reach goals.

Service policy calls for an annual review of the CCP and revision when significant events or new information necessitate change in order to achieve the refuge purposes, vision, and goals

(602 FW 3). Refuge staff will informally review this CCP while preparing annual work plans, and may review it during routine inspections or programmatic evaluations. Results of the reviews may indicate a need to modify the CCP. The monitoring of objectives is an integral part of the CCP, and the Complex may modify management activities if they do not achieve desired results. If minor changes are required, the project leader will determine the level of public involvement and associated NEPA documentation that will be prepared. The Complex will formally revise this CCP at least every 15 years.

Table 5-5. Biological Inventorying and Monitoring Plan

Attwater's Prairie Chicken Habitat Pre-Assessment	Five years following the CCP's approval, complete a preliminary assessment of potential Attwater's Prairie Chicken Habitat	What is the quality of potential Attwater's prairie chicken habitat? What is needed to improve habitat? What other species of concern occupy it?	Vegetation density and diversity and invertebrate size characterization; winter and breeding grassland bird surveys; small mammal surveys	Records from APCNWR	Repeat on 5-year interval	Possible changes in habitat management and restoration techniques
Yellow Rail Habitat Assessment	Within three years following the CCP's approval, complete an assessment on wintering habitat for yellow rails	What are the key habitat variables affecting wintering yellow rail distribution?	Vegetation density and diversity and invertebrate size characterization in relation to burn unit age	Burn Unit Age	Measure vegetation, physical attributes and collect invertebrates at sampling points	Possible change in management actions including burn cycles

Project						
Black Rail Habitat Assessment	Within three years following the CCP's approval, complete an assessment on wintering and breeding habitat for black rails	What are the key habitat variables affecting black rail distribution during the breeding and non-breeding seasons?	Vegetation density and diversity and invertebrate size characterization in relation to burn unit age	Burn Unit Age	Measure vegetation, physical attributes, and collect invertebrates at sampling points	Possible change in management actions including burn cycles
Reptile and Amphibian Survey	Within five years following the CCP's approval, complete an inventory of reptiles and amphibians across all major habitat types on the Complex	What species are present? Are they associated with different management treatments?	Species diversity and density relative to burn unit age, moist soil unit treatment, forest stand age	Burn unit age; msu treatment; forest stand age	Repeat on 10 year interval	Possible change in management actions

Project						
Small Mammal Survey	Within five years following the CCP's approval, complete an inventory of small mammals across all major habitat types on the Complex	What species are present? Are they associated with different management treatments?	Species diversity and density relative to burn unit age, moist soil unit treatment, forest stand age	Burn unit age; msu treatment; forest stand age	Repeat on 10 year interval	Possible change in management actions
Secretive Marsh Bird Survey	Within three years following the CCP's approval, complete an inventory of breeding and wintering secretive marsh birds across fresh and salt marsh habitats	What species are present? Are they associated with different management treatments?	Species diversity and density relative to burn unit age, moist soil unit treatment	Burn unit age; msu treatment	Repeat on 3 year interval	Possible change in management actions
Bobwhite quail surveys across coastal prairie habitats	Within two years, initiate a bobwhite quail survey across coastal prairie habitats	Evaluate impact prairie restoration projects a having on the population of quail	Point Call Counts on prairies across the Complex.	Measure, year post burn and shrub component along with calls heard	Repeat annually for five years	Possible change in management actions including burn cycles or grazing

Project						
Raptor nest monitoring for white-tailed hawks and other hawks.	Within three years, initiate a raptor nest most monitoring program on Refuge lands	Evaluate site selection, population levels, and nest success of raptors	Maintain an inventory of raptor nests identifying GPS location	Identify nest tree and surrounding vegetation. Identify management measures	Ongoing process, adding and deleting nest sites from database	Possible change in management actions
Alligator Survey	Within two years, initiate an alligator survey	Evaluate size and number of alligators across refuges	Population numbers	Survey transect lines, either aerial or by vehicle to estimate population.	Repeat every second year.	Identify population status and the need to reduce populations on refuges.
River Otter Survey	Within two years initiate a monitoring protocol to evaluate populations of river otters on the Complex	Evaluate population sustainability of river otters on the Complex	Population numbers	Survey transect lines, either aerial or by vehicle to estimate population.	Repeat annually.	Possible change in management actions to maintain populations.

Project						
White-tail deer Survey	Within 5 years initiate a monitoring protocol to evaluate populations of white-tailed deer on specific bottomland units	Evaluate population stability and growth across the larger bottomland units	Population estimates	Survey transect lines through bottomland habitats.	Repeat biannually	Possible change in management actions, including the development of a hunting program.
Bat inventory	Within 5 years, conduct an inventory on species of bats using refuges	Evaluate bat use of refuges	Survey a variety of areas using frequency recording device	Survey a variety of habitats to evaluate bat use.	Conduct for two years. Repeat every five years.	Possible change in management actions to maintain populations.
Complex Prescribed Burn Monitoring Plan	Within two months following the CCP's approval, implement the prescribed burn monitoring protocol	Evaluate impact of burns on invasive species, aggressive species, and diversity of prairie species	Fire intensity, weather, and habitat conditions; Vegetation response to burning	Historical records	Ongoing process to evaluate impact of fire program.	Possible change in management actions including burn cycles.

Project						
Complex Non-native plant species inventory and monitoring	Within two years of the CCP's approval, compile list of non-native plant species on the complex.	How many species of non-native plants are residing within the complex boundaries	Population densities and avenues of infestation	U.S. Park Service I&M plan. Historical records.	Repeat on 2-year interval	Change in monitoring protocols
Complex Invasive Plant Control	Within six months following the CCP's approval, implement invasive plant control protocols.	What is the efficacy success rate of herbicide, mechanical and prescribe burn treatments	Response to treatments	Historical record, application rate guidelines	Ongoing process to evaluate impact on invasive plants	Reevaluate application rates. Reevaluate time and date of application and weather conditions
Compplex Vegetation Community Mapping of Bottomland Hardwood Units	Within 5 years of the CCP's approval, identify and map all dominant vegetation communities in the bottomland hardwood forests of all units	How many dominate vegetation communities reside in the bottomland hardwood units of the Complex	Recognition of vegetation communities with ground and map observations.	Historical records. NVCS vegetation classification system	Ongoing process as bottomland hardwood property is acquired	Increase monitoring personnel. Provide for training to recognize plant species.

Project						
Complex Prairie Restoration	Within one year of CCP's approval, map timeline of Chinese tallow tree eradication on the Brazoria NWR	How many acres of Chinese tallow trees have been removed during the timeline of 2009–2011	Landsat photographs depicting tell-tale absence of foliage following mortality of Chinese tallow trees	Landsat photographs from period of 2009–2011	Ongoing process as tracts within the Brazoria NWR are treated for Chinese tallow trees	Increase monitoring of herbicide efficacy at other time and dates herbicide is applied
Fire Atlas	Within one year of CCP's approval, produce an atlas depicting individual burn coverage of Rx burns	How many acres of land were actually burned for all documented prescribed burn and wildfires over the past ten years. Using Landsat photography, determines fire intensity across unit	Landsat photographs depicting pre- and post-burn condition of burn units	Data analysis of Landsat photographs	Ongoing process to evaluate all prescribed burn operations and tropical events	Verify with ground truth. Review Landsat analysis process

Table 5-6. Visitor Services Inventorying and Monitoring Plan

Public Use Opportunities	Within five years of the CCP's approval, initiate a program to assess the numbers and types of activities visitors partake in while visiting the refuges	What is annual visitation across the Complex and are facilities meeting the needs of the public?	Total visitation and survey of attitudes toward public use opportunities across the Complex	Contact a sample of visitors at all Public Use Areas to assess their use of facilities to enjoy nature	Repeat on every five years	Develop additional public use opportunities (primarily in bottomlands) or close opportunities not being used to save money.
Visitor Use Counters	Accurately evaluate public use numbers	How many visitors use trail and roads for visiting the refuges?	Total visitation and individual users	Complete installation of trail and vehicle recorders	Ongoing	Develop additional public use opportunities (primarily in bottomlands) or close opportunities not being used to save money.

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