Appendix B. Environmental Assessment and Finding of No Significant Impact (FONSI)

1.0 PURPOSE OF AND NEED FOR PROPOSED ACTION ALTERNATIVE

1.1 Introduction

The United States Fish and Wildlife Service (Service) proposes to implement a Comprehensive Conservation Plan (CCP) for the Attwater Prairie Chicken National Wildlife Refuge (APCNWR, Refuge), which would guide management on the Refuge for the next 15 years. This Environmental Assessment (EA) is being prepared to evaluate the effects associated with this proposal and complies with the National Environmental Policy Act (NEPA) of 1969 in accordance with Council on Environmental Quality regulations (40 CFR 1500-1509) and Department of the Interior (516 DM 8) and Service (550 FW 3) policies (see Section 1.7 of this appendix for a list of additional regulations with which this EA complies). NEPA requires examination of the effects of proposed actions on the human environment, which comprehensively includes the natural, physical, economic, and social environments. In the following chapters of this appendix, we describe three alternatives for future Refuge management, the environmental consequences of each alternative, and our preferred management direction. Each alternative was designed to contain a reasonable mix of fish and wildlife habitat prescriptions and wildlife-dependent recreational opportunities consistent with the Refuge System Improvement Act and specific Refuge purposes.

The environmental consequences of each alternative are described and form the basis for selection of the proposed action. This Environmental Assessment was designed to cover the environmental consequences for most future management actions and current facilities on the Attwater Prairie Chicken NWR. However, some future actions, such as the construction of major facilities, will require further environmental documentation.

1.2 Location

The APCNWR is located in Colorado and Austin counties, Texas. The Refuge is approximately 60 miles west of Houston, Texas, the nation's fourth most populated city. The Refuge lies about 75 miles inland from the coast (refer to Map 1-1: Context Map in the CCP).

1.3 Background

Once numbering near one million birds, the decline of the Attwater's prairie-chicken population coincided with the period of rapid settlement of prairies and plains and the conversion to agricultural use during the late 1800s, early 1900s (Evans and Probasco 1977). The state offered protection as early as 1897 by shortening the length of the hunting season to avoid the breeding season, and hunting seasons for the bird were further shortened and then eventually closed in 1937. A dramatic decline of the Attwater's prairie-chicken population in the 1960s, combined with increasing national interest in the listing and protection of endangered species, brought about the focused attention of many conservationists and conservation agencies.

Early acquisitions in 1965 and 1967 served as the first core sanctuary for the Attwater Prairie Chicken National Wildlife Refuge, but the Refuge was not officially established until July 1, 1972, when the Service purchased 687 acres from the Verhuel Estate at the site of the present Refuge headquarters. Several important tracts were acquired in the 1970s, and by January 1980, a core area of 7,984 acres had been acquired for the Refuge. The Attwater Prairie Chicken NWR is a permanent "non development" fee title Refuge located within the Gulf Coast Ecosystem of Austin and Colorado counties, Texas. The Attwater's Prairie-Chicken Recovery Plan (USWFS 1993) included a recovery action that recommended protection of an additional 20,000 acres of native coastal prairie grasslands as one of its primary actions needed to meet the recovery objective and resultant delisting of the APC. The Service then published a Final Land Protection Compliance Document and Conceptual Management Plan in September 1998. This

document proposed to acquire up to an additional 22,000 acres in fee and conservation easement. The acquisition of specific lands within the approved acquisition area from willing sellers and donors would establish or reconnect corridors between remnants of coastal prairie in Austin County and the main Refuge tract in Colorado County in hopes of sustaining a healthy APC population. Approximately 2,500 acres of coastal prairie habitat have since been purchased in Austin and Colorado counties, bringing the total Refuge management area to approximately 10,541 acres. The Refuge is specifically managed to maintain or improve native coastal prairie communities for APC, as well as for the benefit of other important fish and wildlife resources. In spring 2011, approximately 110 free-ranging Attwater prairie-chickens occurred in three locations including the Attwater Prairie Chicken NWR.

1.4 Purpose

The purpose of the proposed action is to specify a management direction for APCNWR over the next 15 years. The purpose of the EA is to select a management direction for the Refuge that best achieves the Refuge's purposes, vision and goals; contributes to the mission of the National Wildlife Refuge System (NWRS, Refuge System); is consistent with principles of sound fish and wildlife management; and addresses relevant mandates and major issues identified during scoping. The proposed management direction is described in detail through a set of goals, objectives, and strategies in the CCP. The purpose of this EA is to assess the impacts of the proposed management actions.

1.5 Need for Action

The action is needed because a long-term management plan does not currently exist for the Refuge. Management is now guided by various general policies and the Attwater's Prairie-Chicken Recovery Plan (USFWS 2010). The action is also needed to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a CCP for all national wildlife refuges in the United States.

1.6 Decision to be Made

The Regional Director for the Southwest Region (Region 2 of the U.S. Fish and Wildlife Service) will make two decisions based on this EA: (1) select which alternative the Refuge will implement, and (2) determine if the selected alternative is a major Federal action significantly affecting the quality of the human environment, thus requiring preparation of an Environmental Impact Statement (EIS), or whether implementation of the proposed action can proceed. The Refuge's proposed action is Alternative B. Assuming no significant impact is found, the final CCP will include a Finding of No Significant Impact (FONSI), a statement explaining why the selected alternative will not have a significant effect on the quality of the human environment. This determination takes into consideration the Service and Refuge System mission, the purpose(s) for which the Refuge was established, and other legal mandates. Once the FONSI is signed, the CCP will be implemented, monitored annually, and revised when necessary.

1.7 Regulatory Compliance

National wildlife refuges are guided by the mission and goals of the Refuge System, the purposes of an individual refuge, Service policy, and laws and international treaties. Relevant guidance includes the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, Refuge Recreation Act of 1962, and selected portions of the Code of Federal Regulations and the U.S. Fish and Wildlife Service Manual.

The CCP's overriding consideration is to carry out the purpose for which the Refuge was established. Refuge purposes are stated in the laws that established the Refuge and provided the funds for acquisition. Fish and wildlife management is the first priority in Refuge management, and the Service allows and

encourages public use (wildlife-dependent recreation) as long as it is compatible with, or does not detract from, Refuge purposes.

The EA was prepared by the Service and represents compliance with applicable Federal statutes, regulations, Executive orders, and other compliance documents. Appendix A of the CCP contains a list of the key laws, orders and regulations that provide a framework for the proposed action.

Further, this EA reflects compliance with applicable State of Texas and local regulations, statutes, policies, and standards for conserving the environment and environmental resources such as water and air quality, endangered plants and animals, and cultural resources. An Endangered Species Act (ESA) Section 7 Consultation will be completed for inclusion in the CCP.

Comprehensive Conservation Plans include a review of the appropriateness and compatibility of existing refuge uses and of any planned future public uses. If a use is determined to be an 'Appropriate Refuge Use' by a refuge manager, it is then taken through the 'Compatibility Determination' process. Compatibility determinations have been completed for activities and are provided in Appendix D of the CCP. For more information on Compatibility Determinations and a list included in this CCP, see Chapter 5, Section 5.2.2 of the CCP.

1.8 Scoping and Public Involvement - Issues Identified

Formal scoping began with publication of a Notice of Intent to prepare a Comprehensive Conservation Plan and Environmental Assessment in the *Federal Register* on November 5, 2008. In December 2008, a letter was sent to individuals at Texas Parks and Wildlife Department (TPWD) formally inviting them to participate in the development of the CCP. We received input from TPWD in January 2009. Information sheets were sent to the public by mail, and news releases were sent to four area newspapers and published in two (Colorado County Citizen and Eagle Lake Headlight) to announce the public scoping period. In addition, KULM Radio in Columbus broadcasted an announcement of the public scoping period. The Service used public open house meetings to gather input for the development of the CCP for Attwater Prairie Chicken NWR. Three meetings were held: one each in Sealy, Texas, and Eagle Lake, Texas; and one at the Refuge Headquarters from February 19–21, 2009. Despite advertising for these open houses, turnout was poor. One individual attended the Sealy open house, but no individuals came to the Eagle Lake or APCNWR open houses. A few members of the public sent written comments to the Refuge prior to the open house meetings.

In addition to the scoping activities, two members of the Attwater Prairie Chicken NWR staff participated in an ecoregion-wide coordination meeting with different agencies and organizations on December 9, 2009, to gain a better understanding of what issues are occurring within the Gulf Coast Prairies and Marshes Ecoregion.

The feedback received throughout the public involvement period identified concerns from a variety of stakeholders. The issues and concerns provided the basis for developing the Refuge's management direction and played a role in determining desired conditions for the Refuge. The issues for the Refuge to address are divided into four categories: habitat management, wildlife management, public use, and infrastructure. All the following issues are Refuge management concerns unless otherwise specified.

<u>Habitat Management</u>

Prairie Restoration - A portion of the Refuge (approximately 35 percent) is former cropland in need of restoration to native coastal prairie. Continued efforts to enhance the quality of habitat for APC are

needed. Much of the Refuge was a working livestock ranch and farm prior to its establishment, and there remains a significant amount of infrastructure that interferes with the prairie's hydrology, including dirt and gravel roads, fences, oil and gas infrastructure, levees, ditches, and water control structures.

The Refuge currently manages two man-made impoundments near the west side of the auto tour route. Constructed in the early 1980s by Refuge staff, these impoundments were designed to attract waterfowl to meet Service waterfowl management objectives. While popular with wildlife-viewing enthusiasts, these impoundments (artificial wetlands) were created at a time when APC numbers were significantly higher than they are today and are located in areas that once provided prairie habitat for the endangered APC. The presence of these impoundments also introduces the potential for the spread of disease from migrating waterfowl. APCs and northern bobwhite quail sampled during the late 1990s revealed that 14.8 percent and 5.7 percent, respectively, were serologically positive for *Pateurella multocida* (causative agent for avian cholera) antibodies (Peterson et al. 1998, Purvis et al. 1998). Removal of this infrastructure would compliment other APC recovery efforts to achieve restoration of native prairie and natural hydrology on the Refuge and would decrease the potential for the spread of disease such as avian cholera resulting from waterfowl concentrations on the Refuge in these artificial impoundments.

The Refuge has had problems with obtaining a consistent supply of locally adapted native prairie seed. Production and access to native seed harvested from the Refuge is highly dependent on weather conditions. Because of this, prairie restoration is a slow, long-term commitment for the Refuge. The Refuge needs to explore other options for consistently obtaining native prairie seed to meet restoration goals.

Prescribed fire and grazing are management tools used to restore and maintain native prairie. Properly managed grazing and prescribed fire serve to maintain and encourage native grasses and forbs and to cycle nutrients through the ecosystem. There are aspects of fire and grazing that need to be further analyzed such as the effects of fire on prairie insect populations. In addition, fencing needs should be evaluated to determine the optimal amounts of fencing needed to effectively manage the grazing program.

Land Acquisition - Habitat abundance and quality for obligate grassland species have been severely reduced throughout the ecosystem. With native prairies and grassland habitat being amongst the most threatened in the State of Texas and North America, there is a need to increase acreage to provide habitat for APC. The effects of urban encroachment (ranchettes) and fragmentation of the coastal prairie habitat have become much more noticeable adjacent to the Refuge during the last 8 years, making it critical to initiate funding once again for the land acquisition program. Efforts to connect the two separate Refuge blocks through continued acquisition need to be made.

Invasive Species (Flora) - Several invasive species are common on the Refuge and are reducing the quality and potential of native prairie. It is recognized that invasive plant species out-compete native plant species. The public identified the need for more brush control through fire and other methods. Historically, encroachment of woody species onto grasslands was minimized by periodic fires characteristic of tallgrass prairie ecosystems. However, fire suppression, overgrazing, and introduction of exotic woody species have resulted in dramatic increases in the woody species distribution within the Gulf Prairies. The presence of two man-made impoundments on the Refuge is problematic because the structures harbor invasive species, such as deep-rooted sedge and Macartney rose, which flourish in wet environments.

Climate Change - As habitats change, the wildlife species that utilize those habitats will also change. Although the Refuge can do little to resolve this issue, it can realize that such change is occurring,

document these changes through data collection, and adapt management to reflect and/or address changes in hydrology and plant communities. Water, or lack of water, is expected to become a major environmental crisis throughout the State in the near future if conservation measures are not taken seriously. Combined with climate change, this issue has the potential to affect many Refuge management activities such as grazing, food plot management, and fire management. Although climate change and other factors have the potential to alter the distribution of habitat types in this area, the effects of this change on Refuge resources, including wildlife species, are still unknown.

Wildlife Management

Prairie-chicken Recovery - As stated in the APC Recovery Plan, threats affecting the recovery of APC throughout its historic range include extremely small populations of birds, habitat, and population fragmentation resulting in genetic isolation and diseases and parasites in both the wild and captive settings. The inability of captive breeding facilities to produce large numbers of captive-reared birds to supplement existing populations and re-establish extirpated populations and poor brood survival in wild populations are also problematic. Historically throughout the region, challenges facing wild APC populations include predation, red imported fire ants (RIFA), accidents (e.g., flying into fences and wires), flooding, incompatible grazing, and altered fire regimes (USFWS 2010). Research is needed to gain a greater understanding of the threats and solutions to address causes of APC decline (USFWS 2010). Best management practices need to be continued and enhanced to assist in the recovery of APC and management of predatory wildlife to minimize impacts to APC is also desired. Refuge personnel are concerned with the potential of disease spread (e.g., avian cholera) from high concentrations of waterfowl on the Refuge to Attwater's prairie-chicken populations (USFWS 2010).

Rare and Protected Species - To recover APC, some management activities may have a negative impact on other rare and protected species. Both the public and State have concerns with this issue. The public has expressed concern about sustainable populations of APC and, if recovery efforts are not successful, the Refuge should shift emphasis to other grassland species. The State expressed concerns about predator control methods and management activities that may affect other migratory birds.

***Invasive Species Control (Fauna*) -** Invasive species such as feral hog, nutria, and red imported fire ants have negative effects on habitat and species. Feral hogs currently move primarily along brush corridors not used by APC but could pose a threat to nesting APC if hogs expand into prairie habitat as they have in other portions of the APC's range. In addition, areas disturbed by feral hogs become prone to the establishment of invasive plant species. Nutria are mostly found in the Refuge's artificial water impoundments and burrow through dikes, creating serious safety issues. Red imported fire ants throughout the southeastern United States have affected numerous bird species, such as Attwater's prairie-chicken, Northern bobwhite quail, and loggerhead shrike (USFWS 2010, Allen et. al 2004).

Coordination with Partners - Coordination with more than two dozen partners is critical in carrying out objectives for APC recovery. Often partners are vying or competing for the same grants and funding opportunities without realizing it. Effective coordination and communication is essential to achieving recovery goals.

Visitor Services

Public Use Opportunities - The Refuge provides public use opportunities that are appropriate and consistent with other national wildlife refuges of the same size and staffing levels. Because of the highly endangered status of the Attwater's prairie-chicken, most of the focus on the Refuge is directed toward habitat improvement and recovery actions. Participants in the public scoping process had an interest in

increasing public use opportunities to include weekend hours at the Visitor Contact Station, increased educational programs for local schools, and expanding the auto tour route to include the Horseshoe Lake area. Relocating the Refuge's auto tour route is necessary to address the removal of two man-made impoundments and to provide visitors with more opportunities for appreciating and understanding the coastal prairie ecosystem that makes up the majority of Refuge habitat.

Facilities

Quality and Safety of Refuge Roadways - The condition of roads used by Refuge staff and visitors vary but, generally, are in fair to poor condition. The first mile of the Refuge entrance road is a poorly maintained asphalt county road that leads to the Refuge auto tour route. An existing power line along the first half mile of the entrance road has recently fallen into the roadway, blocking visitor and staff access to the Refuge. All roads are in need of improvement. During inclement weather, the condition of the gravel auto tour route is poor, and vehicles sometimes lose traction around curves and create ruts in the road. For this reason, the auto tour route is often closed during inclement weather. One portion of the auto tour route can create a potential safety concern if vehicles try to pass outside designated pullouts, due to the narrow nature of the levee.

Poorly maintained entrance road. CREDIT: USFWS

Development of Administrative Complex - Permanent and professional headquarters, Visitor Contact Station, and biology lab are needed. The area being utilized for lab facilities was not designed for that purpose. This small facility does not have adequate working space to accomplish Refuge activities. The current administrative complex consists of three separate portable buildings connected by a temporary walkway. The parking lot is inadequate and not level.

Oil and Gas Operations - Although these issues are rare, occasional spills and worn or abandoned equipment must be cleaned up and removed. Some wildlife disturbance does occur during maintenance operations and regular site visits, but it is infrequent and limited in scope.

2.0 ALTERNATIVES

2.1 Formulation of Alternatives

Alternatives are different approaches or combinations of management actions designed to achieve a refuge's purposes and vision, the goals identified in the CCP, the goals of the Refuge System, and the mission of the Service. Based on the issues, concerns, and opportunities heard during the scoping process, the Planning Team developed three alternative management scenarios that could be used at Attwater Prairie Chicken NWR.

Three alternatives were considered in this EA. Three additional management actions were considered but eliminated from detailed analysis (see Section 2.2 in this appendix). The remaining three alternatives cover a reasonable range of actions. These alternatives represent different approaches or management scenarios for the future protection, restoration, and management of the Refuge's fish, wildlife, plants, habitats, and other resources, as well as compatible wildlife-dependent recreation. Refuge staff assessed the biological conditions of Refuge habitats and analyzed the external relationships affecting each Refuge unit. This information contributed to the development of Refuge goals and, in turn, helped formulate the alternatives, summarized in Table 1 of this appendix. Alternatives will be examined in four broad issue categories:

Habitat Management: How will the Refuge manage habitats to ensure the protection of trust resources?

Wildlife Management: How will the Refuge manage wildlife to ensure the protection of trust resources?

Visitor Services: How will the Refuge manage wildlife-dependent public use opportunities to ensure the protection of trust resources?

Facilities: How will the Refuge manage facilities to ensure the protection of trust resources?

2.2 Alternatives Considered But Dismissed From Detailed Analysis

The alternatives development process under NEPA and the Improvement Act are designed to allow the planning team to consider the widest possible range of issues and develop feasible management solutions that respond to these issues. These management solutions are then incorporated into one or more alternatives evaluated in the EA process and considered for inclusion in the CCP.

Actions and alternatives that are not feasible or may cause substantial harm to the environment are usually not considered in an EA. Similarly, an action (and therefore, an alternative containing that action) should generally not receive further consideration if:

- It is illegal (unless it is the No Action Alternative, which must be considered to provide a baseline for evaluation of other alternatives, even though it may not be capable of legal implementation).
- It does not fulfill the mission of the National Wildlife Refuge System.
- It does not relate to or help achieve one of the goals of the Refuge.
- Its environmental impacts have already been evaluated in a previously approved NEPA document.

However, if such actions or alternatives address a controversial issue or an issue on which many public comments were received, they may be considered in detail in a NEPA document to demonstrate clearly why they are not feasible or would cause substantial harm to the environment.

During the alternatives development process, the planning team considered a wide variety of potential actions on the Refuge. The following actions were ultimately rejected and excluded from the alternatives proposed here because they did not achieve Refuge purposes or were incompatible with one or more goals.

A request was made to shift emphasis to other grassland species if there was not a sustainable population of Attwater's prairie-chickens. This action was considered but dismissed because it does not meet the purpose of the Refuge, which is specifically to conserve the endangered Attwater's prairie-chicken. Many prairie restoration efforts prescribed for APC also benefit other grassland species.

There was a request from the public to install photo blinds in areas with APC use. This action was considered but eliminated at this time because it could result in an unnecessary amount of disturbance to APCs during a time when populations are already extremely low and disturbance to the population needs to be minimized. This alternative may be considered for further analysis in the future if Attwater's prairie-chicken populations increase. The Refuge is proposing additional ways for visitors to view APC by exploring opportunities to use current technology (e.g., live video feed, web cam, etc.).

When considering the realignment of the auto tour route, the Refuge only considered routes south of Coushatta Creek. Historically, visitors were allowed to drive through the entire Refuge. However, when prairie-chicken populations dramatically declined in late 1980s and early 1990s, the auto tour route was realigned south of Coushatta Creek. Areas north of Coushatta Creek are essential prairie-chicken habitat. The proposed auto tour route is south of Coushatta Creek to limit disturbance to APCs.

2.3 Features and Management Common to All Alternatives

Although the alternatives differ in many ways, there are similarities among them; several elements of Refuge management are common to all alternatives. These common management activities are listed below to reduce the length and redundancy of the individual alternative descriptions.

Cultural Resources

The Refuge would continue to identify, protect, and manage all significant cultural resources in a spirit of stewardship for the benefit of future generations. The Refuge would administer, preserve, and protect these resources in such a manner that sites, buildings, structures, and other objects of cultural value are preserved and maintained for scientific study and public appreciation and use. The Refuge would ensure that full consideration is given to cultural resources during the appropriate stages of decision making for activities that may affect such resources (e.g., construction, land use or resource planning, and land acquisition or disposal).

Oil and Gas Operations

The Refuge does not own mineral rights. Service policy 612 FW 2 states that the objectives of oil and gas management on Service lands are to protect wildlife populations, habitats, and other resources; and provide for the exercise of non-Federal oil and gas rights while protecting Service resources to the maximum extent possible.

Oil and Gas Facility. CREDIT: USFWS

The Service manages oil and gas operations on Refuge lands in accordance with 50 CFR 29.32, "Mineral Rights Reserved and Excepted." Oil and

gas operations on the Refuge were placed on the land prior to being acquired by the Refuge. Since the lands were acquired, there have not been any new oil and gas activities.

Each operator is required to provide the Refuge Manager with an *Operations Plan* for review and approval. Operators are required to prevent, to the maximum extent possible, releases of hazardous materials and substances, crude oil, and produced water. Each operator and/or facility operator must have a current *Oil Discharge Prevention and Contingency Plan* outlining procedure for accidental releases. Sampling, remediation, and restoration of contaminated sites would be the responsibility of the operator and/or facility operator and would occur in consultation with the Service and the appropriate state agency. All sites no longer being used by industry companies would be sampled for contaminants at the operator's expense to ensure proper disposal of material.

The Service would request, on a case-by-case basis, that wells, roads, pipelines, and associated infrastructure and facilities not needed to support ongoing operations be removed and the sites restored to the satisfaction of the Refuge Manager. The Refuge has a Special Use Permit (SUP) in place for maintenance, including mowing along pipelines. Mowing along pipelines is necessary for the safety of anyone who may dig along the pipeline route. Mowing along pipelines increases the likelihood of detecting any leaks before significant damage or threats to public safety occur. The SUP identifies standard operating procedures to include some of the following to insure the protection of resources:

- It is unlawful to disturb, injure, or take any wildlife or historic feature on the Refuge
- All Refuge gates will be closed and locked upon entering and leaving
- Travel will be on designated roads only
- Yield the right-of-way to Attwater's prairie-chickens by backing up and taking an alternate route
- Mitigate damages affecting existing wildlife habitat
- No littering
- Vehicles with catalytic converters are restricted to recently mowed or maintained roadways
- Smokers will practice caution and will carefully extinguish all matches and cigarette butts
- Equipment will be cleaned prior to use on APCNWR to prevent the spread of exotic species

Rare and Protected Species (Flora)

There are no federally or State-listed plants that occur on the Attwater Prairie Chicken NWR. The Refuge would continue to collect data on species present on its land and would monitor any occurrence of rare or protected species.

Rare, Protected, and Grassland Species (Fauna)

The Refuge would continue to maintain and restore prairie grasslands, which would in turn benefit grassland dependent species. Grassland birds are among the fastest and most consistently declining group of birds in North America (North American Bird Conservation Initiative 2009). The Refuge would not conduct brush management activities during the general bird nesting season unless a thorough survey is conducted and affected habitat is not being used by the species of conservation concern.

Attwater's prairie-chicken Recovery

The Refuge would continue to work towards recovery of the Attwater's prairie-chicken through full implementation of the *APC Recovery Plan,* including managing predation, identifying causes of decline, providing habitat and protection for wild flocks, and overseeing the management of a captive breeding and release program.

Release of captive-reared APC would continue on the Refuge until the APC population on the Refuge is considered stable. After that time, periodic releases may be necessary to manage the genetic health of the population or to buoy populations during declines characteristic of prairie-chickens (Hamerstrom and Hamerstrom 1973). Under the current protocol, APC are released from wire mesh acclimation pens that are approximately 1,500 square feet. They have electric wire surrounding them to prevent cattle from rubbing up against posts and for predator control. The Refuge moves acclimation pens every few years. Release time depends on adaptive management but generally occurs from July to September to correspond with natural dispersal time and to get the birds acclimated to the area before migrant raptors arrive in October. The number of birds released depends on the number of birds available from the captive breeding facilities.

The Refuge would continue to place predator-deterrent fences around APC nests and place perch deterrents on fence posts throughout the Refuge, focused on APC use areas. The Refuge would continue to control small mammal populations prior to and during the APC nesting season. Target species on the Refuge would include but are not limited to striped skunks, opossums, raccoons, and feral and domestic dogs and cats. Coyotes and bobcats are only removed if individuals become a nuisance. All of these are documented predators of prairie-chicken nests, young, or adults (Lehmann 1941, Jurries 1979, Morrow 1986, Attwater Prairie Chicken NWR unpubl. data). Means of control include trapping and shooting (lethal predator removal) through partnership with USDA Wildlife Services.

APC Headstart Box and Predator Deterrent Fence. CREDIT: USFWS

The Refuge would continue to place temporary headstart brood boxes over chicks and hens and feed them insects for the first two weeks as necessary to investigate causes of poor brood survival (Morrow et al. 1996, Toepfer 2003).

The Refuge would continue to place radio transmitters on released APCs to evaluate post release survival, modify rearing and release techniques as needed, and monitor and enhance reproductive success of released birds. The Refuge will continue to collect data on APC populations, both on and off the Refuge, and adapt management strategies based on the best available science.

Climate Change

The Refuge would continue to monitor prairie grasslands using the best available science to minimize impacts associated with climate change. The Refuge would use green infrastructure and related technologies when opportunities and funding permits to reduce its carbon footprint and contribution to climate change.

Coordination between Government Agencies and Private Interests

Coordination with governmental agencies, nongovernmental organizations, and private interests is essential in carrying out the vision and goals of the Attwater Prairie Chicken NWR. The Refuge would continue to work with State and Federal agencies, academia, conservation organizations, interested

entities, and private landowners to provide positive results in areas of habitat management, public outreach, and APC recovery. Coordination with several APC breeding facilities will continue to be critical to the production and release of Attwater's prairie-chickens back into the wild. The Refuge will expand coordination efforts to work more effectively with partners—in particular Refuge and recovery programs involving prairie grassland maintenance and/or restoration, invasive species control, and APC outreach opportunities.

Wildland Fire

The Attwater Prairie Chicken NWR will use a decision support process to guide and document wildfire management decisions. The process will provide situational assessment, analyze hazards and risks, define implementation actions, and document decisions with corresponding rationale. When needed, the Refuge would manage wildland fires for more than one objective, and objectives can change as the fire moves across the landscape. Objectives are affected by changes in fuels, weather, topography; varying social understanding and tolerance; and involvement of other governmental jurisdictions having different missions and objectives (National Interagency Fire Center 2009). Initial action on human-caused wildfire will be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety. Fire management strategies will consider current landscape conditions and spatial and temporal components of the fire regime. Surveillance to ensure confinement within a designated area (previously called Prescribed Natural fire) is not a response at Attwater Prairie Chicken NWR.

2.4 Alternatives Analyzed in Detail

The following alternatives were developed to comply with NEPA and to provide ways to address a number of issues, concerns, and opportunities that were identified during the public and internal scoping process. Though the alternatives may have different emphases, habitat maintenance, restoration, and preservation are common elements of each alternative. The alternatives are intended to provide a range of public uses and access, and respond to significant issues or concerns identified during the planning process. They are discussed in the following text.

2.4.1 Alternative A—No Action Alternative

Habitat Management

Prairie Restoration

Attwater Prairie Chicken NWR would continue to restore and manage habitat using current management tools, including planting and harvesting native prairie seed, prescribed burning, and grazing.

Native Grass Hay Planting. CREDIT:USFWS

The Refuge would restore, through native prairie seed plantings, an average of 75 acres of previously cultivated areas per year. The Refuge would continue to use cleaned, de-bearded seed and hay bales with seed to restore cultivated areas, though the availability of seed is often limited since weather conditions highly affect seed production and harvest operations. Field preparation would include removal of levees and other hydrological hindrances before planting. Through an agreement with a seed contractor, the Refuge receives

15 percent of the total seed harvested by the contractor on Refuge lands. Prairie harvest generally occurs during a three- to four-week period beginning in early November. Contractors use one to three modified combines. Modified combines are used to cut seed off the top of grassheads as high off the ground as possible (generally no lower than 10 inches), and a truck is used to transport seed. During some years, harvest is not attempted because conditions are too wet, and some years' harvest activities are carried out for the entire three- to four-week period. The Refuge also harvests hay containing grass seed during this period in cooperation with grazing tenants or local farmers.

Prescribed Fire on the Refuge. CREDIT:USFWS

The Refuge would continue to burn the majority of the 10,541 acres, but only approximately 2,000–3,000 acres annually, mainly during the winter months of December–January and no later than March 1. Summer burning after July 4th would be conducted when necessary to meet management objectives. The Refuge would continue to integrate grazing and prescribed fire using patch burning (Fuhlendorf and Engle 2001, Bidwell et al. 2003, Fuhlendorf et al. 2006) (see Map B-1). The premise of patch burning with regard to prairie management is that the interaction of burning and grazing creates a diversity of habitat pattern, structure, and plant composition that meet the life requisites of prairie-chickens and other grassland species (Bidwell et al. 2003). As applied on this Refuge, pastures have been divided into 4–16 patches, with 25 percent burned each year on a four-year rotation. Continuous grazing within pastures results in preferential selection of more recent burns for grazing and avoidance of older burns. This fire-grazing interaction has led to the patch burning system, also referred to as rotational grazing without fences (Bidwell et al. 2003).

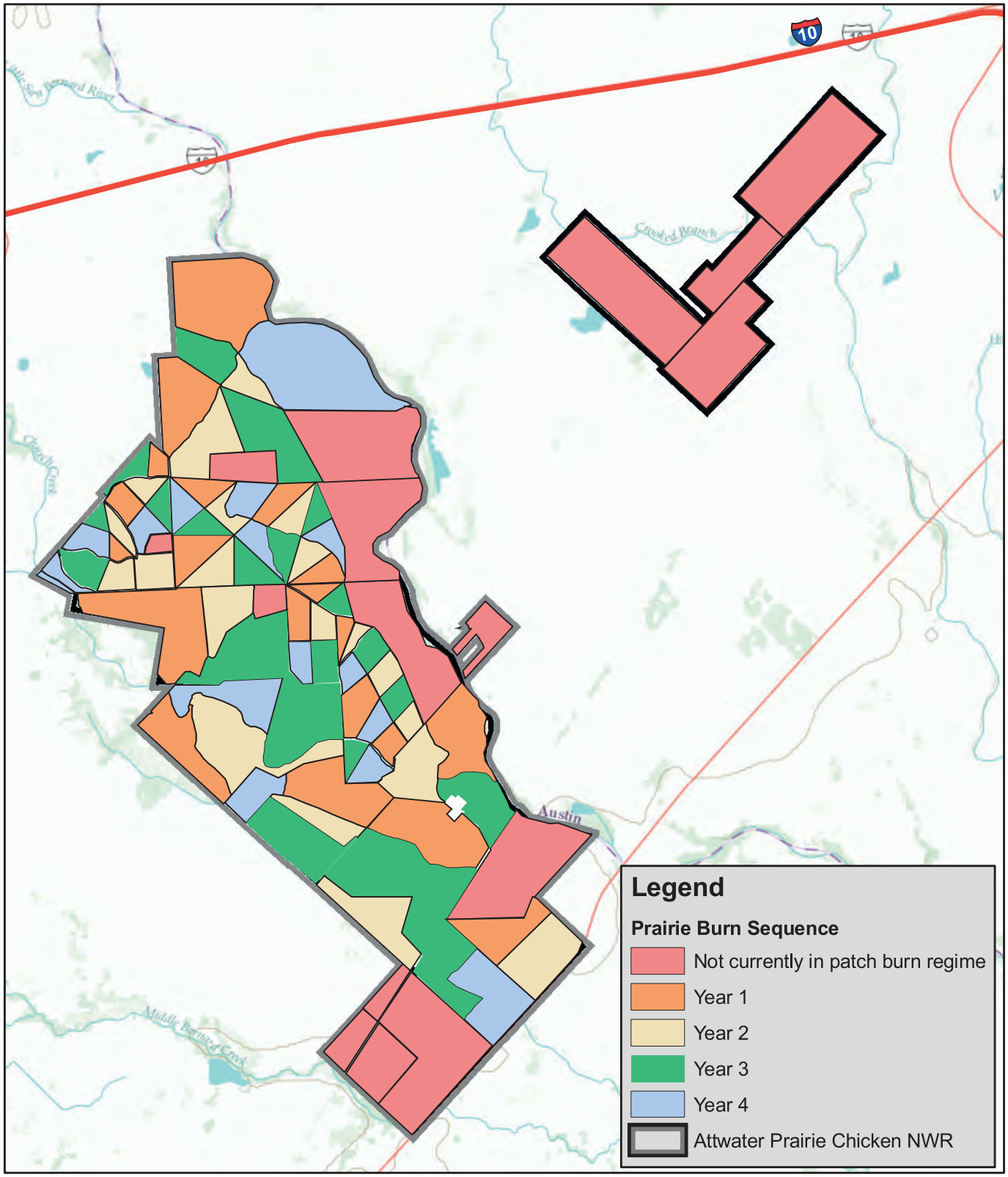
The Refuge would continue to burn the areas labeled, "Not currently in patch burn regime," in 4–6 year intervals. Fire interrupts natural plant succession to favor indigenous herbaceous species characteristic of the coastal prairie ecosystem and control invasive species by top killing invading woody species.

U.S. Fish & Wildlife Service

Attwater Prairie Chicken National Wildlife Refuge

Austin/Colorado County, Texas

Map B-1. Prairie Burn Sequence



PRODUCED IN THE DIVISION OF REFUGE PLANNING
ALBUQUERQUE, NEW MEXICO
LAND STATUS CURRENT TO: 5/31/09
MAP DATE: Dec. 2011
BASEMAP: N/A
MERIDIAN: N/A
FILE: atw_burn_seq_12.5.11_sk

0 0.5 1 2 Miles

0 0.4 0.8 1.6 Kilometers

UTM ZONE 14
NAD 83

Cattle and bison would continue to graze on all of the Refuge except for approximately 2,600 acres (Cranz, Anderson, Becker and tracts in Austin County, Map B-2). Cattle are grazed in designated areas on approximately 7,062 acres of the Refuge in Colorado County. American bison are grazed on the 763-acre Lafitte pasture located within the auto tour route near the Refuge headquarters. A year-long cow-calf operation is used to achieve APC habitat management objectives. Up to 40 American bison graze in the Lafitte pasture to manage habitat and provide viewing opportunities for Refuge visitors. Up to 450 cattle graze on approximately 7,063 acres of the Refuge in Colorado County. Pastures are stocked at light to moderate levels based on recommendations published in the U.S. Natural Resources Conservation Service range site descriptions for the area and principles of adaptive management. Responses of vegetation are monitored and stocking rates evaluated by the Refuge biologist on a constant basis. Livestock are deferred as necessary to meet management objectives. Current stocking rates range from 9–40 acres/animal unit-year (AUY) and average 18.2 acres/AUY. Grazing would continue to be based on the best available science.

Cattle grazing on the Refuge. CREDIT: USFWS

The Refuge would continue to conserve water resources proactively to promote the hydrological integrity of the prairie by using appropriate grazing methods, prohibiting water mining, and eliminating wasteful uses. The Refuge would continue to manage two man-made impoundments near the west side of the auto tour route.

Land Protection and Acquisition

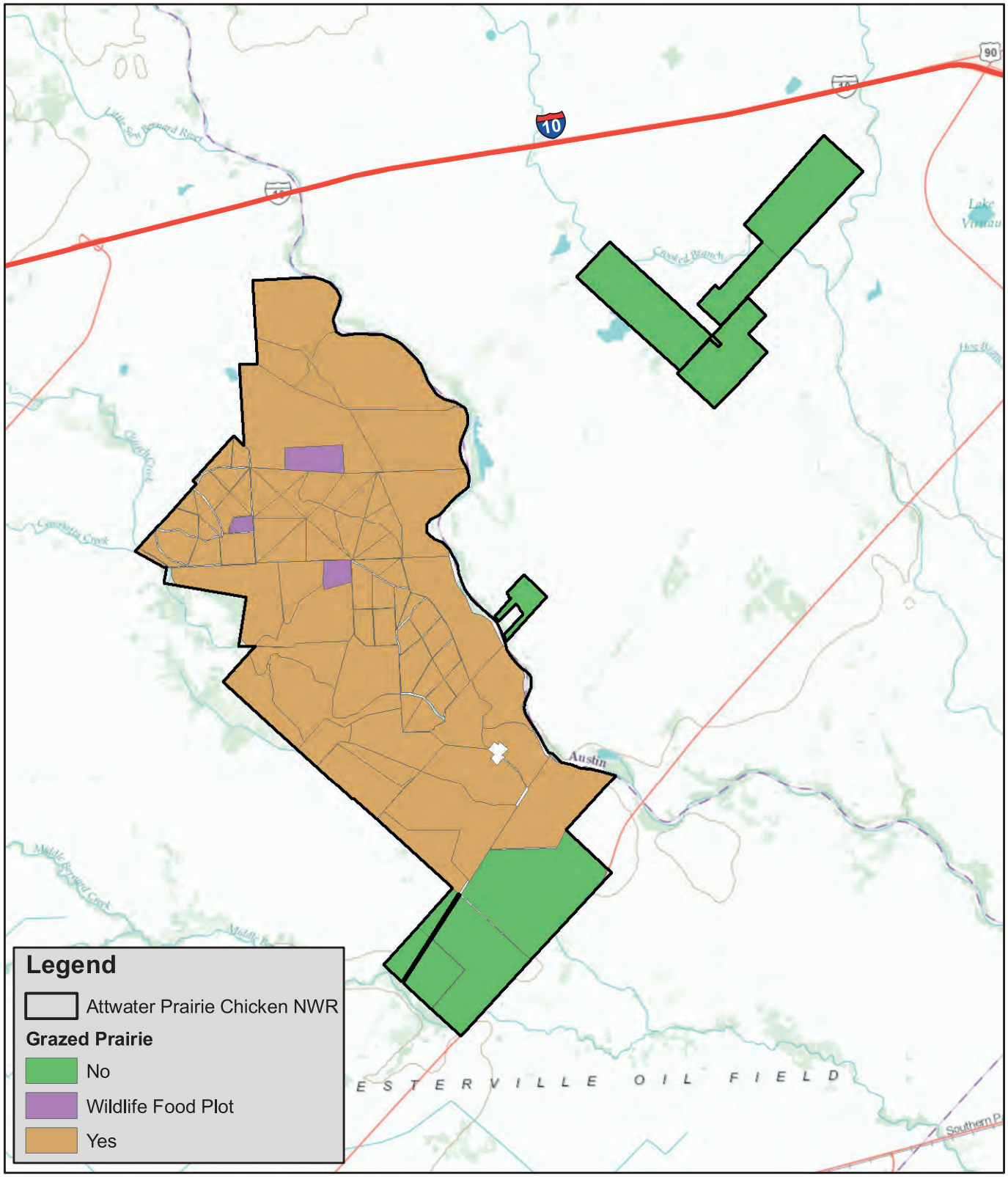
The Refuge would continue to implement the actions outlined in the APCNWR Land Protection Plan and APC Recovery Plan as funding becomes available. The Refuge would continue to acquire lands from willing sellers and conservation easements as they become available. The Refuge would not proactively seek out additional land protection options.

U.S. Fish & Wildlife Service

Attwater Prairie Chicken National Wildlife Refuge

Austin/Colorado County, Texas

Map B-2. Grazed and Ungrazed Prairies Map



PRODUCED IN THE DIVISION OF REFUGE PLANNING
ALBUQUERQUE, NEW MEXICO
LAND STATUS CURRENT TO: 5/31/09
MAP DATE: Jan. 2012
BASEMAP: N/A
MERIDIAN: N/A
FILE: atw_grazing_1.25.12sk

0 0.5 1 2 Miles

0 0.5 1 2 Kilometers

UTM ZONE 14
NAD 83

Invasive Species (Flora)

The Refuge would continue to concentrate its efforts on controlling Macartney rose, deep-rooted sedge, Chinese tallow, and other invasive species on a case-by-case basis to preserve the integrity of the coastal prairie ecosystem through implementation of integrated pest management practices. Prescribed fire and chemical treatments would be the primary tools used to implement this management direction; mechanical treatments would be used on a limited basis. Prescribed fire is the preferred technique for dealing with invasion of woody species. However, in situations where woody species become too large to be effectively controlled by fire, or in areas where fuels are not conducive to achieving brush management objectives (e.g., areas that are wet during burn season, areas where brush canopy prevents build-up of fine fuels, etc.), mechanical or chemical treatments are necessary. Prescribed fire would be used on an average 2,700 acres annually, and chemical treatment would be used on an average 500–600 acres annually. All chemicals used to treat invasive species would be approved through the Pesticide Use Proposal process prior to application. For a full list of chemicals on the Refuge, see Appendix B-A. Macartney rose treatment (combination of prescribed fire and approved herbicides) in a particular area is necessary every 3–4 years. Chinese tallow is treated mostly by cut stump and spray method. Herbicide would be used for deep-rooted sedge control. The Refuge would occasionally use aerial spraying to control invasives. Treatment would be focused on problem areas. The timing of management actions would continue to depend on the species treated and efforts to limit disturbance to protected species. The Refuge would give higher priority to areas utilized by APC.

Wildlife Management

Invasive Species (Fauna)

The Refuge would continue to control feral hogs and nutria on an annual basis. Feral hogs would be taken based on sighting and/or documented damage, and nutria would be removed as they become relatively abundant to minimize damage to water control structures and levees. Red imported fire ants have been documented to be a mortality factor on newly hatched APCs. Therefore, the Refuge would continue to treat areas around APC nest sites with approved fire ant pesticides. The Refuge would apply 2–5 tablespoons of Amdro Pro or Extinguish Plus per mound for spot treatment, not to exceed 1.5 pounds per acre. The Refuge would continue to cooperate with partners to research impacts of RIFA on insect communities used by APC broods for food. This research includes broadcast application of Amdro Pro or Extinguish Plus on a unit-wide (i.e., pasture-wide) scale.

Wildlife Food Plots (Farming Program)

The Refuge would continue to manage three food plots as recommended in the APC Recovery Plan. The units (Renz, Corman, and Krueger Exclosure) managed by Refuge staff (force account) total approximately 150 acres (refer to Map 3-4 of the CCP). The Refuge attempts to plant as much of the 150 acres as possible, but conditions are not always favorable. On average, 85 acres are planted annually to provide additional nutrition for APC during the winter months. Other wildlife also use these food plots. Remaining acreage remains fallow. The Refuge plants milo, soybeans,

Wildlife Food Plots. CREDIT:USFWS

sunflowers, and millet. Preparation of food plots begins during mid- to late February and includes plowing and disking, bedding rows, and planting. The process may take from one to three months, depending on weather conditions. Rainy conditions can slow down the process because heavy equipment cannot be used on wet soils. Currently, wildlife food plots are not irrigated. Herbicides, pesticides, and genetically modified crops are not used for management of these food plots. Fertilizer is applied based on soil testing, the type of crop, and available funding. Invasive species control does not take place in Refuge food plots because invasive species have not been an issue in these areas to date.

Visitor Services

Wildlife Observation and Photography

Primary means of access to areas on the Refuge used for wildlife observation and photography include motorized vehicles on Refuge roads open to the public and walking on trails. A very small number of visitors use bicycles on public roads. The Refuge would continue to offer a five-mile auto tour route and two hiking trails that provide visitors with opportunities to view and photograph wildlife and flora. Wildlife photography is allowed concurrent with wildlife observation in the public use area without a permit. No additional facilities are provided specifically for wildlife photography. Limited access to closed Refuge areas by professional photographers and videographers to photograph APC and its habitat may be allowed at the request of the Refuge to meet specific needs.

Environmental Education

The Refuge would continue to provide limited environmental education opportunities to local school districts, homeschooling groups, and universities on a case-by-case basis as requested and as Refuge resources permit. Primary means of access to areas on the Refuge used for environmental education include motorized vehicles on Refuge roads open to the public and walking on trails.

Interpretation

The Refuge would continue to host the Attwater's Prairie-Chicken Festival annually, which offers participants opportunities to view the Attwater's prairie-chicken on their booming grounds, wildlife viewing and birding opportunities, and opportunities to view wildflowers in bloom. Special tours and interpretation opportunities are offered throughout the year, as staff time allows, for groups that have an environmental education purpose. Off-site talks would continue to be conducted to further the awareness of the prairie-chicken's status and ongoing recovery efforts as staff time allows. A Visitor Contact Station would continue to be available to display APC educational videos. Primary means of access to areas on the Refuge used for interpretation include motorized vehicles on Refuge roads open to the public and walking on trails. A very small number of visitors use bicycles on public roads.

Facilities

Roads

The Refuge would continue to maintain the auto tour route through grading on an as-needed basis (approximately 20 times a year) to provide safe and enjoyable conditions for visitors. Service roads are maintained as needed through grading. The entrance road is maintained by Colorado County and coldpatched once or twice a year. The shoulders are also mowed a few times a year by the county.

Development of Administrative Complex

The Refuge would conduct its administrative operations out of currently existing facilities, which consists of three portable structures connected by temporary walkways.

2.4.2 Alternative B—(Proposed Action)

Habitat Management

Prairie Restoration/ Ecoregion Biodiversity

The Refuge would increase restoration efforts up to 400 acres annually by evaluating various partnership options. These opportunities may include (a) negotiating a partnership that would grow native grass seed under controlled methods in an effort to provide a consistent amount of seed annually and/or (2) establishing a partnership with surrounding landowners to produce and harvest seed.

Prescribed fire would continue to be implemented as stated in Alternative A; however, the Refuge would explore expansion of patch burning to include the entire Refuge. The Refuge would determine which of the remaining areas identified in Map B-1 would be incorporated into the four-year patch burning rotation as indicated by habitat conditions. Rotation would be determined partly based on fence removal and pasture consolidations. No change in the total proportion of Refuge burned is being proposed. In addition, monitoring and evaluation of burning effects on the grassland landscape would be expanded.

Grazing practices would continue to be implemented as stated in Alternative A; however, monitoring and evaluation of grazing effects on the grassland landscape would be expanded. Determining the effects of grazing on prairie insect populations, forbs, and other related topics would be pursued. Also, an evaluation would be conducted to determine the amount of fencing needed to manage the grazing program efficiently. This would include consolidation of pastures to remove unnecessary fencing and installing new fencing, if necessary. The Refuge would repair current fences, gates, cattle guards and additional water sources (e.g., windmills and wells) associated with managing the grazing program. The Refuge would install fencing to exclude cattle from the proposed trail at Horseshoe Lake and Sycamore Trail. Grazing would be incorporated on former agricultural areas after restoration is complete on a case-by-case basis and as habitat conditions dictate.

The Refuge would continue to conserve water as described in Alternative A; however, the Refuge would remove all unnecessary infrastructures to restore a functional level of hydrology that will allow for successful native prairie restoration. This would include the restoration of the two man-made impoundments back to native prairie by removing water control structures, dikes, and levees. The Refuge has identified “undisturbed” and “disturbed” areas (See Map B-3). The areas considered undisturbed are areas where the native prairie remains or areas where restoration efforts have been successful. Disturbed areas are areas of land that were agriculture before being acquired by the Refuge and have not been fully restored to prairie. The Refuge would remove any infrastructure, including levees, irrigation canals, drainage ditches, roads, and fences on a case-by-case basis to restore a prairie’s hydrologic components.

Land Protection and Land Acquisition

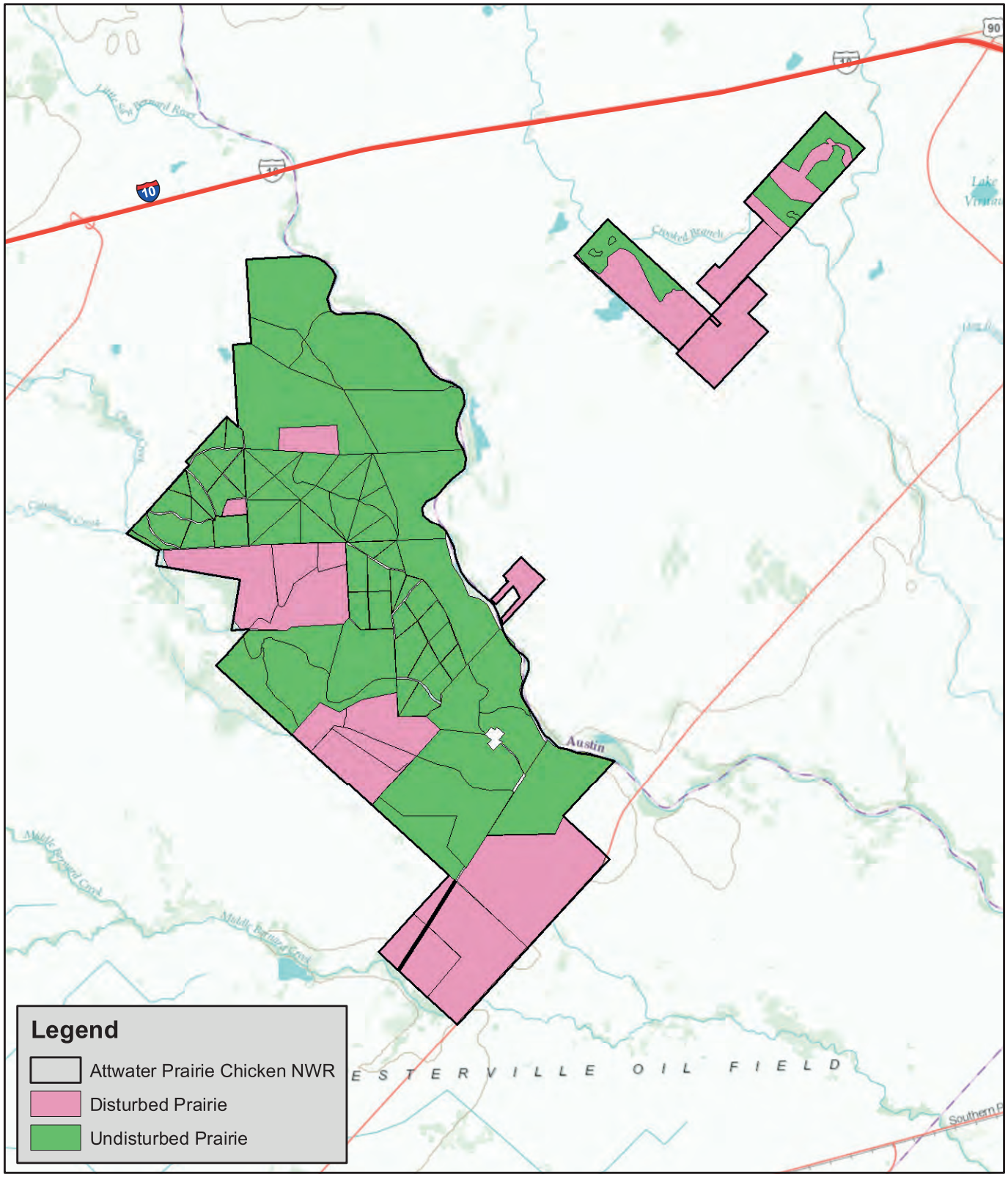
The Refuge would continue to acquire land as described in Alternative A; however, the Refuge would place a greater emphasis on options other than fee-title to support prairie-chicken recovery efforts. Options would include conservation easements, additional partnerships with other groups and agencies, safe harbor agreements, NRCS’s Grassland Reserve Program, Environmental Quality Incentives Program, Farm Bill, TPWD’s Landowner Incentive Program, the Service’s Partners for Fish and Wildlife Program, and other options that may be available.

U.S. Fish & Wildlife Service

Attwater Prairie Chicken National Wildlife Refuge

Austin/Colorado County, Texas

Map B-3. Disturbed and Undisturbed Areas



PRODUCED IN THE DIVISION OF REFUGE PLANNING
ALBUQUERQUE, NEW MEXICO
LAND STATUS CURRENT TO: 5/31/09
MAP DATE: Jan. 2012
BASEMAP: N/A
MERIDIAN: N/A
FILE: atw_native_prairie_1.25.12sk

0 0.5 1 2 Miles

0 0.5 1 2 Kilometers

UTM ZONE 14
NAD 83

Invasive Species (Flora)

Invasive species would continue to be treated as stated in Alternative A; however, the Refuge would apply a one-time systematic chemical treatment, using the same chemicals listed in Alternative A, on the entire Refuge within a short time period to get a better handle on invasive species control and minimize infestations before they become problematic. This would be done through individual plant treatments by multiple individuals (to possibly include contractors) using a combination of chemical and mechanical treatment. After the one time treatment, through a maintenance schedule, the Refuge would treat at least every 2–3 years or as needed to prevent re-establishment of these invasive species. Timing of applications would depend upon target species and weather conditions. Best management practices would be implemented when applying chemical treatment.

Wildlife Management

Invasive Species (Fauna)

Invasive species would be managed the same as Alternative A; however, the Refuge would work with adjacent landowners to control feral hogs and nutria. The Refuge would also remove brush along Coushatta Creek and other avenues of hog movement corridors to control such species. Using the adaptive management approach and pending results from current red imported fire ant research, the Refuge would expand treatment for RIFA to the entire Refuge through the same techniques discussed in Alternative A. This treatment would also be expanded off-Refuge through cooperation with adjacent landowners.

Wildlife Food Plots (Farming Program)

Management would continue as stated in Alternative A; however, the Refuge would explore additional ways to provide supplemental food to prairie-chickens, including the possibility of irrigating crops to minimize crop failure and the potential for adding more food plots as the APC population expands. If needed, the Refuge would use the most efficient irrigation system, including possibly center pivot irrigation. The Refuge may need to dig one well, possibly one at each food plot. The need to expand would be based on APC Recovery team recommendations.

Visitor Services

Wildlife Observation and Wildlife Photography

Wildlife observation and photography would be managed as stated under Alternative A; however, the Refuge would relocate the auto tour route as identified in Map 4-2 in the CCP. The current Pipit Trail would be eliminated and replaced with a new trail near Horseshoe Lake, and cattle would be excluded from all public walking trails. Improvements to the public use area would include adding a universally accessible viewing platform to the new Horseshoe Lake Trail. Turn-outs would be added to the newly aligned auto tour route. The Refuge would add a short spur trail off Sycamore Trail into the San Bernard River. APC viewing opportunities would be expanded by increasing the number of van tours provided during the spring.

Environmental Education

The Refuge would develop an Environmental Education Program and promote environmental education programs in local school districts. The Refuge would also continue to provide environmental education to groups when requested.

Interpretation

In addition to opportunities stated in Alternative A, the Refuge would add interpretive signs and kiosks to the new auto tour route alignment and new trail alignment at Horseshoe Lake. The Refuge would add some additional interpretive signage to Sycamore Trail. Interpretive opportunities would also be expanded using available technologies, including webcasts and possibly live stream video of APC in their native habitat to be viewed in the Visitor Contact Station.

Public Use Interpretive Kiosk. CREDIT:USFWS

Facilities

Roads

Roads would be managed as stated under Alternative A; however, the Refuge would seek to acquire jurisdiction and maintenance responsibilities of the existing Refuge entrance road. The entrance road would be widened to two full lanes and resurfaced. Also, the Refuge would bury the overhead power line along the first half mile of the entrance road. The Refuge would remove some service roads and restore these areas to prairie.

Development of Administrative Complex

The Refuge would develop and approve a site plan to build an administrative complex that is one permanent structure as opposed to three portable buildings at the same location as is the current complex. The facility would include administrative offices, Visitor Contact Station, and a professional lab designed around the needs of Attwater's prairie-chicken recovery activities. The Refuge would also develop a permanent parking area and associated sidewalks. This new administrative complex will be contained within the existing administrative complex footprint. The implementation of a new administrative complex would depend on Congressional appropriation of funds.

2.4.3 Alternative C

Habitat Management

Prairie Restoration and Ecoregion Biodiversity

Prairie restoration would be implemented as stated under Alternative B; however, the Refuge would establish the capabilities to produce, collect, and harvest seed on site. The Refuge would consider eliminating cattle as a grazing tool but use bison as the primary grazing tool. The Refuge would, to the extent possible and based on available historical habitat data, restore areas to historical topography to include construction of mima mounds and mimic historical elevations and natural drainage as opposed to only a functional level of hydrology as stated in Alternative B.

Land Protection and Land Acquisition

Land acquisition would continue as described in Alternative B.

Invasive Species (Flora)

Management of invasive flora species would continue as stated in Alternative B.

Wildlife Management

Invasive Species (Fauna)

Management of invasive fauna species would continue as stated in Alternative B.

Wildlife Food Plots (Farming Program)

The Refuge would discontinue the management of three wildlife food plots and restore to prairie habitat.

Visitor Services

Wildlife Observation and Wildlife Photography

Wildlife observation and photography opportunities would continue as described in Alternative B.

Environmental Education

The Refuge would explore the options of an outdoor classroom through partnerships with local schools, volunteers, and Friends group.

Interpretation

Interpretation would continue as described in Alternative B.

Facilities

Roads and Development of Administrative Complex

Roads and development of administrative complex would be managed as described in Alternative B.

2.5 Comparison of Alternatives

Table B-1. Comparison of Alternatives

Issue Topic	Alternative A (Current Management)	Alternative B (Proposed Action)	Alternative C
Habitat Management			
Prairie Restoration	Combination of planting native grasses, grazing, burning, hydrologic restoration.	Same as Alternative A; plus explore partnership options to produce native grass seed on a consistent basis annually and increase the number of restoration acres; expand monitoring for grazing and burning effects; remove infrastructure, including two man-made wetland impoundments, restoring a functional level of hydrology.	Same as Alternative B; except establish seed harvest and production on the Refuge; grazing bison only; remove infrastructure and restore areas to historical topography and natural drainage.
Land/Property Acquisition	Acquire acres within approved acquisition boundary (additional 22,000 acres) in fee and conservation easement. Not proactively seeking out additional land protection options.	Continue to acquire land within acquisition boundary, proactively seek out land protection options and diversify those options (easements, Federal subsidies, etc.).	Same as Alternative B.
Invasive Species Control (Flora)	Focus on Macartney rose, deep-rooted sedge, and Chinese tallow; treatments include a combination of chemical, mechanical and prescribed fire.	Same as Alternative A ; plus conduct systematic chemical invasive species control for entire Refuge, unit-by-unit one time; treatment is expected to be required every 2–3 years as invasive species are re-established.	Same as Alternative B.

Issue Topic	Alternative A (Current Management)	Alternative B (Proposed Action)	Alternative C
Wildlife Management			
Invasive Species Control (Fauna)	**Feral Hogs**: eliminate hogs based on sighting and/or documented damage; **Nutria**: eliminate nutria along impoundment areas of the Refuge; **Red Imported Fire Ant**: treat nest sites and conduct research on impacts of RIFA on insect community.	Same as Alternative A; plus **Feral Hogs**: work with adjacent landowners to control feral hog population; remove brush and other avenues of hog movement corridors; **Red Imported Fire Ant**: depending on results of current research, expand treated area to full extent of Refuge and work with adjacent landowners to expand treatment off Refuge.	Same as Alternative B.
Wildlife Food Plots (Farming Program)	Manage three food plots totaling up to 150 acres.	Same as Alternative A; plus explore additional ways to provide supplemental food to APC, including capability to irrigate and addition of food plots when APC populations expand.	Eliminate wildlife food plots.
Visitor Services			
Wildlife Observation and Wildlife Photography	Provide wildlife observation and photography to include auto tour route and two hiking trails.	Same as Alternative A; plus realign auto tour route; exclude cattle from public hiking trails; establish a new platform and hiking trail around Horseshoe Lake; remove Pipit Trail; increase guided van tours.	Same as Alternative B.
Environmental Education	Provide environmental education as requested and as staff time permits.	Develop an environmental education program and promote in local school districts.	Develop an outdoor classroom through partnerships with local schools, volunteers, and friends group.
Interpretation	Host annual Attwater's Prairie-Chicken Festival; interpretive signage at headquarters and along auto tour route.	Same as Alternative A; plus add interpretive signage and kiosk to new auto tour route and new trail; expand interpretive opportunities using recent technologies.	Same as Alternative B.

Issue Topic	Alternative A (Current Management)	Alternative B (Proposed Action)	Alternative C
Facilities			
Roads	Cooperate with county maintenance personnel for Refuge entrance road, and maintain other Refuge roads.	Same as Alternative A; plus acquire jurisdiction and maintenance responsibilities of existing Refuge entrance road and widen to two full lanes; bury power line along entrance road.	Same as Alternative B.
Development of Administrative Complex	Administrative operations conducted out of three portable structures	Develop and approve site plan for new integrated administrative complex.	Same as Alternative B.
Administration			
Budget[1]	$1,174,394 annually	Over the 15-year life of the CCP, the Refuge will need $45,995,000 for full implementation.	In addition to Alternative B, an additional $3 million is needed to implement this alternative.
Staff	8 FTE's	12 FTE's	12 FTE's

Table B-2. Mitigation Measures and Monitoring

Mitigation Measure and Monitoring Description	Alternatives
General	
Gather expanded resource baseline data to enhance current analytical base from which to judge future management impacts and effects.	A, B, and C
Develop and implement an extensive and ongoing monitoring program to judge management action effectiveness and provide alternative solutions that would lessen any short-term or long-term negative impacts on fish and wildlife resources and other environmental elements.	A, B, and C
Regulate management actions to adequately address any potential impacts. For example, activities would be conducted during times of the year and in areas where breeding and nesting activities are at a minimum.	A, B, and C
Prohibit or restrict activities in areas where listed species occur. The potential effects of Comprehensive	A, B, and C

[1] All budget figures identified in this row are approximations and are subject to change at time of implementation of any given project.

Mitigation Measure and Monitoring Description	Alternatives
Conservation Plan implementation on federally-listed species has been reviewed per an Intra-Service Section 7 Consultation (See Appendix F).	
Seek public input in future planning for any management actions that are considered major Federal actions, as per NEPA requirements.	A, B, and C
Air Quality	
For prescribed burning, the following precautions would be in place: habitat management involving prescribed burning will occur only under prescribed weather conditions, and smoke management practices will be implemented during all burning events; an approved prescribed Burn Plan, favorable weather conditions, and adequate firefighting resources all work together to prevent pervasive air pollution from affecting air quality.	A, B, and C
Blowing dust is abated by performing work during times of favorable wind conditions.	A, B, and C
Water Management and Quality	
Avoid spraying during or immediately before a rainfall event to reduce the chances of run-off and herbicide delivery to water resources.	A, B, and C
Agency-approved application practices and guidelines will be implemented during all prescription events and under an approved plan to prevent or minimize effects to water quality.	A, B, and C
As needed, conduct groundwater modeling, water quality and water quantity analysis throughout the Refuge.	B, and C
Soils	
Erosion fences will be established on construction sites when erosion is a concern. If heavy sediment deposits occur in water, maintenance workers will use excavators to pull sediment and move it back into place.	A, B, and C
Habitats	
Take a proactive approach to working with information provided through biological surveys, inventories, and monitoring, including monitoring of grazing and prescribed burning to determine changing conditions and vegetation associated with Attwater's prairie-chicken needs.	A, B, and C
Wildlife	
The Refuge will coordinate with Coastal Prairie Conservation Initiative and others to maximize outcomes and success of Attwater's prairie-chicken recovery efforts on private lands.	A,B, and C
To avoid displacement or removal of migratory birds' nests in either of the man-made impoundments, the Refuge would not conduct operations to remove impoundments when habitat conditions are favorable for use by migratory species.	B and C
Refuge management methods would not result in direct take of any species of conservation concern, and brush	A, B, and C

Mitigation Measure and Monitoring Description	Alternatives
management activities would not occur during general bird nesting season (March through August) unless a thorough survey is conducted and affected habitat is not being used by species of conservation concern.	
Oil and Gas Activities	
The Refuge will work with oil and gas companies using best management practices to ensure that, to the greatest extent practicable, all exploration, development, and production operations are conducted in such a manner as to prevent damage, erosion, pollution, or contamination to the lands, waters, facilities, wildlife, and vegetation of the area.	A, B, and C

3.0 AFFECTED ENVIRONMENT

Refer to Chapter 3 of the CCP.

4.0 ENVIRONMENTAL CONSEQUENCES

This section analyzes and discusses the potential environmental effects or consequences that can be reasonably expected by the implementation of each of the three alternatives described in Chapter 2 of this EA. For each alternative, the expected outcomes are portrayed through the 15-year life of the CCP.

This chapter identifies, describes, and compares the physical, biological, and human environment of the three alternatives proposed in this draft CCP and EA. Current management (Alternative A, the No Action Alternative) provides the basis for comparing the effects of the action alternatives (Alternatives B and C). The direct, indirect, and cumulative effects of each alternative are analyzed in this chapter.

An analysis of the effects of management actions on the physical environment has been conducted for soils, water, and air quality. Analysis of the effects of management actions on the biological environment has been conducted for vegetation, wildlife, and threatened and endangered species. Although all plant, animal, and fish species on the Refuge are important, most species are not expected to experience any change as a result of implementing any of the alternatives. Therefore, the only species that will be discussed are those that will be impacted. An analysis of the effects of management actions on the socio-economic environment has been conducted for local populations and economy, recreational uses and facilities, scenery, oil and gas activities, natural and cultural prehistoric and historic resources, and land acquisition. Potential impacts are described in terms of type, duration, intensity, and context (scale). General definitions are as follows.

4.1 Definition of Terms

Effects

Direct effects are the impacts that would be caused by the alternative at the same time and place as the action.

Indirect effects are impacts that occur later in time or distance from the triggering action.

Cumulative effects are incremental impacts resulting from other past, present, and reasonably foreseeable future actions, including those taken by Federal and non-Federal agencies, as well as undertaken by private individuals. Cumulative impacts may result from singularly minor but collectively significant actions taking place over a period of time.

Impact Type

Beneficial impacts are those resulting from management actions that maintain or enhance the quality and/or quantity of identified Refuge resources or recreational opportunities.

Adverse impacts are those resulting from management actions that degrade the quality and/or quantity of identified Refuge resources or recreational opportunities.

Duration of Impacts

Short-term impacts affect identified Refuge resources or recreational opportunities; they occur during implementation of the management action but last no longer.

Medium-term impacts affect identified Refuge resources or recreational opportunities that occur during implementation of the management action; they are expected to persist for some time into the future though not throughout the life of the CCP.

Long-term impacts affect identified Refuge resources or recreation opportunities; they occur during implementation of the management action and are expected to persist throughout the life of the CCP and possibly longer.

Intensity of Impact

Negligible impacts result from management actions that can be reasonably expected to have no effect on identified Refuge resources or recreational opportunities at the identified scale.

Minor impacts result from a specified management action that can be reasonably expected to have detectable though limited effects on identified Refuge resources or recreation opportunities at the identified scale.

Moderate impacts result from a specified management action that can be reasonably expected to have apparent and detectable effects on identified Refuge resources or recreation opportunities at the identified scale.

Major impacts result from a specified management action that can be reasonably expected to have readily apparent and substantial effects on identified Refuge resources and recreation opportunities at the identified scale.

Scale of Impact

Site-specific effects are those impacts that occur solely within the project area.

Local effects are those impacts that can be reasonably expected to have detectable effects within and immediately surrounding the project area.

Refuge-wide effects are those impacts that can be reasonably expected to have noticeable effects across the entire Refuge landscape.

4.2 Effects Common to all Alternatives

Several potential effects will be very similar under each alternative, and they are summarized in this section.

Climate Change

Carbon sequestration is a climate-related impact to be considered in planning. Vegetated land is a tremendous factor in carbon sequestration. Terrestrial biomes of all sorts—grasslands, forests, wetlands, tundra, and desert—are effective both in preventing carbon emission and acting as biological “scrubbers” of atmospheric carbon dioxide (U.S. Dept. of Energy 1999).

Conserving natural habitat for APC is the main management focus for the CCP. The actions proposed in this CCP would conserve or restore land and habitat and would thus retain or enhance existing carbon sequestration on the Refuge. This, in turn, contributes positively to efforts to mitigate human-induced global climate change.

One Refuge activity in particular, prescribed burning, releases carbon dioxide directly into the atmosphere from the biomass consumed during combustion. However, there is actually no net loss of carbon, since new vegetation quickly sprouts to replace the burned-up biomass and sequesters or assimilates an approximately equal amount of carbon as was lost to the air (Dai et al. 2006). Overall, there should be little or no net change in the amount of carbon sequestered at the Refuge from any of the proposed management alternatives. The use of green technology and products would reduce the Refuge's carbon footprint.

Cultural Resources

The Service is responsible for managing archeological and historic sites found on national wildlife refuges. Undertakings accomplished on the Refuge have the potential to impact cultural resources. The consequences for cultural resources would be the same under each management alternative. During project planning, Federal agencies are required to consider historic properties through a consultation process under Section 106 of the National Historic Preservation Act. The goal of the consultation process is to identify historic properties that may be affected by the undertaking, assess the undertaking's effects on the properties, and seek ways to avoid, minimize, or mitigate any adverse effects (National Historic Preservation Act Section 106 §800.1(a)). Thus, the Refuge Manager, during early planning, provides the Regional Historic Preservation Officer (RHPO) a description and location of all projects, activities, routine maintenance, and operations that affect ground and structures; requests for permitted uses; and provides alternatives being considered. The RHPO analyzes these undertakings for potential to affect historic properties and enters into consultation with the State Historic Preservation Officer and other parties as appropriate. The Refuge Manager also asks the public and local government officials to identify concerns about impacts caused by a proposed action in a notification that is at least equal to, and preferably with, the public notification carried out for NEPA and compatibility.

Impacts from Pesticide Applications

Chemical herbicides are one of the main methods the Service uses to control invasive plants on national wildlife refuges. Herbicides can efficiently and effectively suppress or kill unwanted plants, and the Service uses them in such a manner as to minimize adverse effects on non-target resources. An herbicide suppresses or kills plants by decreasing their growth, seed production, and competitiveness (USFWS 2009).

The benefits of herbicides in controlling invasive plants must be weighed against the potential for exposure and impacts to human health, non-target organisms, and the environment. The U.S. Environmental Protection Agency (EPA) requires extensive test data from herbicide producers to show that their products can be used safely. EPA scientists and analysts carefully review these data to determine whether to register (license) an herbicide and whether certain restrictions on use are needed (USFWS 2009). More information about EPA registration and re-registration of chemicals can be found at http://www.epa.gov/pesticides.

EPA evaluates both exposure and toxicity to determine the risk associated with the use of a given herbicide. People, non-target flora and fauna, water, and soil may all be exposed directly or indirectly to herbicides during applications and subsequent movement; this exposure can be minimized or avoided by following proper instructions and labels. For wildlife and humans, herbicides may enter the body through the skin, by swallowing, and by breathing. Once herbicides have been applied, the potential for exposure is further influenced by the many biotic (living) and abiotic (non-living) processes that affect the fate of herbicides in the environment.

Herbicide use on national wildlife refuges must comply with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and other Federal laws and authorities. The use of herbicides and other pesticides on refuges is governed by the U.S. Department of Interior Integrated Pest Management Policy (517 DM 1), the Service Pest Management Policy and Responsibilities (30 AM 12), and the Service Refuge Manual (7 RM 14).

The Service policies and Refuge Manual state that refuges will use herbicides only after full consideration of management alternatives, including chemical, biological, physical, and no action. If, after considering all of these factors, managers determine that herbicides will be used to meet invasive plant management objectives, then the least hazardous, most effective herbicides will be used to meet those objectives (USFWS 2009).

Refuge staff must complete a Pesticide Use Proposal (PUP) whenever a pesticide is used on a refuge, including applications by staff, volunteers, contractors, or in association with a right-of-way easement or Special Use Permit. The PUPs are usually completed and submitted by individuals with duties related to plant management and knowledge and experience with herbicides. The full list of pesticides approved for use on APCNWR can be found in Appendix B-A. An online PUPS database enables staff to complete and submit PUPS electronically. Depending on the type of pesticide and conditions listed in the PUP, the Project Leader may review and approve the PUP or it may require review and approval by the Regional Office or even the Washington Office. The National Integrated Pest Management Coordinator works with a national team to determine the appropriate level of review and approval that each pesticide requires. PUP reviewers examine each PUP for compliance with regulations to ensure that employees use the most specific and effective pesticides with the least risk to manage the target pests.

As outlined in 569 FW 1.9 J (USFWS 2010), Refuge Managers or Project Leaders must ensure that:

- Pest management decisions are consistent with all applicable policies, laws, and regulations.
- Integrated Pest Management (IPM) plans are developed and include strategies consistent with resource management goals and objectives.
- IPM practices are promoted to landowners and others whose pesticide use may affect Service lands and resources.
- Anyone applying pesticides, releasing biological control agents, and conducting other Integrated Pest Management (IPM) activities has the appropriate training and equipment necessary to protect their safety and health.
- Pesticides are applied only after the appropriate reviewer approves the PUP.
- Threshold levels of damage for pest populations are established according to Service or field station goals and objectives and applicable laws.
- Staff must verify that damage levels for pest populations exceed threshold levels at potential treatment sites prior to treatment.
- After treatment, staff determines whether the pest management action achieved the desired results and whether there were any unanticipated or non-target impacts.
- Staff store, handle, and dispose of pesticides and pesticide containers in accordance with the label and in a manner that safeguards human, fish, and wildlife health and prevents soil and water contamination.
- Submit annual reports documenting pesticide use and efficacy into the online PUPS database (USFWS 2009).

In addition to Service policy, the approved PUPs include measures to minimize environmental impacts through the following best management practices:

- Calibrate application equipment
- Application must be in accordance with chemical label
- Field scouting and/or monitoring before pesticide application
- Use pesticide application buffers around sensitive areas
- Use lowest effective application rate
- Herbicides will not be applied within 100 feet of wetlands
- Foliar applications will not be made if wind speeds are in excess of 10 mph
- Pesticides will not be applied after a moderate or heavy rain or if significant rainfall is forecast within six hours

Overall, the effects of controlling invasive species for all of the alternatives would be moderate, beneficial, long-term, and localized to widespread. Adverse impacts are expected to be negligible to minor based on measures put in place to minimize environmental impacts.

4.3 Physical Environment

4.3.1 Impacts on Air Quality

Alternative A—No Action Alternative

The following activities would have an impact on air quality: invasive species control, Refuge farming operations, prescribed fire, construction and maintenance activities, public uses, scientific research, and oil and gas operations.

There is the potential for spray drift resulting from chemical control of invasive species, especially concerning aerial spraying. The majority of spraying is done through individual plant treatment using an ATV. Treatment is conducted on approximately 500–600 acres per year. Timing is dependent on the species being targeted and efforts to limit disturbance to protected species. Foliar applications will not be made if wind speeds are in excess of 10 miles per hour. There is the potential for additional adverse impacts on air quality due to exhaust from aircraft when conducting aerial spraying; however, aerial spraying is not conducted on a consistent basis (1–2 times in the last five years). Therefore, adverse impacts on air quality are expected to be negligible and short-term in duration.

The Refuge plants 80–150 acres (three food plot fields) annually based on weather conditions and resources. Preparation of fields lasts approximately 4–6 weeks in the spring, working every day. The period is highly dependent on weather. During rainy conditions, it may take up to four months to complete fields because the Refuge cannot operate equipment on wet soils. The Refuge's farming operation generally utilizes two tractors per field, preparing only one field at a time. During preparation, a disk is used to prepare the soil. Then usually one tractor is used for bedding the soil and one follows behind to plant the crop.

Prairie seed harvest generally occurs during a 3–4 week period in the fall based on when seed is available. This action is also highly dependent on weather. Some years harvest is not attempted because conditions are too wet, some years harvest activities are carried out for the entire 3–4 week period, and some years harvest is done sporadically during that 3–4 week period. One to three modified combines are used to collect seed, and a truck is used to transport the seed. Although exhaust gas and fugitive dust are potential

impacts to air quality, adverse impacts are expected to be negligible to minor based on the level of intensity and duration of these activities, and short-term, occurring at a site-specific scale.

Implementing a patch burning rotation, prescribed burning occurs on approximately 2,000–3,000 acres annually, mainly during December and January. In brush and grass vegetation types, smoke would dissipate rapidly, and smoke should be gone shortly after ignition. Using a patch burning sequence, the Refuge burns smaller units, resulting in smaller amounts of smoke rising into the air (Map B-1). Therefore, adverse impacts to air quality are expected to be minor, short-term, and occur at the Refuge scale.

Air quality may be impacted from dust and emissions produced by equipment and vehicle operation associated with general Refuge maintenance. General activities include maintaining existing facilities and infrastructure (e.g., Refuge headquarters, fences, windmills) and grading roads, which is conducted approximately 20 times per year. Performing work during times of low to no wind would abate blowing dust. Therefore, adverse impacts to air quality are expected to be negligible and site-specific.

Wildlife observation and photography, interpretation, environmental education, and scientific research have the potential to impact air quality. Vehicles travelling Refuge roads for public use and research purposes may result in emissions that could negatively affect air quality; however, very low frequency and duration of these uses will result in negligible impacts to air quality.

There is a potential for oil and gas operations to impact air quality. However, oil and gas operators would manage all equipment within State and Federal limits for emission to ensure minimal impacts to air quality within the area.

Overall, continued implementation of current management activities in Alternative A are expected to produce short-term adverse impacts to air quality that would be negligible to minor and occur at the local scale.

Alternative B—Proposed Action

The effects of Alternative B are expected to be the same as Alternative A; however, the construction of a new administrative facility, the realignment of the auto tour route, removal of old farm field infrastructure, creation of additional wildlife food plots, and other maintenance activities may have a greater adverse impact on air quality due to increased dust and emissions produced by equipment and vehicle operations associated with construction. Although the adverse impacts would be slightly greater, those impacts would still be considered short-term, negligible to minor, and occur at the Refuge scale.

Alternative C

The effects of Alternative C on air quality are expected to be the same as Alternative B; however, there would be a negligible short-term beneficial impact to air quality due to the elimination of farming because the exhaust gas and fugitive dust produced by the use of machinery would be eliminated. Restoring the farmed area to prairie habitat would have negligible adverse impacts due to restoration activities, which would require heavy machinery for replanting native seed and other activities. Once units are fully restored, adverse impacts on air quality should be nonexistent.

4.3.2 Impacts on Water Quality and Quantity

Alternative A—No Action Alternative

The following activities that would continue under Alternative A would have impacts on water quality: grazing, farming, invasive species control, and oil and gas operations.

Grazing is conducted through a calf-cow operation. Pastures are stocked at light to moderate levels based on best available science, which is roughly 14 acres per head, depending on soil type. Potential adverse impacts from grazing could occur through increased sedimentation. Refuge topography is flat and does not easily facilitate movement of sediment. Based on intensity of the activity and topography, adverse impacts to water quality are expected to be negligible.

The Refuge's farming operation generally utilizes two tractors per field. Preparation includes the use of 1–2 tractors and disks to prepare the soil. Then, one tractor is used for bedding, and one follows behind to plant the crop. These farming operations have the potential to increase erosion, thereby resulting in higher levels of sedimentation reaching area water bodies. This siltation could adversely affect water quality of the San Bernard River locally and downstream; however, farming activities are not expected to contribute to increased erosion due to the influence of the flat topography of the area, which minimizes erosion potential. Distance from the river or its tributaries (approximately one mile) further minimize erosion potential. Healthy grassland plant communities help filter runoff before it reaches waterbodies, thereby minimizing impacts to water quality. Therefore, the current farming operations would result in negligible long-term adverse impacts to water quality that occurs at a local scale.

Herbicides have the potential of leaching into and polluting groundwater and getting flushed into surface water if improperly applied. However, proper application under conditions specified on product labels and the use of best management practices minimizes movement of herbicides from their intended targets. Herbicides will not be applied after a moderate or heavy rain or if significant rainfall is forecast within six hours. Therefore, impacts on water quality are expected to be negligible.

Oil and gas extraction activities could potentially cause adverse impacts to water quality when accidental spills occur or when development sites are not properly rehabilitated. Clean up and restoration of these sites would occur according to the *Spill Prevention Control and Countermeasure Plan (2004*), which proactively plans for any issues associated with these developments. The oil and gas company has installed earthen berms (a raised area with vertical or sloping sides) intended to prevent contamination of the surrounding environment, including nearby waterbodies in the case of a spill and/or leak.

Overall, continued implementation of management activities under Alternative A are expected to produce negligible to minor long-term adverse impacts on water quality.

<u>Alternative B–Proposed Action</u>

Impacts would be the same as Alternative A; however, the following will have additional impacts on water quality: removal of impoundments and construction activities.

The removal of two man-made impoundments would result in more in-stream flow and less evaporation. Although open water from these impoundments would be removed, impoundments are man-made and not part of the natural or historical prairie habitat. The area will be restored to native prairie, and the restored prairie will contain an ephemeral wetland component that would be seasonally available. There would still be an overall reduction of open water on the Refuge, which would have negligible impacts on water quantity.

The construction phase of the following projects could potentially result in some impacts to water quality: prairie restoration projects (removal of levees, irrigation canals, drainage ditches), realigning the auto tour route, removal of roads and fences, the development of a new administrative complex, widening of the Refuge's entrance road, and other maintenance projects. These projects may require heavy equipment that could potentially result in some impacts on water quality from erosion and sedimentation; however,

projects will be completed over the 15-year life of the CCP and will not likely be conducted at the same time. Further, the flat topography of the area minimizes erosion potential.

Under this alternative, the Refuge would create additional wildlife food plots and look into irrigation options to increase crop success. Field preparation and planting would occur as described in Alternative A. An irrigation system would require digging a well and would pull from groundwater to irrigate portions of the 150 acres of crops. A portion of the water applied to irrigated acreage percolates back into the soil. The crop will use some of the water consumptively to grow, and some water applied to the acreage will evaporate. Generally, the Refuge would only irrigate as needed, based on weather conditions, and need would vary by crop. Irrigation potentially would take place off and on for a two- to three-month period in the spring. Therefore, this action is expected to have negligible impacts on water quantity and quality.

Overall, implementation of management activities in Alternative B are expected to produce short-and long-term adverse impacts to water quality and quantity that are negligible to minor and occur at the Refuge scale.

Alternative C

Impacts would be the same as Alternative B, however, the elimination of the farming program and restoring the area to native prairie would have some additional impacts on water quality.

The removal of the farming program (conducted on an annual basis), would eliminate ground disturbance, reducing the potential for erosion or sedimentation; however, the process for restoring these areas to native prairie would involve similar equipment used for farming operations to plant native grasses. Once the area is restored, the use of equipment will no longer occur in this area.

Overall, the intensity and duration of this action is expected to result in short-term negligible adverse impacts and long-term negligible beneficial impacts to water quality.

4.3.3 Impacts on Soils

Alternative A—No Action Alternative

Alternative A would result in adverse and beneficial impacts to soil with the continuation of some management activities.

The Refuge manages invasive species through chemical treatments and prescribed fire. ATVs and TerraGators® (large machine used to spray chemicals) are used to apply chemicals for invasive species control. Application is generally done for a six-week period during the fall months. The Refuge conducts individual plant treatment using two ATVs during that period. Generally, on an annual basis, a TerraGator® is used for a one-week period to treat heavily infested areas. This machinery may cause some soil compaction, although wide tires used on TerraGators® should minimize compaction. In addition, firebreaks are prepared by tilling (disking) to mineral soil using agricultural equipment. The adverse impacts on soil are expected to be negligible and short-term.

Feral hogs damage soils from rooting activities and nutria tend to disrupt soils through dike burrowing; therefore, efforts to control feral hogs and nutria have long-term beneficial impacts on soil.

Grazing is conducted through a calf-cow operation year-round. Cattle are stocked based on adaptive management to prevailing conditions. During dry conditions, cattle may be removed from pastures; during wet conditions, additional cattle may be added. The Refuge monitors conditions and controls the

number of cattle on each pasture. Pastures are generally stocked at light to moderate levels based on best available science. Current stocking rates range from 9–40 acres/animal unit-year (AUY) and average 18.2 acres/AUY. Sandy and previously disturbed soils are stocked with fewer cattle. Light to moderate grazing on average soils decreases infiltration by approximately 25 percent compared to the ungrazed condition (Gifford and Hawkins 1978). Grazing stimulates carbon and nitrogen cycling from above ground plant components to the soil (Schuman et. al. 1999). Therefore, grazing will have minor long-term beneficial and adverse impacts on soil.

The Refuge plants 80–150 acres (three food plot fields) annually based on weather conditions and resources. Preparation of fields lasts approximately 4–6 weeks in the spring, working every day. The period is highly dependent on weather. During rainy conditions, it may take up to four months to complete field preparations because the Refuge cannot operate equipment on wet soils. The Refuge's farming operations generally utilize two tractors per field, preparing only one field at a time. Preparation includes the use of 1–2 tractors and disks to prepare the soil. Then usually one tractor is used for bedding the soil, and one follows behind to plant the crop. Potential impacts from preparation and planting are disturbance to soils such as increased soil erosion, leaching of nutrients, and physical degradation. Long-term minor adverse impacts are expected that would be site specific.

Prescribed fire is conducted on the majority of the 10,541-acre Refuge (See Map B-1). The Refuge conducts prescribed fire using a patch burning rotation, burning approximately 2,000–3,000 acres annually. The areas that are not yet incorporated into the patch burning rotation are generally burned every 4–6 years. Using a patch burn system combined with grazing improves root tissue quality by promoting faster cycling of nitrogen and increasing nitrogen availability. (Anderson et al. 2006, Weir et al. 2007, Johnson and Matchett 2001). However, tilling of fire breaks on the periphery of burns to mineral soil to ensure proper control results in soil disturbance with impacts similar to those discussed for the food plots. Therefore, implementation of prescribed fire under Alternative A is expected to result in long-term minor adverse impacts near fire breaks and moderate long-term beneficial impacts on soils within the areas burned.

Wildlife observation and photography, interpretation, environmental education, and scientific research have the potential to impact soils. The use of trails and other area of the Refuge for these activities may cause some soil compaction and possible erosion, but the very low frequency and duration of these uses will result in negligible impacts to soil.

Oil and gas extraction activities have the potential for causing adverse impacts to soils when accidental spills occur or when development sites are not properly rehabilitated. Clean up and restoration of these sites occurs according to the Spill Prevention Control and Countermeasures Plan (2004), which proactively plans for any issues associated with these developments. The oil and gas company has installed earthen berms (a raised area with vertical or sloping sides) intended to prevent contamination of the surrounding environment in case of a spill and/or leak.

Overall, continuing management under Alternative A would result in minor short-term and long-term adverse impacts and moderate long-term beneficial impacts.

Alternative B—Proposed Action

The effects of Alternative B are expected to be the same as those under Alternative A; however, there would be additional impacts due to projects identified in the proposed action.

The removal of two man-made impoundments, levees, irrigation canals, drainage ditches, roads, fences, and other infrastructure would have an impact on prairie habitat. During the construction phase, when infrastructure is being removed, heavy machinery (possibly tractors, etc.) may be needed to complete projects. Heavy machinery would cause some soil disturbance, soil compaction, and possible erosion. Once infrastructure is removed, the areas will be restored through planting of native prairie seed. Restoration to native grasses would increase soil health. There will be long-term beneficial impacts on soil once functional hydrology has been restored. These projects are expected to have short-term minor adverse impacts and long-term moderate beneficial impacts on soil.

The Refuge would be removing and adding fencing in an effort to consolidate pastures to better manage prairie (refer to Map 4-4 and 4-5 in the CCP). This is to reduce overall fragmentation on the Refuge due to infrastructure. Grazing would still be managed as described under Alternative A. The removal and addition of fences would require some equipment that would cause some disturbance to soil and soil compaction. This activity is expected to result in short-term negligible to minor adverse impacts. The removal of infrastructure and consolidation of pastures is expected to have negligible to minor long-term beneficial impacts on soil.

The development of a new trail at Horseshoe Lake would not involve major groundbreaking activities. The vegetation would be mowed for visitor access. It may require some minor trimming of trees in some areas where tree cover is thick. Mowing, trimming, and foot traffic on the new trail may cause some soil compaction; however, adverse impacts on soil are expected to be negligible and short-term.

The construction of a new administrative facility would occur in the existing footprint of the current administrative facility. Further, the re-routing of the auto tour route would be on existing service roads; therefore, these actions are expected to result in negligible adverse impacts.

The creation of additional wildlife food plots would also have additional adverse impacts on soil compared to Alternative A due to disturbance while new areas are being prepared for planting. Field preparation and planting would occur as described in Alternative A. The Refuge would also look into irrigation options to increase crop success. This would require digging a well and installation of an irrigation system. This activity would cause additional disturbance to soil. Once installation is completed, additional soil disturbance would no longer take place. This is expected to have minor adverse impacts that are short-term and site-specific.

The Refuge would take a one-time holistic approach for invasive species control. This would involve multiple individuals within a short window of time treating the entire Refuge through individual plant treatment using the same chemicals as listed under Alternative A. This activity would require more ATVs than listed in Alternative A. This one-time approach would expectantly require less treatment in the future, allowing the Refuge to develop a schedule for treating invasive species before huge infestations occur. This approach is expected to have short-term negligible adverse impacts on soil due to compaction from multiple ATVs, but minor beneficial impacts are expected long-term.

Overall, negligible to minor short-term adverse impacts and minor long-term beneficial impacts are expected from implementing management activities under Alternative B. These impacts would be site-specific.

Alternative C

Some activities proposed under Alternative C would have additional impacts on soil.

Under Alternative C, the Refuge would restore the prairie landscape to historical topography and natural drainage. This would require heavy equipment to manipulate the land to create elevation gradients, mima mounds, and seasonal wetlands. This would cause soil disturbance and compaction and could potentially cause some erosion. These activities are expected to result in short-term minor to moderate adverse impacts and minor long-term beneficial impacts on soil.

Removal of the three wildlife food plots would eliminate the potential for increased soil erosion, leaching of nutrients, and physical degradation from tilling and preparing fields for planting. The removal of wildlife food plots would have long-term minor beneficial impacts on soil in that area.

Overall, activities proposed under Alternative C are expected to have short-term minor to moderate adverse impacts and minor long-term beneficial impacts on soil.

4.4 Biological Environment

4.4.1 Impacts on Habitat

Alternative A—No Action Alternative

The following activities will have both beneficial and adverse impacts on habitat: management of impoundments, prairie restoration activities, wildlife food plots, invasive species control, public use, scientific research, and oil and gas operations. The majority of management activities are conducted to manage habitat for Attwater's prairie-chicken and other native wildlife species.

Two man-made impoundments (totaling 200 acres) were built during the 1980s and are not a natural component of the prairie. These impoundments harbor invasive species such as deep-rooted sedge and Macartney rose, which flourish in moist soils. In addition, the presence of feral hogs and nutria associated with the two man-made impoundments has adverse impacts to habitat through feral hog rooting activities and nutria dike burrowing. Continuing current management of these areas is expected to result in adverse moderate impacts that are long-term in duration.

Prescribed fire and grazing are the primary management tools used on the Refuge to provide high quality grassland habitat. Although these activities have potential adverse impacts to other resources (as listed in previous sections), the activity is expected to have major long-term beneficial impacts on habitat. The combination of fire and grazing increases nitrogen availability in grassland, which assists with creating great plant diversity (Anderson et al. 2006, Weir et al. 2007, Johnson and Matchett 2001).

Invasive species control using chemical treatment is conducted annually for approximately six weeks during the fall months. Invasive species out-compete native species for resources. The Refuge uses best management practices to minimize impacts to non-target vegetation when using chemical treatments. Invasive species control is expected to have negligible adverse impacts and long-term moderate beneficial impacts on prairie habitat.

Temporary impacts to habitat occur as tall grasses are pushed over by the harvest equipment, creating a two-track trail in some cases. However, most plants are entering fall or winter dormancy at the time of harvest. Modified combines are used to harvest native grass seed by cutting grass seed heads as high off the ground as possible (generally no lower than 10 inches). This action is highly dependent on weather. Some years harvest is not attempted because conditions are too wet, and some years harvest activities are carried out for the entire 3–4 week period. The Refuge uses cleaned, de-bearded seed and hay bales (collected by the Refuge in partnership with grazing tenants or local farmers) with seed to restore

cultivated areas. Harvesting and replanting native prairie seed is an important aspect of prairie restoration. Negligible short-term adverse impacts may occur at seed harvesting sites; however, there would be long-term moderate beneficial impacts to restored area and overall Refuge habitat.

Three wildlife food plots (totaling approximately 150 acres) have replaced native habitat. Food plots provide supplemental food sources for APCs and other wildlife during fall and winter, periods that are stressful for many wildlife species. While plant diversity is reduced in the local vicinity of these plots, landscape diversity is increased and the process of cultivating promotes production of native forbs such as croton and signal grass. Further, organic farming practices are observed and invasive species are not an issue in these areas. Wildlife food plots are expected to have moderate beneficial impacts on habitat.

Some trampling of vegetation may occur while Refuge users are participating in wildlife observation and photography, interpretation, environmental education and scientific research, but the very low frequency and duration of these uses will result in negligible impacts to habitat.

Oil and gas extraction activities could cause adverse impacts to habitat when accidental spills occur or when developed sites are not properly rehabilitated. Clean up and restoration of these sites occurs according to the *Spill Prevention Control and Countermeasures Plan* (2004), which proactively plans for any issues associated with these developments. The oil and gas company has installed earthen berms (a raised area with vertical or sloping sides) intended to prevent contamination of surrounding environment in the case of a spill and/or leak.

Overall, the continuation of management under Alternative A would have negligible to minor short-term and long-term adverse impacts and moderate to major long-term beneficial impacts on Refuge habitat.

Alternative B—Proposed Action

Impacts under Alternative B are expected to be similar to those in Alternative A; however, additional impacts from habitat management activities are expected.

The construction of a new headquarters facility would be in the same footprint as the current headquarters compound and would require minimal clearing of vegetation. Impacts on habitat are expected to be negligible.

The development of a new trail at Horseshoe Lake would not involve major groundbreaking activities. The vegetation would be mowed for visitor access. It may require some minor trimming of trees in some areas where tree cover is thick. Mowing, trimming, and foot traffic on the new trail are expected to have long-term negligible adverse impacts on habitat that are site-specific.

The Refuge would take a one-time holistic approach for invasive species control. This would involve multiple individuals within a short window of time treating the entire Refuge through individual plant treatment using the same chemicals listed under Alternative A. This activity would require more ATVs than listed in Alternative A. This one-time approach would ideally require less treatment in the future, allowing the Refuge to develop a schedule for treating invasive species before huge infestations occur. This approach would decrease the coverage and stature of invasive plants on the landscape. This approach is expected to have short-term negligible adverse impacts on habitat due to trampling of vegetation from multiple ATVs, but moderate beneficial impacts are expected long-term.

The Refuge would be removing and adding fencing in an effort to consolidate pastures to better manage prairie (refer to Map 4-4 and 4-5 in the CCP). This is being done to reduce overall fragmentation on the

Refuge due to infrastructure. Grazing would still be managed as described under Alternative A. The removal and addition of fences would require some equipment and minor trampling of vegetation. These adverse impacts are expected to be short-term and negligible to minor. The removal of infrastructure and consolidation of pastures are expected to have minor long-term beneficial impacts on habitat.

Restoring areas that were previously cultivated and the removal of the two man-made impoundments (200 acres) would have minor adverse impacts on habitat that are short-term in duration during the actual removal of levees and other infrastructure associated with these areas because it would require some vegetation clearing. These areas would be restored through native seed plantings and would be incorporated into the fire and grazing cycle. This would have long-term major beneficial impacts on coastal prairie habitat and would increase viable APC habitat.

Under this alternative, the Refuge would explore options for obtaining a consistent amount of prairie seed annually for restoration. One option would be obtaining seed that has been grown in a controlled environment. Having a consistent amount of prairie seed annually would allow the Refuge to restore more acres than are currently being restored. This is expected to have moderate long-term beneficial impacts on habitat.

The Refuge would explore options for improving crop success, including creating additional wildlife food plots and investigating the possibility of adding an irrigation system. New food plots would be placed in areas that have previously been disturbed so as to not reduce native prairie acreage. This is expected to have minor adverse impacts on prairie habitat. The installation of an irrigation system would cause some habitat disturbance as a well is drilled and when maintenance would be needed. Adverse impacts on habitat, however, would be minor, short-term and would be site-specific.

Overall, management actions proposed under Alternative B are expected to have short- and long-term negligible to minor adverse impacts and minor to major long-term beneficial impacts on Refuge habitat.

Alternative C

Impacts would be the same as Alternative B; however, activities under Alternative C would have additional impacts on habitat. A seed harvest program would be established on the Refuge that would potentially supply more seed. However, weather conditions would still limit production and harvesting capabilities. The Refuge would eliminate the three wildlife food plots and restore those areas to native prairie. These activities are expected to have minor long-term beneficial impacts on habitat and moderate beneficial impacts by the expansion of viable APC habitat.

4.4.2 Impacts on Wildlife

Alternative A—No Action Alternative

Under the No Action Alternative, the existing habitat conditions would be maintained.

Prescribed burning and grazing have a beneficial impact on ground-dwelling grouse species and other grassland species by reducing woody vegetation and creating a mosaic of habitat structures necessary for meeting life requisites (e.g., Lehmann 1941, Chamrad and Dodd 1972, Westemeier 1972, Lehmann 1965, Kessler 1978a, Horkel 1979, Bidwell et al. 2003, USFWS 2010). Historically, natural disturbances, such as fire, were a component of the coastal prairie. During a prescribed burn, most wildlife flee the area, causing temporary displacement of some species. Wildlife would quickly return to the area. These

management tools are expected to have negligible short-term adverse impacts and moderate long-term beneficial impacts on wildlife.

Efforts to restore and maintain prairie habitat are beneficial to both migratory and resident wildlife, including short-eared and burrowing owls, LeConte's sparrows, and Sprague's pipits. The Refuge provides riparian areas along the San Bernard River and Coushatta Creek that have beneficial impacts to wildlife by supporting a diversity of species, including passerine birds, raptors, and several species of amphibians and reptiles. Continuing management of the two man-made impoundments would provide habitat for some migratory waterfowl and waterbirds. This management is expected to have moderate long-term beneficial impacts on wildlife.

The Refuge would continue to control feral hogs and nutria on an annual basis. Feral hogs compete with native species and destroy Refuge habitat through rooting activities. Feral hogs would be removed based on sighting and/or documented damage, and nutria would be removed as they become relatively abundant to minimize damage to water control structures and levees. The adverse impacts of red imported fire ants (RIFA) to a variety of wildlife species are well documented (Allen et. al. 1994, Drees 1994, Allen et. al. 1995, Mueller et. al. 1999, Allen et. al. 2001, Wojcik et. al. 2001, Allen et. al. 2004). Red imported fire ants would be controlled through chemical treatment as needed. Refuge personnel would apply 2–5 tablespoons of AmdroPro or Extinguish Plus per mound for spot treatment, not to exceed 1.5 pounds per acre in the vicinity of APC nests. Broadcast application on a unit-wide (pasture) basis would be continued to research the impacts of RIFA on insect communities used as food by APC broods. Application would be conducted using best management practices to minimize impacts to non-target wildlife species. Invasive species control is expected to have negligible adverse impacts and moderate long-term beneficial impacts on Refuge wildlife.

The Refuge conducts small mammal removal (striped skunks, opossums, raccoons, and feral and domestic dogs and cats) to assist in APC recovery. Coyotes and bobcats are only removed if individuals become a nuisance. Predator management is conducted in the spring prior to and during APC nesting season. The Refuge's largest mammalian problems include striped skunks (removing 80–100 annually), raccoons (40–50), and opossums (20–30). Although there would be a major impact on the particular individual trapped, short-term negligible adverse impacts would occur on the species as a whole (U. S. Department of Agriculture 1997). The effort to reduce perching predators on the Refuge through perch deterrents placed on fence posts would have minor adverse impacts on raptor species because they would be displaced from core APC habitat.

Heavy machinery during the months when the Refuge is preparing food plots would cause some disturbance and displacement of wildlife. Once fields are planted, this disturbance would no longer occur. Further, the process of cultivating promotes production of native forbs such as croton and signal grass. These native plants produce seed utilized by APC and other wildlife.

The food plots attract many species of wildlife, including deer, geese, and insects. There is an overall increased species diversity of insects in the food plot areas. The Refuge farming program has negligible short-term adverse impacts and minor long-term beneficial impacts on wildlife populations.

Oil and gas production has been in operation for a number of years and occurs in areas that were formerly cultivated prior to Refuge acquisition. Although these areas have not been totally restored to prairie habitat, some wildlife disturbance would be expected from maintenance and production activities associated with existing oil and gas developments. Currently, oil and gas developments have negligible to minor impacts on wildlife.

Impacts associated with wildlife observation and photography, interpretation, and environmental education vary based on mode of access. Pedestrians, vehicles, and bicycles have the potential to disturb wildlife and influence wildlife distribution and habitat use. Disturbance of wildlife by visitors is likely to be greatest in concentrated areas of use, including along trails and roads. While some species appear to acclimate to vehicular traffic, and even the presence of visitors on trails, other species are less tolerant of disturbance. Overall, it is likely that species composition and abundance is decreased in areas supporting these recreational uses. However, by concentrating disturbances to these designated areas, which constitute a very small portion of the Refuge, large and extensive tracts of undisturbed habitat remain available for wildlife throughout the Refuge. Disturbance impacts caused by wildlife photographers tend to be greater than other public uses as photographers are much more likely to leave their vehicles and approach wildlife on foot. Other impacts include the potential for photographers to remain close to wildlife for extended periods of time in an attempt to habituate the wildlife subject to their presence and the tendency of casual photographers with low power lenses to get much closer to their subject than other activities would require. Litter improperly discarded by visitors can entangle wildlife or be ingested, potentially resulting in injury or death. Efforts to educate the public about such issues are incorporated into outreach efforts, educational programs, and interpretative programs. Visitor access, however, is typically by individuals or groups that participate in recreational activities for short durations. These uses are expected to have negligible to minor adverse impacts on Refuge wildlife. Enhancing these uses will give many people a deeper appreciation of wildlife and a better understanding of the importance of conserving wildlife and its habitat.

Overall, continuing current management would have negligible to minor short- and long-term adverse impacts and minor to moderate long-term beneficial impacts on Refuge wildlife.

Alternative B—Proposed Action

Implementing the Proposed Action would have similar impacts as Alternative A; however, there would be additional beneficial and adverse impacts on small mammals, birds, and other wildlife due to the following activities.

Under this alternative, the Refuge will remove two man-made impoundments and restore the areas to native prairie. These impoundments (artificial wetlands) were created at a time when APC numbers were significantly higher than they are today and are located in areas that once provided prairie habitat for the endangered APC. The presence of these impoundments also introduces the potential for the spread of disease from migrating waterfowl. Substantial loss of waterfowl to avian cholera occurred on Refuge impoundments and other area waterfowl concentration points during the late 1980s and early 1990s. Analysis of blood samples collected from Attwater's prairie-chickens at the Refuge indicated that 25 percent (1/4) and 20 percent (1/5) tested positive for exposure to *Pasteurella multocida*, the causative agent for avian cholera, in 1987 and 1993, respectively (Peterson et al. 1998). Removal of this infrastructure would compliment other APC recovery efforts to achieve restoration of native prairie and functional hydrology on the Refuge and would also decrease the potential for the spread of disease such as avian cholera resulting from larger waterfowl concentrations on the Refuge in these artificial impoundments. While wetland and open water habitat on the Refuge would be reduced, the two man-made impoundments are not the only available wetland habitat on the Refuge. The Refuge would still provide other open water habitat at Horseshoe Lake, seasonal wetlands, and livestock ponds. Ephemeral wetlands (approximately 1,000 acres) are scattered throughout the Refuge and are a natural component of the prairie ecosystem. Providing scattered wetlands reduces waterfowl concentrations in one area, presumably lowering the potential for disease outbreak. Additionally, the Refuge would restore the ephemeral wetland component of the native prairie formerly occupied by these impoundments, which would provide habitat for some of the

species that may be displaced. During the construction phase of this process, wildlife would be temporarily displaced. However, once the areas are restored to native prairie, grassland species will return to this area. This area would provide additional grassland habitat for grassland dependent species, such as APCs and Sprague's pipits. Only about two percent of the tallgrass prairie that existed in the early 1800s still remains (National American Bird Conservation Initiative 2009). The restoration of these two man-made impoundments to prairie habitat will likely reduce feral hog and nutria populations since they prefer moist areas. Restoration of these areas is not expected to have any impact on aquatic species since these man-made impoundments are seasonal and go dry for long periods over the year. Further, similar aquatic habitat is available at Horseshoe Lake, Coushatta Creek, and the San Bernard River. The removal of these impoundments is expected to have moderate long-term beneficial impacts on grassland-dependent species, minor short-term adverse impacts on Refuge wildlife in that area, and moderate long-term adverse impacts on migratory waterfowl.

Prairie restoration projects like the removal of old farm field infrastructure would have short-term minor adverse impacts on small mammals, birds, and other wildlife due to habitat loss and displacement during implementation; however, similar habitat is available in other areas of the Refuge and surrounding lands. The long-term wildlife benefits associated with the restoration and expansion of native grassland habitats would outweigh temporary displacement of species during the construction phase of these projects.

The new auto tour route alignment would be on existing service roads. These roads would require some improvements to include pull-outs. During the process when these roads are being improved for the auto tour route, some wildlife disturbance and displacement may occur. Additionally, there may be some disturbance to wildlife from long-term visitor usage. While these roads are currently being travelled by Refuge staff, traffic would increase as result of the new auto tour route alignment. Disturbance would vary depending on season of the year. This activity is expected to have negligible to minor short- and long-term adverse impacts on wildlife.

Increasing the number of food plots and increasing efficiency through an irrigated system would continue to benefit wildlife. There would be minor short-term adverse impacts that would occur at the site-specific scale while the installation of an irrigation system and addition of food plots takes place due to disturbance from loud machinery. Wildlife species would be temporarily displaced but would return to the area following the installation of the well, irrigation system, and food plot. This is expected to result in negligible beneficial impacts on Refuge wildlife.

Overall, activities under Alternative B are expected to have minor to moderate long-term beneficial impacts, negligible to minor short-term adverse impacts, and negligible to moderate long-term adverse impacts on Refuge wildlife.

Alternative C

Impacts would be the same as Alternative B; however, the removal of the three wildlife food plots may have minor adverse impacts on the species that use the habitat and food these plots provide. Adverse impacts would be short-term, and species are expected to return to the area following the restoration to native prairie.

4.4.3 Impacts on Threatened and Endangered Species and Special Status Species

Alternative A—No Action Alternative

Actions under Alternative A are expected to have both beneficial and adverse impacts on threatened and endangered species.

The Refuge would continue to use a patch burning rotation to manage prairie habitat. Research suggests that a rotation of smaller burns and associated grazing pressure would create the patchwork of burned and unburned prairie needed for breeding and nesting greater prairie-chickens (Bidwell et al. 2003, Patten et. al. 2007). Prescribed fire also facilitates nutrient cycling and improves grazing distribution of livestock and wildlife. This activity is expected to have long-term moderate beneficial impacts on APC populations occurring at the Refuge scale.

Grazing would consist of year-round cow-calf operations. Pastures would be stocked at light to moderate levels. Light to moderate grazing, often in combination with prescribed fire, is a generally accepted tool in prairie-chicken management in preventing creation of an overly dense, matted grassland cover situation (Lehmann 1941, Hamerstrom et al. 1957, Chamrad and Dodd 1972, Cogar et al. 1977, Kessler 1978a, Kessler 1978b, Jurries 1979, USFWS 2010). Grazing enhances APC habitat by facilitating movements and feeding through reduced litter accumulation, creation of cover openings, and increased cover heterogeneity (Lehmann 1941, Kessler 1978a, Kessler 1978b). Additionally, grazing creates short grass cover at livestock concentration points (e.g., watering points) suitable for APC courtship activities (Kessler 1978b). Grazing is expected to have long-term moderate beneficial impacts on APC.

Harvesting native seed occurs in the fall when APC's dispersal is most widespread. Direct impacts to prairie-chickens are not expected to occur. In fact, observations suggest that although harvesting activities may result in temporary disturbance, APCs may actually select these recently harvested sites for cover due to the physical arrangement of grass stubble and straw.

The two man-made impoundments on the Refuge have replaced native grassland habitat. There is the potential for diseases, such as avian cholera, which can be present in high concentrations of migratory waterfowl, and potentially spread to APC. Impoundments also attract feral hogs, which degrade Refuge habitat through rooting activities. Continuing management of these impoundments has potential minor to moderate long-term adverse impacts on APC.

The Refuge would continue treatment and studies on red imported fire ants. Controlling red imported fire ants would reduce the impacts of RIFA on insect communities and reduce chick mortality. They are also a threat to ground dwelling nesting birds and other wildlife (Allen et. al 2004). Controlling RIFA through chemical treatments and continuing research are expected to have major long-term beneficial impacts on brood success and APC populations as a whole.

Wildlife food plots provide supplemental food during the winter months for Attwater's prairie-chickens. These areas also provide shelter, facilitate APC flocking and social behaviors, and provide an abundant source of insects during the summer months. Further, the process of cultivating promotes production of native forbs such as croton and signal grass, which produce seed utilized by APC. Managing these food plots would have moderate long-term beneficial impacts on APC populations on the Refuge.

Toepfer (2003) reported 69.9 percent of observed greater prairie-chicken predation was by raptors, and 30.4 percent by mammals. Perch deterrents are placed on fence posts in core APC habitat, and small mammal predators are removed to decrease the overall predation-related mortality of APC. The Refuge conducts small mammal removal on striped skunks, opossums, raccoons, and feral and domestic dogs and cats. Coyotes and bobcats are only removed if individuals become a nuisance. Predator removal is conducted in the spring prior to and during the APC nesting season. The Refuge's largest mammalian problems include striped skunks (removing 80–100 annually), raccoons (40–50), and opossums (20–30). These activities are expected to have long-term moderate beneficial impacts on APC populations.

Perch Deterrents. CREDIT: USFWS

APC recovery efforts, which include captive bird releases, headstart brood boxes, and placement of radio transmitters, may have negligible to minor adverse impacts on APC individuals. Handling of the birds to do these activities would cause them temporary stress. However, major beneficial impacts that are long-term to the overall recovery of the species should result from the information gathered in conducting these activities.

Individuals visiting the Refuge for recreational purposes are not allowed in the core use area for prairie-chickens unless accompanied by Refuge staff, and while this may lead to a significantly reduced opportunity for visitors to see prairie-chickens, it reduces potential negative impacts as well. Educating the public through public use programs about Attwater's prairie-chicken is a primary goal of the Refuge and will include some staff-led tours in the restricted use area, which may cause temporary and mild amounts of disturbance to prairie-chickens. Providing public uses opportunities is expected to result in negligible adverse impacts to APC.

Oil and gas operations on the Refuge in areas that were formerly cultivated prior to Refuge acquisition have occurred for a number of years. Habitat has not yet been restored to native prairie in these areas, although restoration is currently in progress. Therefore, these areas are not consistently used by prairie-chickens to date. If APCs become established in this area, the Refuge may need to reassess the impacts of oil and gas operations. Currently, oil and gas developments have negligible to minor impacts on APC.

Although releases of captive-reared Houston toads occurred on the APCNWR during the early to mid-1980s, no Houston toads have been documented on the Refuge in recent years. Therefore, it is unlikely that management actions would affect Houston toads.

Overall, continuing management under Alternative A is expected to result in moderate to major long-term beneficial impacts and negligible to moderate long-term adverse impacts on the endangered Attwater's prairie-chicken.

<u>Alternative B—Proposed Action</u>

In addition to the impacts described under Alternative A, the Proposed Action would have additional beneficial impacts to APC.

Restoring Refuge lands that were previously cultivated and restoring approximately 200 acres of man-made impoundments would provide additional grassland habitat on the Refuge. Grassland habitat off-Refuge has declined 83 percent in historic times (Morrow et.al. 1996). Only about two percent of the tallgrass prairie that existed in the early 1800s still remains (North American Bird Conservation Initiative 2009). In addition to providing habitat for APC, removal of impoundments would also reduce the potential spread of disease from migrating waterfowl. Once these areas are restored, lands would be incorporated into the grazing program and patch burn rotation that are currently implemented on native prairie. Restoration of these areas to native habitat is expected to have major long-term beneficial impacts on APC by providing additional suitable habitat.

The more proactive approach to land acquisition would have long-term major beneficial impacts on APC by increasing the opportunities to provide suitable lands for APC populations to expand.

The Refuge would treat invasive species at one time using a systematic approach. This would enable the Refuge to get a better handle on invasive species control by reducing the amount of invasive species and brush that hinder prairie-chicken movement. This would also reduce perch locations for predatory raptors. This activity would have long-term moderate beneficial impacts on APC populations.

Pastures would be consolidated by removing approximately 10 miles of fence on the Refuge. This would also reduce potential collision hazards, invasive species corridors, predator travel corridors, and perch sites for raptors, which all occur with the presence of fencing on the Refuge. Firebreaks located along fence lines also become barriers to water flow when soil accumulates along them. The consolidation of pastures would have long-term moderate beneficial impacts on APC.

Under this alternative, the Refuge would remove brush along Coushatta Creek. This brush consisted of invasive species like Macartney rose, Chinese tallow, and deep-rooted sedge. This area serves as a corridor for small predators and as perch sites for avian predators. Removing this brush would have long-term minor beneficial impacts on APC populations.

Creating new food plots would allow for better access for APCs. Irrigating crops would reduce crop failure, thus providing more food and shelter for APCs. Additional food plots and incorporating the possibility to irrigate crops would have moderate long-term beneficial impacts on APC populations.

Realignment of the auto tour route would require improving current service roads, and there would be increased visitor use of that area, which may cause some disturbance. The degree of disturbance would depend on time of year. The auto tour route would not go through core APC habitat at this point. Therefore, this is expected to have short-term, negligible adverse impacts on APC populations. Adjustments to timing of traffic on the auto tour route (e.g., close the tour route during morning prairie-chicken display periods) may be necessary if APC increase use of this area due to population expansion.

Increased environmental education and expanding the public use program would lead to increased public awareness of Refuge purposes and APC recovery efforts. Increased public use of the Refuge may result in limited disturbance. However, increased awareness of APC recovery efforts is expected to have long-term beneficial impacts on APC.

Overall, activities proposed under this alternative are expected to have minor to major long-term beneficial impacts on APC and negligible short-term adverse impacts.

Alternative C

Impacts are expected to be the same as Alternative B; however, the elimination of the wildlife food plots would have moderate adverse impacts on the APC population that may be long-term in duration and occur at a local scale because these areas would no longer provide supplemental food or facilitate flocking and social behaviors.

Compared to Alternative A, the Refuge would graze using only bison. Bison consume more graminoid species and generally less forbs and browse than cattle (Plumb and Dodd 1993). Since forbs are especially important in the APC diet (Lehmann 1941, Kessler 1978a, Cogar 1980), reduced forb consumption by bison as compared to cattle suggests less potential for competition between APCs and bison for the forb resource. This is expected to result in minor long-term beneficial impacts to APC.

4.5 Human Environment

4.5.1 Impacts on Cultural Resources

Alternative A—No Action Alternative

Under this alternative, there are no anticipated direct or indirect impacts to the cultural environment, as current conditions would be maintained, and no ground disturbance would occur.

Alternative B—Proposed Action

Under the Proposed Action Alternative, there could be impacts to cultural resources if any archeological sites are found where ground disturbance is planned. If archaeological sites are found, the Refuge would survey the area and coordinate with the Regional Archeologist before activities proposed under this alternative are implemented.

Alternative C

Impacts would be the same as Alternative B.

4.5.2 Impacts on Socioeconomics

Alternative A—No Action Alternative

The economic and social condition of the area would remain the same, with beneficial impacts on surrounding areas. The presence and operation of the Refuge provides economic benefits to the surrounding communities within a 30-mile radius in several ways. The Refuge attracts local, national, and some international visitors. By attracting visitors to the area, the Refuge generates revenue for the local economy. Much of the Refuge's annual budget is recycled into local businesses through Refuge staff, purchases of equipment and supplies, as well as contracts for local labor to accomplish Refuge projects. The Refuge provides full-time employment for eight individuals that live in nearby communities. Socio-economic benefits from the current grazing program are attributable to the fact that the cattle and bison operations are private sector enterprises, managed through Special Use Permits (SUP) with the Refuge. As such, expenditures and profits associated with the grazing operations and seed harvesting are important inputs to the economy of the local community.

Alternative B—Proposed Action

In additional to the beneficial impacts described under Alternative A, the proposed action would have a beneficial impact on the local economy through projects proposed under this alternative. Generally, local

contractors and/or vendors are used to complete large projects. Exploring partnerships and cost-share opportunities for native prairie seed production would have minor beneficial impacts on the local communities. Relocation of the auto tour route, the construction of the new administrative facility, and other construction projects could have beneficial impacts on local communities that would be short-term for the duration of construction phases. Depending on the contractor and size of projects, in some cases supplies and materials needed for construction of these projects would be purchased from the local communities.

Enhancing the public use program through the construction of a new Visitor Contact Station and trail, increasing the number of interpretive events, and other opportunities outlined in Alternative B could result in long-term beneficial impacts for local communities based on these communities receiving more income generated by eco-tourism.

Alternative C

The impacts would be the same as Alternative A, but grazing solely with bison would have minor beneficial economic impacts for the bison permittee at the local scale. There would be moderate adverse economic impacts for the cattle permittee. There would be minor adverse effects to the local economy from not planting the food plots due to the loss of sales associated with preparing and planting the food plots (e.g., fuel, seed, fertilizer, equipment parts).

4.5.3 4.5.3 Impacts on Aesthetic and Visual Resources

Alternative A—No Action Alternative

There would be minor adverse impacts to the visual landscape from acclimation pens placed on the Refuge for releasing captive bred APC. These pens are relocated to a different area of prairie every few years to minimize impacts on prairie quality. Continued presence of oil and gas operations would detract from the visual quality of the area.

Alternative B—Proposed Action

In additional to Alternative A, implementing the Proposed Action would have both adverse and beneficial impacts on visual resources on the Refuge. During proposed prairie restoration actions, auto tour route realignment, and new administrative facility construction, minor adverse visual effects could occur from construction equipment, dust, and the loss of vegetative cover. In the long-term, visitors may experience improved visual quality of the site and its surroundings consistent with natural prairie function and vegetation.

The removal of the two man-made impoundments would change visual resources in this area because viewing those wetlands would no longer be possible. However, new viewing opportunities made available under this alternative would depict a more realistic view of historic habitat conditions when prairie-chickens were abundant, and thereby result in beneficial long-term impacts.

Alternative C

The effects of Alternative C are expected to be the same as those under Alternative B.

4.5.4 Impacts on Public Use Opportunities

Alternative A—No Action Alternative

Under Alternative A, there are beneficial and adverse impacts on public use. The annual Attwater's Prairie-Chicken Festival has beneficial impacts on public use by providing visitors with the unique opportunities to view APC in the wild through guided van tours.

Depending on the time of year, the current public use program provides an auto tour route that enables the visitor to view some migratory birds and wetland species. This is a minor beneficial impact that occurs at the local scale. For individuals who value native prairie habitat, the current auto tour route would have minor long-term adverse impacts on public use because the auto tour route runs through a disturbed area and two man-made impoundments that do not show the visitor quality native coastal prairie habitat. Because the current auto tour route does not come back to the Visitor Contact Station, it does not foster communication between visitors and Refuge staff.

Grazing bison in the area adjacent to the public use area has minor beneficial impacts on wildlife observation and interpretation. The Refuge uses bison as an interpretive opportunity to teach visitors about the relationship between bison and native prairie.

The current environmental education program has minor beneficial impacts on public awareness of APCNWR since the current program does not proactively solicit schools. The program works on an "as requested" basis as staff time allows.

The continued presence of oil and gas facilities may decrease the quality of the Refuge experience by decreasing the naturalness of the area; however, the Refuge does not have jurisdiction over mineral rights.

Alternative B—Proposed Action

The relocation of the auto tour route would have both beneficial and adverse impacts, depending on the user group. The new auto tour route, which would go through an area of native prairie habitat, would allow visitors to see and appreciate recovery efforts by the Refuge, providing minor beneficial impacts to visitors who would like to see native coastal prairie. The auto tour route would have minor adverse impacts on visitors who only like to see migratory waterfowl and/or wetland dependent species because the auto tour route would no longer go by man-made impoundments since the impoundments would be removed; however, similar viewing opportunities would be provided by an accessible trail to Horseshoe Lake.

The new auto tour route would also have beneficial impacts on public use as a whole by returning to the administrative offices where visitors can communicate their experiences to Refuge staff; the Refuge, through adaptive management, can use that feedback to improve public use opportunities.

Expanding the environmental education program would have beneficial impacts on public use because a full-time staff member would be hired to solicit local school and provide on-Refuge and off-Refuge educational opportunities. In addition, expanding the hours that the Visitor Contact Station is open to include weekends would make educational opportunities available to a wider clientele.

Exploration of new technologies, including webcam or live-stream video and podcasts, would have beneficial impacts on public use by providing visitors with the unique opportunity to view APC without causing disturbance to the birds.

Alternative C

This alternative increases beneficial impacts when compared to Alternative A because the addition of an outdoor classroom would increase the capacity of the environmental education program by providing students increased opportunities to learn about APC and the coastal prairie ecosystem. Grazing with only bison would have minor, long-term beneficial impacts on interpretation and wildlife viewing opportunities because the visitors would have more opportunities to learn about the relationships between bison and native prairie.

4.6 Assessment of Cumulative Impacts

"A cumulative impact is defined as an impact on the environment that results from the incremental impact of the [proposed] action when added to other past, present, and reasonably foreseeable future action regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time." (40 CFR 1508.7)

Cumulative impacts are the overall net effects on a resource that arise from multiple actions. Impacts can "accumulate" spatially, when different actions affect 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. Occasionally, different actions counterbalance one another, partially cancelling out each other's effects on a resource. But more typically, multiple effects add up, with each additional action contributing an incremental impact on the resource. Accurately summarizing cumulative effects is difficult in that while one action increases or improves a resource in an area, other unrelated actions may decrease or degrade that resource in another area.

As stated in the Service Manual (550 FW 1 and 2), in an EA, a cumulative impact assessment should be conducted if it is determined necessary through scoping to make a determination of significance of the proposed action. When a cumulative effects analysis is included in an EA, the analysis need only be sufficient for the decision maker to reach a conclusion on the significance of the impact to determine if the preparation of an EIS is required.

The Refuge is located 60 miles west of Houston. From 2007–2008, the Houston metro area experienced the nation's second-largest total population increase, adding 130,185 people (Texas Comptroller of Public Account 2010). The 13-county Gulf Coast Region's proximity to the Texas coast makes the area a center for commerce, industry, and agriculture. A vast majority of growth in this region is due to new jobs in oil and gas operations. Oil and gas operations near Refuge lands vary seasonally depending on the industry, and there are a number of facilities and pipelines within close proximity of Refuge boundaries. Agricultural and/or livestock uses are very prominent around the Refuge. Rice crops in this region account for 79 percent of the total crop acreage in Texas (Texas Comptroller of Public Accounts 2010). Colorado County is one of the State's top three rice producing counties. Spraying of croplands for pests and weeds has occurred and continues to occur regularly off Refuge. Less than one percent of original coastal prairie grasslands remain in relatively pristine condition (Smeins et al. 1991). Remaining representative pieces of most habitat types are generally small, fragmented, and degraded in some way (i.e., exotic plants, disrupted hydrology, overgrazing, channelization). Large landholdings are also becoming less common due to inheritance tax and developmental pressures. Within the last several years, new homes and subdivisions have encroached closer to Refuge lands.

The following section addresses the potential cumulative effects for all the alternatives and is intended to consider the activities on the Refuge in the context of other actions on a larger spatial and temporal scale.

The impacts of past and present actions that have taken place on the Refuge are reflected in the current resource conditions (affected environment) as described in Chapter 3 of the CCP. The impacts of proposed future actions (for all alternatives) are discussed in earlier parts of this EA. As discussed in the previous chapter of this appendix, the Service also considered past, present, and future planned actions on other State, Federal and private lands surrounding the Refuge. Based on this analysis, the Service has concluded that proposed Refuge management actions (for all alternatives), when added to other past, present, or future proposed actions, would not result in significant cumulative impacts, as summarized in the following text. The benefits to habitat, wildlife, and public use opportunities that the proposed actions would achieve greatly outweigh any of the adverse impacts discussed in this document.

Cumulative Impacts on Physical Resources

Air Quality

The growing metropolitan area of Houston, oil and gas activities, agricultural and/or livestock land uses, and developmental pressures can contribute to air pollution and have negative impacts on air quality. Lands near the Refuge are used for disposal of treated sewage sludge, which can also affect air quality. Even with these activities occurring around the Refuge and the Refuge's proximity to Houston, according to the Texas Commission on Environmental Quality (TCEQ), Colorado and Austin County have no reported long-term adverse air quality conditions as noted in Section 3.2.2 of the CCP.

Although similar activities that can affect air quality (prescribed burning, farming operations, prairie restoration, invasive species control, construction and maintenance activities, and visitor use) occur on the Refuge, the cumulative effects of these activities are negligible when compared to off-Refuge agricultural and industrial developments. The restoration and maintenance of over 10,000 acres of prairie habitat would be a long-term benefit to air quality by increasing carbon sequestration and preserving natural habitat. The presence of the Refuge would help serve to mitigate adverse impacts on air quality of the other human activities and processes in the region.

Water Quality and Quantity

An increasing population in the region, along with greater urban, industrial, and agricultural development, would tend to increase the extent of adverse effects on water quality in and around the Refuge by increasing discharges from point and non-point sources of water pollutants and contaminants. In addition, as the area grows and develops, there will be an increased demand for water, and water table drawdown could be a potential problem in the area. As noted in Section 3.2.3 of the CCP, the San Bernard River has been classified as impaired on the TCEQ 303 (d) list due to bacteria levels; however, tests conducted by State agencies report that river bacteria counts just south of the Refuge are usually at acceptable levels or better for most of the year than at points further downstream. Activities occurring off-Refuge and increasing population growth have negative implications for water quality and quantity in the area. The Refuge provides some benefits to water quality and quantity through the preservation of natural habitat and is not expected to add to adverse impacts cumulatively. However, the overall condition of water resources in the coming decades, with human population increases, will probably be somewhat less desirable than at present (somewhat less water available and somewhat lower water quality).

Soils

Past, present, and reasonably foreseeable future impacts to soil on the Refuge would stem mostly from activities on the Refuge, with the exception of potential development on adjacent Refuge land. Adjacent lands are currently used for crop production or ranching. Development near APCNWR lands may

increase market pressure on smaller private landowners to sell their property for further development. This development would degrade soil conditions around the Refuge.

On-Refuge cumulative effects on soils would result from several factors, including ground disturbance from crop cultivation, prescribed fires, and construction, which have the potential to result in erosion, sedimentation, and nutrient loss. Continuous use of chemical compounds would mean that residues of a number of pesticides would continue to occur in soils throughout the lifetime of the CCP. However, selection of pesticides with short half-lives and use of best management practices will minimize this impact.

Overall, cumulative effects on soils would be a mix of minor adverse and minor to moderately beneficial. Adverse cumulative effects would probably occur on those soils that are regularly or continually subjected to some form of disturbance. These adverse effects are not anticipated to be major. Minor to moderately beneficial effects on soil would be expected to occur at those sites constituting the majority of the Refuge, whereupon undisturbed soils would continue to develop (slowly increasing in depth and fertility) as a result of nearly continuous grassland vegetative cover.

Cumulative Impacts on Biological Resources

Habitats

The Refuge is surrounded by private agricultural and/or livestock lands, and such use could offer an array of threats to habitats, including invasive plants, crop monocultures, and habitat fragmentation. Rice farming operations leave fields fallow for 1–3 years. This practice can lead to the establishment of deep-rooted sedge, an invasive plant, which provides a large seed source that can spread to adjacent lands**.** Past conversion of lands resulted in apparent loss of prairie habitat in the region. Less than one percent of the tallgrass coastal prairie remains (Smeins et al. 1991). The increased potential for rural residential development further increases the potential for habitat fragmentation and may create pest management problems. In addition, increased urbanization has the potential to dramatically reduce or inhibit Refuge habitat management activities. As more homes surround the Refuge, prescribed burning becomes more expensive and more difficult to conduct safely.

Overall, cumulative effects on habitat would be a mix of beneficial and adverse impacts. Lands set aside for habitat in the region are rare and include State Wildlife Management Areas and other national wildlife refuges. Other private and public prairie conservation and restoration efforts in the region contribute to beneficial impacts on prairie habitats. The Refuge's and other conservation areas' efforts to restore and maintain healthy grasslands would benefit the grassland communities; however, future development could have adverse impacts. The Refuge would continue to monitor habitat and use prescribed burning, grazing, prairie restoration, and invasive species control to manage prairie habitats. These management activities result in beneficial impacts to coastal prairie habitat. Although the Refuge's contribution is relatively small in acreage, preservation of this rare habitat in this region is invaluable.

Wildlife

Off-Refuge throughout the State, management of migratory birds is a large undertaking on the part of other public land managers. There are twenty other national wildlife refuges in the State of Texas. Texas Mid-Coast National Wildlife Refuge Complex (NWRC), Aransas NWRC, and Texas Chenier Plain NWRC are located along the Texas gulf and were established for migratory birds. The Texas Parks and Wildlife Department manages some State parks and Wildlife Management Areas in the same ecoregion as APCNWR.

Agricultural and/or livestock land uses exist around the Refuge which could offer an array of threats to fish, wildlife, and their habitats, including feral animals, pathogens (i.e., avian cholera), and pollutants. Even though threats are present, croplands can also provide some benefit for migratory waterfowl. The method in which rice farming occurs in the area results in wetland habitat, which benefits wetland-dependent wildlife by providing habitat. Rice farming operations surrounding the Refuge attract more than 100,000 geese (mostly snow geese) annually to the area.

Some Refuge management activities may adversely impact some wildlife (predator control, perch deterrents, removal of impoundments, etc); however, on private lands surrounding the Refuge, there is ample habitat available for common species. Therefore, the Refuge's contribution to adverse impacts on those species throughout the region is expected to be negligible.

Habitat conversion, degradation, and fragmentation from diverse human activities currently occur and are expected to increase throughout the region. The presence of the Refuge reduces these threats by providing habitat for approximately 428 species and is essential for the recovery of the critically endangered Attwater's prairie-chicken.

Cumulative Impacts on the Human Environment

Public Use Opportunities

The Attwater Prairie Chicken NWR provides opportunities for the public that are somewhat rare in the State of Texas since most of the State is privately-owned and grassland habitat has been significantly reduced. To limit disturbance to APC, public use is limited to wildlife photography, observation, interpretation, and environmental education on the Refuge. There are opportunities for recreational fishing, hunting, swimming, camping, and hiking at other State parks and NWRs.

Land Protection

The Refuge would likely acquire more lands for habitat protection under any alternative. Alternative B would take a more active approach to secure additional lands. "Coastal prairie habitats compatible with APC occupation should be interconnected through grassland corridors within the APC's historic range to allow for dispersal and genetic exchange" (USFWS 2010). To maximize benefits for APC recovery, management priority should be given to habitats in close proximity to existing APC populations or future release sites. The Refuge would work to establish partnerships with existing grasslands currently under public ownership to encourage management consistent with APC habitat requirements. The Refuge would also establish partnerships with private landowners through various options to include a combination of fee, simple, and long-term easements, safe harbor agreements, etc. This could have potential negative impacts on development opportunities in the area because lands under any sort of conservation status would not be available for development; however, property values of areas adjacent to the Refuge would increase due to their close proximity to the Refuge.

Climate Change

Area industry contributes negatively to climate change. The Refuge may be a negligible to minor contributor to climate change; however, the benefit it provides in keeping land in a predominantly natural or undeveloped state far outweighs the impact. Vegetative communities serve to sequester carbon. Therefore, under all alternatives, the Refuge would have beneficial cumulative impacts on climate change. As the Refuge begins experiencing greater effects from climate change, the need for adaptive

management will increase. More scientific data on when and where these changes may occur along with what they may entail is necessary before determining how to counteract or adapt to them.

4.7 Short-Term Uses Versus Long-Term Productivity

The habitat protection and management actions under the proposed alternative are dedicated to maintaining the long-term productivity of Refuge habitats. The benefits of this CCP for long-term productivity far outweigh any impacts from short-term actions, such as the removal of old agricultural features, construction of administrative facilities such as a Visitor Contact Station, or creation of new trails. While these activities would cause short-term negative impacts, the educational values and associated public support gained from the improved visitor experience would produce long-term benefits for Attwater's prairie-chicken recovery efforts and improve the integrity of the coastal prairie.

4.8 Unavoidable Adverse Effects and Mitigation Measures

Under Alternative B, the proposed action, there will be some unavoidable impacts as described here. These impacts are expected to be minor and/or short-term in duration. However, the Refuge would attempt to minimize these impacts wherever possible. The following sections describe the measures the Refuge would employ to mitigate and minimize the potential impacts that could result from implementation of the proposed action.

Water Quality from Soil Disturbance and Use of Herbicides

Foot traffic on new trails is expected to have a negligible impact on soil erosion. To minimize the impacts from public use, the Refuge would include informational signs that request trail users to remain on the trails to avoid causing potential erosion problems.

Long-term herbicide use for exotic plant control could result in a slight decrease in water quality in areas prone to exotic plant infestation. Through the proper selection and application of herbicides, however, this is expected to have a minor impact on the environment, with the benefit of reducing or eliminating exotic plant infestations.

Wildlife Disturbance

Disturbance to wildlife is an unavoidable consequence of any public use program, regardless of the activity involved. All of the public use activities under the proposed alternative would be planned to avoid unacceptable levels of impact. The Refuge would continue to allow very limited access (through special tours) to APC habitat to reduce disturbance. Impacts of public use activities will be monitored, and if disturbance to wildlife becomes significant, especially for the endangered APC, public use activities will be modified to reduce disturbance.

Vegetation Disturbance

Negative impacts could result from the creation and maintenance of trails that require the clearing of non-sensitive vegetation along their length. This is expected to be a minor short-term impact. The Refuge could minimize this impact by installing informational signs that request users to stay on the trails. Negative impacts could result from redistribution of food plots. However, these impacts will be counterbalanced by restoration of existing food plots. If expansion of the food plot program becomes necessary, net increases of acreage will occur on previously disturbed areas.

Other Unavoidable and Adverse Impacts

Potential development of the Refuge's buildings, trails, and other improvements could lead to minor, short-term, negative impacts on vegetation, soils, and some wildlife species. When building the administrative facilities, efforts would be made to use recycled products, energy saving products, and environmentally sensitive products. To avoid the loss of prairie habitat, the facility would be built within the same footprint as the current administrative compound. Projects to remove man-made impoundments and other infrastructure would be conducted using best management practices and areas would be restored through planting of native prairie grasses. All construction activities would comply with the requirements of Section 404 of the Clean Water Act; the National Historic Preservation Act; Executive Order 11988, Floodplain Management; and other applicable regulatory requirements.

4.9 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that this use could have on future generations. Irreversible effects primarily result from the use or destruction of specific resources that cannot be replaced within a reasonable time frame, such as energy or minerals. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action, such as extinction of a threatened or endangered species or the disturbance of a cultural resource.

None of the alternatives would result in a large commitment of nonrenewable resources.

Project implementation would require the irretrievable commitment of fossil fuels (diesel and gasoline), oils, and lubricants used by heavy equipment and vehicles. In addition, management actions in this document will require a commitment of funds that would be unavailable for use on other Service projects. At some point, commitment of funds to these projects would be irreversible, and once used, these funds would be irretrievable. The proposed action would result in some unavoidable harm or harassment to some wildlife. The Service would implement best management practices to minimize potential impacts.

4.10 Environmental Justice

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority and Low-Income Populations; February 11, 1994) was designed to focus the attention of Federal agencies 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 and environmental effects of their programs, policies, and activities on minority and low-income populations. The order is intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment and to provide minority and low-income communities with access to public information and opportunities for participation in matters related to human health and the environment.

None of the alternatives described in this EA will disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. Implementation of the proposed action is anticipated to benefit the environment and people in the surrounding communities.

4.11 Indian Trust Assets

There are no reservations or ceded lands present. Because resources are not believed to be present, no impacts are anticipated to result from implementation of the alternatives described in the EA.

Table B- 3. Summary of Environmental Effects by Alternative

Environmental Resource	Alternative A: No Action Alternative	Alternative B: Proposed Action Alternative	Alternative C:
Impacts to Air Quality	Negligible to minor short-term adverse impacts	Same as Alternative A	Negligible short-term adverse and beneficial impacts
Impacts to Water Quality and Quantity	Negligible to minor short- and long-term adverse impacts	Same as Alternative A	Negligible long-term adverse and beneficial impacts
Impacts to Soils	Minor short-term and long-term adverse impacts; moderate long-term beneficial impacts	Negligible to minor short-term adverse impacts; minor long-term beneficial impacts	Minor to moderate short-term adverse impacts; minor long-term beneficial impacts
Impacts on Habitat	Negligible to minor short and long-term adverse impacts; moderate long-term beneficial impacts	Negligible to minor short- and long-term adverse impacts; minor to major long-term beneficial impacts	Minor long-term beneficial impacts
Impacts of Wildlife	Negligible to minor short- and long-term adverse impacts; minor to moderate long-term beneficial impacts	Negligible to minor short-term and negligible to moderate long-term adverse impacts; minor to moderate long-term beneficial impacts	Negligible to minor short-term adverse impacts
Impacts on Threatened and Endangered Species	Negligible to moderate long-term adverse impacts; moderate to major long-term beneficial impacts	Negligible to short-term adverse impacts; minor to major long-term beneficial impacts	Moderate long-term adverse impacts; minor long-term beneficial impacts
Impacts on Cultural Resources	No anticipated impacts	Same as Alternative A	Same as Alternative A
Impacts on Socio-economic Resources	Minor long-term beneficial impacts	Minor short-term and long-term beneficial impacts	Minor to moderate short-term adverse impacts and minor beneficial impacts
Impacts on Aesthetic and Visual Resources	Minor to negligible short-term adverse impacts	Minor short-term adverse impacts; beneficial long-term impacts	Same as Alternative B
Impacts on Public Use	Minor long-term adverse impacts; minor to moderate long-term beneficial impacts	Minor long-term adverse impacts; moderate long-term beneficial impacts	Same as Alternative B

5.0 Consultation, Coordination and Document Preparation

5.1 Document Preparation

Refer to Appendix I: List of Preparers of the CCP.

5.2 Agencies and individuals consulted in the preparation of this document include:

Texas Parks and Wildlife Department, as well as other Federal, State, and local agencies and organizations, were involved in review period for the CCP and EA.

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Appendix B-A: List of Pesticides used on Attwater's Prairie Chicken National Wildlife Refuge

Before applying any pesticide, the Refuge would go through the Pesticide Use Proposal process (PUP). A PUP is information required by the U.S. Fish and Wildlife Service before application of a pesticide on Service property. It is a protective measure to ensure the proper use of pesticides on Service lands. The form asks for a variety of information, including where the pesticide will be applied, what pesticide will be used, what species will be managed with the pesticide, and whether or not there are any endangered species in the pesticide application area.

Several PUP's are entered into the database and are approved for use on the Refuge in case the need arises to use them. However, only a small portion of the pesticides with an approved PUP are used during any given year. The following pesticides are being or have been used to treat invasive species on APCNWR.

Trade Name	Common Name (active ingredient)	% active ingredient	Target Pest (s)
Alligare Panoramic 2SL	Ammonium salt of imazapic	23.30%	Weed control and/or turf height suppression
Ally	Metsulfuron-methyl	60%	Broadleaf weeds
Amdro Fire Ant Bait	Hydramethylnon	0.73%	Red imported fire ants
Amdro Pro	Hydramethylnon	0.73%	Red imported fire ants
2,4-D Amine 4	Dimethylamine salt of 2,4-dichlorophenozyacetic acid (2,4-D)	46.80%	Broadcast weeds
Aquamaster	Glyphosate	53.80%	Chinese tallow, deep-rooted sedge, Macartney rose, yaupon, weeds sp.
Buccaneer Plus	Glyphosate	41%	Chinese tallow, deep-rooted sedge, Macartney rose, yaupon, weeds sp.
AquaNeat	Glyphosate	53.8%	Chinese tallow, deep-rooted sedge, Macartney rose, yaupon, weeds sp.
Arsenal	Imazapyr	27.60%	Chinese tallow, Macartney rose, weeds sp.
Chaparral	Metsulfuron-methyl	9.45%	Macartney rose
	Aminopyralid	62.13%	Macartney rose
Clearcast	Imazamox	12.10%	Chinese tallow, Macartney rose

Trade Name	Common Name (active ingredient)	% active ingredient	Target Pest (s)
Extinguish Plus	Hydramethylnon	0.37%	Red imported fire ants
	Methoprene	0.25%	Red imported fire ants
Garlon 3A	Triclopyr triethylamine salt (triclopyr acid)	44.40%	Chinese tallow, Macartney rose, yaupon, weeds sp.
Grazon Next	Aminopyralid	6.58%	Macartney rose
	Triisopropanolamine salt of 2,4-dichlorophenozyacetic acid (2,4-D)	51.06%	Macartney rose
Grazon P+D	Picloram	10.20%	Macartney rose
	Triisopropanolamine salt of 2,4-dichlorophenozyacetic acid (2,4-D)	39.60%	Macartney rose
Outrider	Sulfosulfuron	75%	Johnsongrass
Plateau	Imazapic	23.60%	Bahiagrass, deep-rooted sedge, Johnsongrass, Vasey grass
Surmount	Picloram	13.20%	Macartney rose
	Fluroxypyr	10.60%	Macartney rose
Velpar L	Hexazinone	25%	Chinaberry, Chinese tallow, Macartney rose

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United States Fish and Wildlife Service
Environmental Action Statement

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA), and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and determined that the action of implementing the Attwater Prairie Chicken National Wildlife Refuge Comprehensive Conservation Plan is found not to have significant environmental effects as determined by the attached *Finding of No Significant Impact* (following) and the *Comprehensive Conservation Plan and Environmental Assessment*.

Dr. Benjamin N. Tuggle, Regional Director
U.S. Fish and Wildlife Service, Region 2

4/27/12
Date

Terry Rossignol, Refuge Manager
Attwater Prairie Chicken National Wildlife Refuge

3/27/2012
Date

Aaron Archibeque, Regional Chief, NWR System
U.S. Fish and Wildlife Service, Region 2

4/20/12
Date

Carol Torrez, NEPA Coordinator, NWR System
U.S. Fish and Wildlife Service, Region 2

4/2/2012
Date

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FINDING OF NO SIGNIFICANT IMPACT

ENVIRONMENTAL ASSESSMENT OF THE ATTWATER PRAIRIE CHICKEN NATIONAL WILDLIFE REFUGE COMPREHENSIVE CONSERVATION PLAN U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife Service (Service) has developed a Comprehensive Conservation Plan (CCP) and Environmental Assessment (EA) for the Attwater Prairie Chicken National Wildlife Refuge (APCNWR or Refuge) located in Colorado and Austin Counties, Texas. The CCP provides management direction to present and future Refuge managers for the next 15 years. It describes management activities that occur on the Refuge and provides management goals, measurable objectives, and management actions or strategies designed to enhance and protect existing habitats and restore degraded habitats for the benefit of wildlife, specifically the endangered Attwater's prairie-chicken (APC). The goals and objectives shall guide management toward the Refuge vision or the ecologically desirable outcome for the Refuge. The CCP also identifies wildlife viewing, interpretation, photography and other wildlife-dependent recreation opportunities; development of compatible facilities; habitat and wildlife management; and implementation of related programs.

An Environmental Assessment was completed to fulfill the requirements of the National Environmental Policy Act (NEPA) of 1969 and to inform the public of the possible environmental consequences of implementing the CCP for the APCNWR. A total of three alternatives were evaluated and analyzed for potential impacts on the human environment. An Environmental Assessment (EA) was prepared in compliance with the National Environmental Policy Act (NEPA) to provide decision-making framework that 1) explores a reasonable range of alternatives to meet project objectives, 2) evaluates potential issues and impacts to the refuge, resources and values, and 3) identifies mitigation measures to minimize the degree or extent of these impacts.

ALTERNATIVES CONSIDERED AND ANALYZED

Alternative A: Current Management (No Action Alternative)

Alternative A, the no action alternative, assumes no change from current management programs and is considered the baseline to compare other alternatives against. Under Alternative A, the primary management focus of the Refuge would continue to be providing for the enhancement and restoration of prairie habitat to support the Attwater's prairie-chicken population. Restoration actions would continue to include a combination of planting native grasses, cattle and bison grazing, prescribed fire, and restoration of hydrologic features. The Refuge would continue to utilize integrated pest management practices to treat invasive species. Additionally, the Refuge would continue to acquire land from willing sellers under the land protection plan.

The Refuge would continue to work towards recovery of the Attwater's prairie-chicken through full implementation of the APC Recovery Plan, including managing predation, identifying causes of decline, providing habitat and protection for wild flocks, and overseeing the management of a captive breeding and release program. The Refuge would continue to manage three wildlife food plots (totaling up to 150 acres) to provide additional nutrition for APC during

the winter months. The Refuge would continue to control feral hogs and nutria on an annual basis. Red imported fire ants (RIFA) have been documented to be a mortality factor on newly hatched APCs. Therefore, the Refuge would continue to treat areas around APC nest sites and cooperate with partners to research impacts of red imported fire ants on insect communities used by APC broods for food. This research includes broadcast application of approved pesticides on a unit-wide (i.e., pasture-wide) scale.

Recreational opportunities would continue to include wildlife observation and photography, outreach, and interpretation. The Refuge would continue to provide limited environmental education opportunities to local school districts, homeschooling groups, and universities on a case-by-case basis as requested and as Refuge resources permit.

Alternative B: Proposed Action

Under Alternative B, the Refuge would adopt and implement the management direction presented in the Attwater Prairie Chicken NWR CCP. This alternative would improve and/or expand APC recovery efforts through enhanced restoration programs and expanded visitor services programs and public use facilities on the Refuge. Under this alternative the use of adaptive management practices would contribute to ongoing monitoring and modification of refuge resources throughout the life of the plan.

Prairie restoration would continue as in Alternative A; however, under this alternative the Refuge would explore additional partnership opportunities for producing a more consistent seed base to increase the number of acres restored annually. Prescribed burning would continue to be implemented as stated in Alternative A: however, the Refuge would explore expansion of patch burning to include the entire Refuge in a 4-year patch burning rotation as indicated by habitat conditions. Additionally, monitoring and evaluation of grazing effects on the grassland landscape would be expanded. The Refuge would consolidate pastures with the removal of unnecessary fencing and the addition of new fencing where needed to aid in APC recovery efforts by minimizing effects of drainage, availability of raptor perches, and the potential for prairie-chicken collisions. Under Alternative B, the Refuge would remove unnecessary infrastructure on the prairie to restore a functional level of hydrology that would allow for successful prairie restoration. This would include the removal of two man-made impoundments (approximately 200 acres), with restoration back to native prairie. Under this alternative the Refuge would continue to acquire land from willing sellers as described in Alternative A: however, the Refuge would place a greater emphasis on options other than fee-title to support APC recovery efforts.

Under Alternative B the Refuge would continue to work towards recovery of the Attwater's prairie-chicken through actions identified in Alternative A. The Refuge would continue to provide food plots and would explore additional ways to provide supplemental food to prairie-chickens, including the possibility of irrigating crops and adding more food plots as the APC population expands. The Refuge would also remove brush along Coushatta Creek and other avenues of hog movement corridors to control such species. Using the adaptive management approach and pending results from current RIFA research, the Refuge would expand treatment for RIFA to the entire Refuge through the same techniques discussed in Alternative A. Additionally, the Refuge would work with adjacent landowners to treat RIFA and to control feral hogs and nutria.

The Refuge would continue to provide public use opportunities for wildlife observation and photography. Under Alternative B, the Refuge would relocate the auto tour route and eliminate one trail and provide the opportunity for walking/hiking with a new trail near Horseshoe Lake. Additional interpretive signs and kiosks would be installed along the new auto tour route and new trail. The Refuge would also expand interpretive opportunities using available technologies, including webcasts and the possibility of live stream video of APCs. Under this alternative, the Refuge would also develop a new administrative complex.

Alternative C

Under Alternative C, the Refuge would incorporate the habitat and wildlife management and visitor services components called for in Alternative B; plus, under this alternative, the Refuge would establish the capabilities to produce, collect, and harvest seed on site. The Refuge would consider eliminating cattle grazing and use bison as the primary grazing tool. The Refuge would, to the extent possible and based on available historical habitat data, restore areas to historical topography to include construction of mima mounds and mimic historical elevations and natural drainage as opposed to only a functional level of hydrology as stated in Alternative B. Under this alternative, the Refuge would discontinue management of the three wildlife food plots. Environmental education would be maximized through the development of an outdoor classroom through partnerships.

DECISION: THE SELECTED ALTERNATIVE

Alternative B was selected over the other alternatives because it best meets the Refuge's vision for the future, the purposes for which the Refuge was established, and the habitat, wildlife and visitor services goals identified in the CCP. This alternative is the basis for the Comprehensive Conservation Plan and describes how habitat objectives will be accomplished through a combination of management activities to encourage ecological integrity, control invasive species, improve or maintain habitats, and most importantly support recovery of the Attwater's prairie-chicken. Opportunities for wildlife-dependent recreation activities will be enhanced. Future management actions will have a neutral or positive impact on the local economy and the recommendations in the CCP will ensure that Refuge management is consistent with the mission of the National Wildlife Refuge System and U.S. Fish and Wildlife Service.

SUMMARY OF EFFECTS

Implementation of the Service's decision would be expected to result in environmental, social and economic effects as outlined in the CCP/EA and summarized here. The CCP describes habitat management, population management, and land conservation objectives that would result in increased recovery efforts for the Attwater's prairie-chicken and improved habitat conditions. The proposed visitor services management activities would result in enhanced prospects for wildlife-dependent recreational opportunities.

Refuge management activities (prescribed burning, invasive species control, removal of impoundments, new construction, etc.) would result in short- and long- term negligible to moderate adverse impacts to soils, air, water, habitat, and wildlife as described in the EA; however, the long-term impacts are expected to be beneficial. These habitat management activities would result in the creation and improvement of habitats to support the recovery of

Attwater's prairie-chicken. The removal of the two man-made artificial impoundments would have moderate adverse impacts on local migratory bird populations due to displacement. Although wetland and open water habitat on the Refuge would be reduced, the two man-made impoundments are not the only available wetland habitat on the Refuge. The Refuge would still provide other open water habitat at Horseshoe Lake, seasonal wetlands, and livestock ponds. Ephemeral wetlands (approximately 1,000 acres) are scattered throughout the Refuge and are a natural component of the prairie ecosystem. Removal of this infrastructure would compliment other APC recovery efforts to achieve restoration of native prairie and functional hydrology on the Refuge and would also decrease the potential for the spread of disease such as avian cholera resulting from larger waterfowl concentrations on the Refuge in these artificial impoundments. While this action may adversely impact migratory birds, it would have long-term beneficial impacts on the Attwater's prairie-chicken and other grassland-dependent wildlife.

Opportunities for wildlife-dependent activities such as wildlife observation, photography, environmental education and interpretation would be enhanced. There would be permanent loss of a small amount of habitat through the establishment of a new hiking trail. This would also result in short-term impacts to wildlife (disturbance), but we have determined that these short and long-term impacts are minimal and will eventually be outweighed by the benefits provided by the improved visitor service programs.

Disturbance to wildlife at some level is an unavoidable consequence of any public use program, regardless of the activity involved. Obviously, some activities innately have the potential to be more disturbing than others. The management actions to be implemented have been carefully planned to avoid high levels of impact. As currently proposed, the known and anticipated levels of disturbance associated with management actions are considered minimal and well within the tolerance levels of know wildlife species and populations present in the area.

The increased opportunities for wildlife-related recreational opportunities on the refuge would also have beneficial impacts on the local economy through increased visitation and revenue. Partnerships with county, state and federal agencies, private landowners, and conservation groups would enable the refuge to achieve goals and objectives, minimize costs, and bridge relationships with others.

Implementing the Service's management action is not expected to have any significant adverse effects on wetlands and floodplains, pursuant to Executive Order 11990 and 11988, because there would be no development of refuge facilities within wetland or floodplain areas. There would be no adverse effect on threatened, endangered, proposed or candidate species and/or critical habitat, as documented in the intra-service Section 7 (Endangered Species) Consultation completed with the Clear Lake Ecological Services Field Office and signed on July 6, 2011. In addition, archeological and/or historical resources would not be impacted.

The Refuge is not aware of any other past, present, or reasonably foreseeable future planned actions that would result in a significant cumulative impact when added to the Refuge's proposed action, as outlined in Alternative B.

PUBLIC OUTREACH, REVIEW AND COMMENT

Development of the Attwater Prairie Chicken NWR CCP has been coordinated with all interested and/or affected parties. Formal scoping began with publication of a Notice of Intent to prepare a Comprehensive Conservation Plan and Environmental Assessment in the *Federal Register* on November 5, 2008 (Volume 73, Number 215, pp. 65871-65872). In December 2008, a letter was sent to individuals at Texas Parks and Wildlife Department (TPWD) formally inviting them to participate in the development of the CCP. We received input from TPWD in January 2009. Information sheets were sent to the public, and news releases were sent to four area newspapers and published in two of the local newspapers (Colorado County Citizen and Eagle Lake Headlight). The news release also aired on KULM Radio in Columbus, TX. Three public open house meetings were held, one each in Sealy, TX and Eagle Lake, TX, and one at the APCNWR Headquarters in February 2009 to solicit initial input and involvement during the early stages of the CCP's development. Despite advertising for these open houses, turnout was poor. One individual attended the meeting in Sealy, and there was no attendance at the other locations. Additional written comments were received prior to these open house meetings. The Draft CCP and EA was released for public review and comment from December 12, 2011 to January 23, 2012. The public was notified of the release of the Draft CCP and EA with a Notice of Availability in the *Federal Register* on December 12, 2011 (Volume 76, Number 238, pp. 77245-77247), as well as through local media outlets (local newspapers, radio station, and television). Additionally, public notices were posted on various community bulletin boards in Sealy, TX; Eagle Lake, TX; and Columbus, TX. An open house was held during the comment period (January 14, 2011) at the Refuge headquarters building, providing the public with an opportunity to discuss the plan with Service staff. Despite being heavily advertised, few individuals attended this event and no formal comments were received. The Service received four comment letters during the review period. All comments were considered and addressed in Appendix J of the CCP.

FINDINGS

Based on the analysis documented in the environmental assessment and with due consideration given to comments from the public and through consultation with the State of Texas, it is my determination that the proposed action does not constitute a major Federal action that will have a significant effect on 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 it is my conclusion that an environmental impact statement is not required for this plan and the selected alternative may be implemented as soon as practicable. This determination is based on the following factors (40 C.F.R. 1508.27), as addressed in the attached Environmental Assessment, which is attached.

1. Both beneficial and adverse effects have been considered and this action will not have a significant effect on the environment (Environmental Assessment, pages B-31 – B-55).

2. The actions will not have a significant effect on public health and safety (Environmental Assessment, pages B-49 – B-52).

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 (Environmental Assessment, pages B-32).

4. The effects on the quality of the human environment are not likely to be highly controversial (Environmental Assessment, pages B-49 – B-52).

5. The actions do not involve highly uncertain, unique, or unknown environmental risks to the human environment (Environmental Assessment, pages B-49 – B-52).

6. The actions do not establish a precedent for future actions with significant effects nor do they represent a decision in principle about a future consideration (Environmental Assessment).

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 (Environmental Assessment, pages B-52 – B-55).

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 (Environmental Assessment, pages B-32).

9. The actions are not likely to adversely affect threatened or endangered species, or their habitats (Environmental Assessment, pages B-46 – B-49; Appendix F: Intra-Service Section 7 Consultation).

10. The actions will not lead to a violation of federal, state, or local laws imposed for the protection of the environment (Environmental Assessment, pages B-2 – B-4).

It is the intent of the Service to revisit questions of significant environmental consequences in accordance with NEPA upon consideration of the implementation of site specific proposals call for and discussed in the final CCP.

Recommended: Terry A. Rossignol — 3/27/2012

Terry Rossignol, Refuge Manager
Attwater Prairie Chicken NWR

Date

Approved: Benjamin N. Tuggle — 4/27/12

Dr. Benjamin N. Tuggle, Regional Director
U.S. Fish and Wildlife Service, Region 2

Date

SUPPORTING REFERENCES

Fish and Wildlife Service, 2011. Draft Comprehensive Conservation Plan and Environmental Assessment for the Attwater Prairie Chicken National Wildlife Refuge, Austin and Colorado Counties, Texas. U.S Department of the Interior, Fish and Wildlife Service, Southwest Region.

Fish and Wildlife Service, 2012. Comprehensive Conservation Plan and Environmental Assessment for the Attwater Prairie Chicken National Wildlife Refuge, Austin and Colorado Counties, Texas. U.S Department of the Interior, Fish and Wildlife Service, Southwest Region.

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