

FERAL HOG MANAGEMENT

Environmental Assessment

For

***SOUTHWEST LOUISIANA NATIONAL WILDLIFE REFUGE
COMPLEX***

Sabine National Wildlife Refuge

DRAFT- MAY 2010



Environmental Assessment
2010 Feral Hog Management
for
Sabine National Wildlife Refuge
Cameron Parish, Louisiana

U. S. FWS
Southwest Louisiana National Wildlife Refuge Complex
1428 Hwy 27
Bell City, LA 70630

Prepared by:
U. S. Fish and Wildlife Service
Bell City, Louisiana
May 2009

TABLE OF CONTENTS

Chapter 1	PURPOSE AND NEED FOR ACTION	5
Chapter 2	ALTERNATIVES INCLUDING THE PROPOSED ACTION	8
Chapter 3	AFFECTED ENVIRONMENTS.....	10
Chapter 4	ENVIRONMENTAL CONSEQUENCES.....	30
Chapter 5	CONSULTATION AND COORDINATION WITH OTHERS	38
	Literature Reference	39

APPENDECIES

	Aerial Capture, Eradication and Tagging of Animals (ACETA) Handbook	42
	Non Law Enforcement Firearms Policy for the Southwest NWRC.....	43

LIST OF FIGURES

Figure 1.	Location of Sabine Refuge National Wildlife Refuge and the Southwest Louisiana National Wildlife Refuge Complex.....	11
Figure 2.	Distribution of Feral Hogs in the United States; courtesy of the Southeastern Cooperative Wildlife Disease Study, Athens, Georgia.....	7
Figure 3.	SNWR Mgt.Units.....	12
Figure 4.	Vegetation SNWR.....	14
Figure 5.	Waterfowl Survey Results for SNWR.....	19

LIST OF TABLES

Table 1. Birds of management concern to the Refuge.....17-18

Table 2. Annual peak wintering waterfowl populations on SNWR.....19

Table 3. Cameron Parish -Occupations of employed civilian population 16 years.....27

Table 4. Cameron Parish - Employment of civilian population 16 years and older by industry (2000).....28

DRAFT

Chapter 1 Purpose and Need for Action

Sabine National Wildlife Refuge (SNWR) was established in 1937 to provide habitat for migratory waterfowl and other avian species. It encompasses 125,790 acres of fresh, intermediate and brackish marshes, and is comprised of a basin of wetlands located between the beach Chenier's of the Gulf of Mexico and the coastal prairie. It is the largest coastal refuge in the National Wildlife Refuge System and is a component of the Southwest Louisiana NWR Complex (Figure 2). SNWR was established by the following: 1) Executive Order 7780, "...as a refuge and breeding ground for migratory birds and other wildlife...;" 2) the Migratory Bird Conservation Act, "... for use as an inviolate sanctuary, or any other management purpose, for migratory birds," (U.S.C. 715d). Additional lands were added to the Refuge under 3) Fish and Wildlife Act of 1956 "...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." [16 U.S.C. 742f (a)(4)] and 4) "...for the benefit of the United States FWS, in performing its activities and services" [16 U.S.C. 742f(b)(1)]. However, subsurface mineral ownership was retained by the former landowner and must be given reasonable access for mineral exploration and production. The infrastructure associated with oil and gas exploration, development and marketing has provided avenues for feral hogs to enter the refuge and cause habitat damage.

The U S Fish and Wildlife Service (FWS) is proposing to aggressively manage feral hogs on the SNWR through the use of four management tools:

- 1) Aerial gunning (from a helicopter) operations would be conducted by USDA Wildlife Services (WS) as requested by FWS personnel ;
- 2) Public hunting regulated by Special Use Permit;
- 3) Ground shooting near feeders by FWS personnel and/or USDA (WS) ;
- 4) Trapping conducted by FWS personnel and/or USDA (WS). Followed by on-site euthanasia .

The purpose of the proposed action is to protect 125,790 acres of fresh, intermediate and brackish refuge marshes from feral hog (*Sus scrofa*) induced erosion, mottled duck and other native species habitat destruction and avian nesting mortality. Currently and in past years, feral hogs have roamed at large on private property adjacent to SNWR and have gone unchecked and unmanaged. The rapidly expanding distribution of feral hogs in the United States has caused great concern for many land and resource managers (Figure 2). The ecologically-rich marshes of SNWR have not been immune to the invasion of these animals. cursory observations suggest accelerated increases over the last few years. Feral hogs are omnivores devouring flora and fauna alike. Their access to the refuge has been enhanced through the years by oil and gas exploration and development occurring on the refuge.

The FWS does not hold mineral rights on the Refuge. Subsurface mineral rights were retained by The Texas Company (now the ChevronTexaco U.S.A. Production Company) in 1937 when SNWR was acquired. The acquisition deed stipulated that oil and gas operations were not to interfere with the Refuge purpose, but ultimately stated that the Refuge could not prevent the subsurface owner from exercising their rights to access and develop their minerals. A mutually agreed upon special use permit is issued for all oil and gas operations to communicate refuge expectations and environmental concerns to all operating companies.

In accordance with current FWS policy which is derived from a July 17, 1986, Department of the Interior Solicitors Office Opinion and Louisiana State mineral rights law, the owners of subsurface oil and gas mineral rights must be granted a reasonable and necessary means of extraction and production. As oil and gas companies continue to explore, drill, and maintain wells; roads are maintained and constructed per special use permit. These roads are manmade corridors readily utilized by feral hogs for easy access to SNWR.

Marsh habitat, throughout SNWR, has been compromised because of extensive rooting (foraging for food) by feral hogs. Since 1990, feral hog sightings have been primarily reported on the western side of SNWR known as Marceaux Island. Marceaux Island is an area of concern, as it has been designated as “Marceaux Island Prairie Natural Area” by the Louisiana Department of Wildlife and Fisheries as well as the Louisiana Natural Heritage Foundation, based on the existence of remnant prairie habitat. Since, SNWR was established in 1937: “...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds...” (16 U.S.C. 715d (Migratory Bird Conservation Act)) and “...as a refuge and breeding ground for migratory birds and other wildlife...” (16 U.S.C. 715e (Migratory Bird Conservation Act)), controlling the feral hog population in this sensitive area and throughout the Refuge should be a priority. Authority to control wildlife populations for management is governed by Title 50 CFR, Part 31, Section 14:

(a) Animal species which are surplus or detrimental to the management program of a wildlife area may be taken in accordance with federal and state laws and regulations by federal or state personnel or by permit issued to private individuals.

(b) Animal species which damage or destroy federal property within a wildlife refuge area may be taken or destroyed by federal personnel.

Title 50 CFR, Part 30, Section 11 (a) states that feral animals, including horses, burros, cattle, swine, sheep, goats, reindeer, dogs, and cats, without ownership that have reverted to the wild from a domestic state may be taken by authorized federal or state personnel or by private persons operating under permit in accordance with applicable provisions of federal or state law or regulation.

Also, Executive Order 13112 (Federal Register/ Vol. 64 No. 25 / Monday, Feb. 8, 1999/ Presidential Documents 6183) states in Sec. 2. Federal Agency Duties. that we should; (i) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (ii) monitor invasive species populations accurately and reliably; (iii) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (iv) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species

This document stresses the urgency for action and specific tools to reduce the population of feral hogs which are classified as an “outlaw quadruped “ by the Louisiana Department of Wildlife and Fisheries and reclaim habitat for native species. The current feral hog population on the refuge at this time is estimated at between 150-300 animals.

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

Management of feral hogs is consistent with the recommendations found in the SNWR Comprehensive Conservation Plan and Environmental Assessment completed during 2007. This plan and environmental assessment will become an appendix to the Southwest Louisiana National Wildlife Refuge Complex Habitat Management Plan.

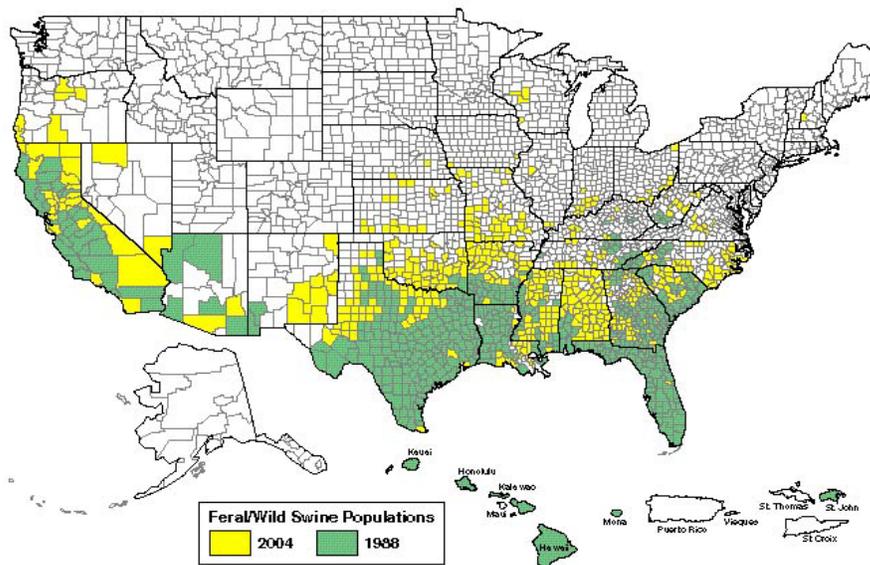


Figure 2. Distribution of feral hogs in the United States; courtesy of the Southeastern Cooperative Wildlife Disease Study, Athens, Georgia

Chapter 2 Alternatives Including the Proposed Action

This chapter discusses the alternatives considered for feral hog management on the 124,511 acre SNWR. These alternatives are:

Alternative 1. No action

Alternative 2. (Proposed action), Implementation of the SNWR Feral Hog Management Plan that provides for aggressive feral hog management using multiple tools including public hunting.

Alternative 3. Relocation of feral hogs.

Feral hog management is often challenging because of the prolific nature of the species. Efficient and effective population “management” is essential to the overall success of the program. Control effort administration will be under the jurisdiction of FWSs (FWS) personnel, and USDA/WS pursuant to *Executive Order 13112* which directs federal agencies whose actions may affect the status of invasive species to reduce invasion of exotic species and associated damages to the extent practicable and permitted by law.

2.1 Alternative 1: Current Management

Under this alternative, management of feral hogs would not comply with the approved SNWR’s Comprehensive Conservation Management Plan (SCCP). Feral hogs would continue to propagate and roam throughout the Refuge. The current feral hog population would increase thereby escalating the rate of destruction of refuge habitat and wildlife. The Alternative 1. No Action is required under the National Environmental Policy Act of 1969 (NEPA) and establishes a baseline for comparing the present management direction and environmental consequences of the proposed action alternative.

2.2 Alternative 2: (Proposed Action): Implement the SNWR Feral Hog Management Plan

Efforts to remove feral hogs from the Refuge would focus on:

- 1) Aerial gunning (from a helicopter) operations would be conducted by WS as requested by FWS personnel. Shooting would be one hundred percent selective for targeted species. Aerial operations would be conducted according to the Department of Interior (DOI) *Aerial Capture, Eradication and Tagging of Animals* ACETA Handbook (Appendix 1). A pre-treatment survey will be conducted in an effort to determine hog densities in targeted areas prior to aerial gunning. After aerial gunning the USFWS will then initiate an aerial population assessment survey. If the 95% population eradication objective is not met then the USFWS will move forward with the secondary tools identified below. If the objective is met the USFWS may still move forward with secondary measures in

an effort to continue to keep hog populations at the desired level in an effort to reduce the more costly aerial gunning technique in the future.

- 2) A Public hunting program would be implemented through a special use permitting program similar to the alligator hunting program.
- 3) Ground shooting near feeders would be conducted by FWS personnel and/or WS at USFWS discretion. As feral hogs become more difficult to trap, FWS personnel would transition to day- and night- strategies that incorporate the actions listed. Firearm policies and procedures would be under the jurisdiction of SWLA NWR Complex's: Non Law Enforcement Firearms Policy for the Southwest Louisiana National Wildlife Refuge Complex (Appendix 3).
- 4) Trapping would be conducted by FWS personnel and/or USDA (WS). On-site euthanasia would be applicable to all feral hogs encountered. Live traps would be checked on a daily basis and feral hogs captured would be dispatched immediately, all non-targeted wildlife captured will be released on site. Other trapping devices may be used as requested and approved by USFWS on site personnel.

2.3 Alternative 3: Feral Hog Relocation

This action would call for the trapping and relocation of feral hogs. This action would be conducted by FWS personnel and/or contracted trappers under the direction of FWS. Traps would be checked on a daily basis when set. Hogs would be immediately transported to the relocation site. This action is not recommended due to the increasing hog populations of western Louisiana which are causing detriment to the local flora and fauna, as well as negatively impacting native freshwater mussels and insects by contributing *E. coli* to water systems (Kaller et al. 2007). Because of the additional adverse impacts this Alternative causes on other habitat and the substantial cost associated with relocation, this Alternative was dropped from further consideration and will not be further evaluated in this document.

Chapter 3 Affected Environments

3.1 Physical Environment

SNWR was administratively combined with nearby Cameron NWR in 2000. Lacassine NWR and Shell Keys NWR joined the Complex in 2004 and 2006, respectively. The four Refuges now comprise the Southwest Louisiana National Wildlife Refuge Complex with Cameron Prairie serving as Complex Headquarters. The Complex also has a unique administrative oversight role with the Louisiana Department of Wildlife and Fisheries (LDWF) Rockefeller Refuge and manages water levels on the 60,000 acre Cameron-Creole Watershed joint venture project .

SNWR was established in 1937, and is one of more than 545 Refuges within America's National Wildlife Refuge System, the world's largest network of lands set aside specifically for wildlife. The Refuge is located eight miles south of Hackberry, on State Highway 27 in Cameron Parish, Louisiana (Figure 1 & 2). It occupies the marshes between Calcasieu and Sabine Lakes in southwest Louisiana, and encompasses 125,790 acres, consisting of 40,403 acres of open water and 85,387 acres of marsh grassland. This area contains a diversity of habitat including freshwater impoundments, wooded ridges and levees, canals, ponds, lakes, and bayous. Some of the largest wetland management efforts in Louisiana occur at Sabine. The Refuge is managed to provide habitat for migratory waterfowl and other birds in addition to preserving and enhancing coastal marshes for wildlife and fish. Oil companies, however, still own subsurface rights to the Refuge and must be given reasonable access.

Hurricanes Rita & Ike left a broad swath of destruction in SNWR. SNWR bore the brunt of Rita & Ike's 15–20 foot storm surges which deposited tons of debris onto the Refuge. It contained a chaotic assemblage of natural vegetation, construction debris, a myriad of household items, and an unknown amount of hazardous materials. Approximately 32,000 acres on the Refuge have been impacted, including 1,700 acres of debris piles, seven million cubic meters of debris, and nearly 1,400 potential hazmat items positively identified. Estimates range from 115,000 to 350,000 gallons of hazardous liquids and gases.

3.2 Habitat

Sabine Refuge provides habitat for many species of wildlife, including ducks, geese, alligators, muskrats, nutria, raptors, wading birds, shorebirds, blue crabs, shrimp, and various fish. The Refuge is one of the primary wintering refuges for waterfowl in the Mississippi Flyway. Olivaceous cormorant, snowy egret and common egret rookeries are present on the Refuge. In the fall and spring, many shorebird species can be found here. Numerous species of neotropical migrant songbirds pass through the Refuge on their migration. Many species of fish and shrimp mature and grow in the “nursery” provided by the Refuge's intermediate and brackish marshes. Areas in coastal southwest Louisiana outside of freshwater impoundment have experienced changes in vegetation (see figure 4) due to increased salinity and freshwater retention time, according to surveys dating back to 1949 (O'Neil 1949; Chabreck et al. 1970). The increased salinity can be attributed to navigation channels and their maintenance, primarily the Calcasieu Ship Channel into nearby Calcasieu Lake. These channels allow salt water from the Gulf of Mexico into the marsh faster than fresh water can flow into it. Between 1875 and 1910, Calcasieu Lake salinities were low enough for the water to be used to irrigate rice, which cannot tolerate salinities over 0.6 ppt (Louisiana Coastal Wetlands Conservation and Restoration Task Force 2002). Today, the average water salinity of Calcasieu Lake is between 8 and 12 ppt.

Figure 1. Sabine NWR Location

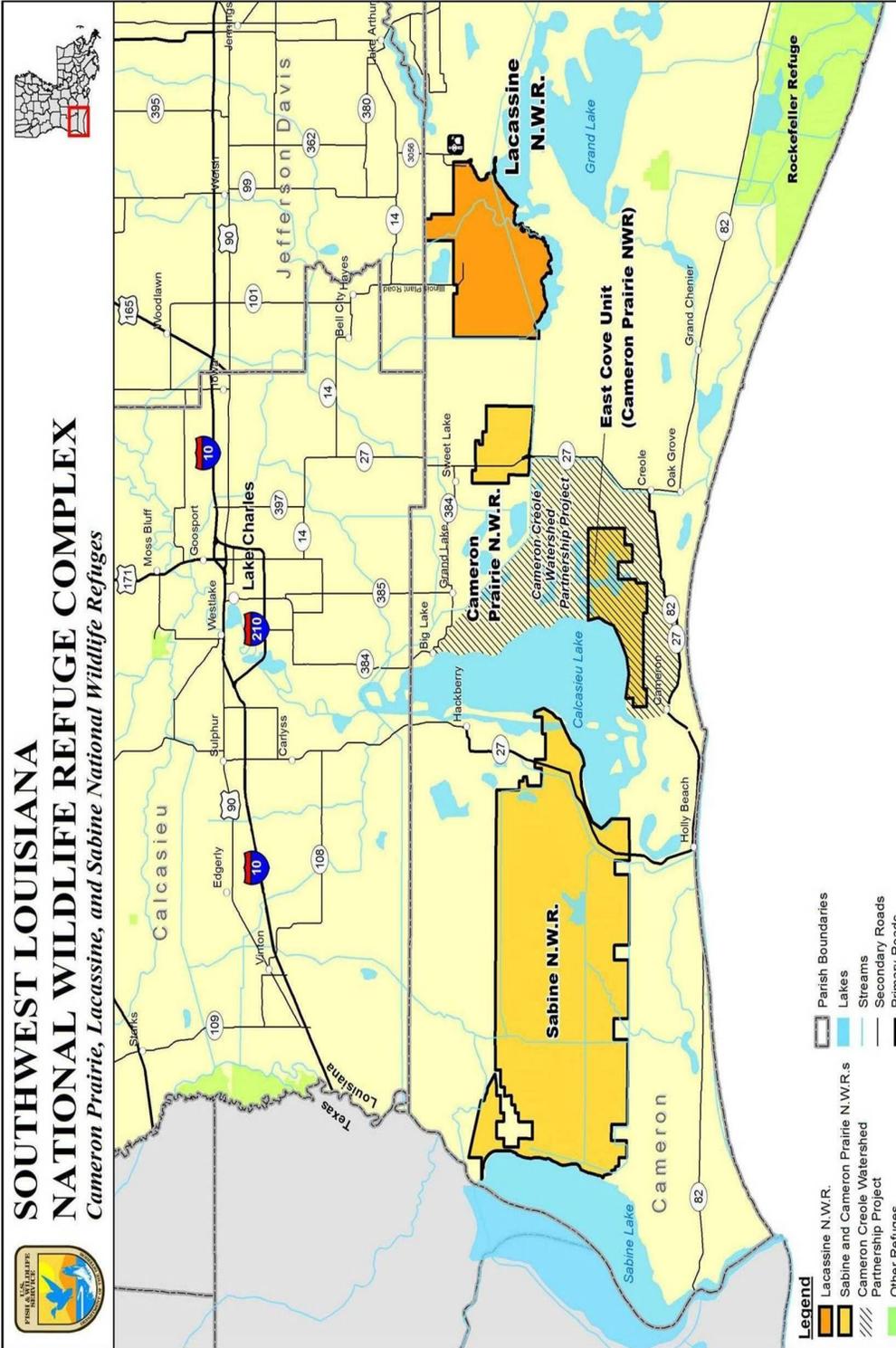
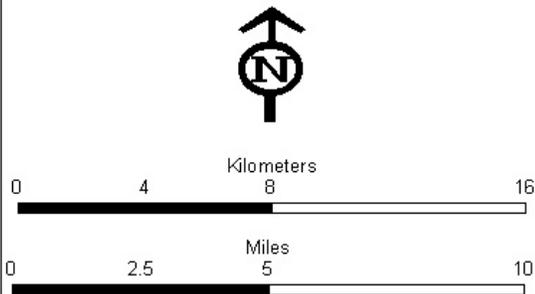
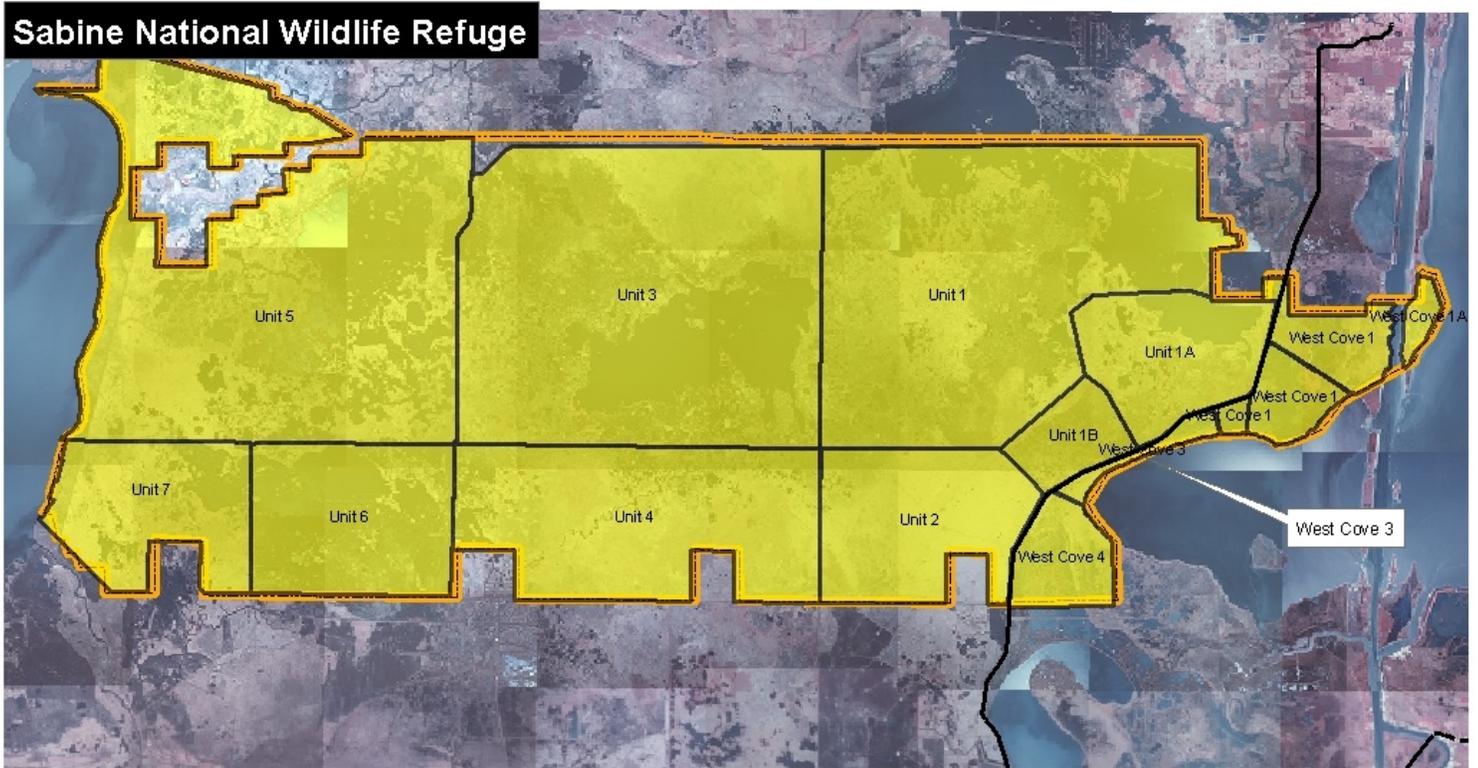


Figure 3. Sabine NWR Management Units



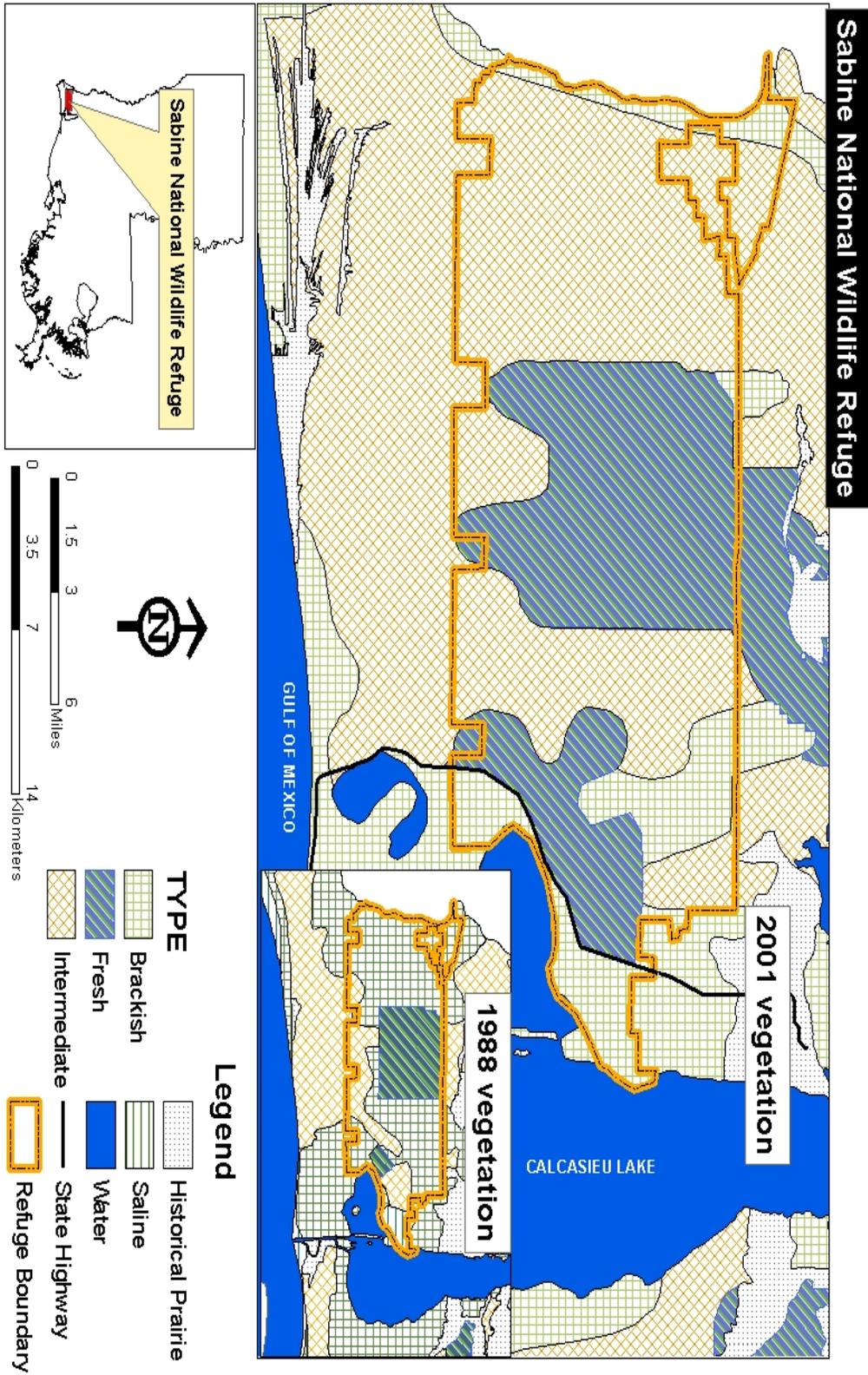
LEGEND

Unit	Acres
1	23277
1A	5269
1B	2058
2	7124
3	26402
4	12654
5	27617
6	7496
7	6254
WC1	3741
WC1A	498
WC3	686
WC4	2308

Major factors contributing to shifting vegetation is canals and their associated spoil banks impeding the north-south flow of fresher water over the marsh. Reduce fresh water inflow combined with drought conditions can cause salinities in many areas to increase dramatically in some instances. Three areas of the Refuge were impounded to prevent saltwater intrusion and lessen drought-induced salinity shifts in those areas.

The three semi-impounded freshwater marsh management units are dominated by bulltongue (*Sagittaria spp.*), water shield (*Brasenia schreberi*), white water-lily (*Nymphaea odorata*), spikerush (*Eleocharis spp.*), cattails (*Typha spp.*) and bulrushes (*Scirpus spp.*). Open water areas throughout the Refuge host a variety of submerged aquatics that assist with marsh stabilization, add to detritus build-up, and provide food for waterfowl. Widgeon grass (*Ruppia maritime*), coontail (*Ceratophyllum demersum*), southern naiad (*Najas quadalupensis*), common bladderwort (*Utricularia vulgaris*), fanwort (*Cabomba caroliniana*), Eurasian milfoil (*Myriophyllum spicatum*) and Ottelia (*Ottelia alismoides*) line the shallow areas along canals and bayous, in addition to occupying large expanses of open water. Over 25 acres in Management Unit 3 have wild celery (*Vallisneria americana*) beds, an important food for wintering canvasbacks. Vegetative species that occur on drier upland sites such as ridges and levees include Chinese tallow (*Sapium sebiferum*), groundsel-tree (*Baccharis halimifolia*), live oak (*Quercus virginiana*), rattlebox (*Sesbania drummondii*), black willow (*Salix nigra*), waxmyrtle (*Myrica cerifera*), common elderberry (*Sambucus canadensis*), blackberry (*Rubus spp.*), trumpet vine (*Campsis radicans*), blue vervain (*Verbena hastate*), and goldenrod (*Solidago spp.*) (USFWS 1993).

Figure 4. Vegetation of SNWR



SNWR is managed to balance the needs of reducing stress to wetland plants caused by waterlogging and saltwater intrusion while providing sufficient access to interior marshes for estuarine species.

Freshwater Impoundments

Three rain-fed freshwater impoundments created in 1951 and 1959 provide habitat for numerous species of waterfowl, wading birds, shorebirds, mammals, reptiles, and fish. Management Unit 3, encompasses 26,400 acres, is the largest freshwater marsh remaining in southwest Louisiana. Management Units 1A and 1B comprise 5,138 acres and 1,800 acres of marsh, respectively, and are highly utilized by a variety of wildlife, most notably ducks. Waterfowl foods in Management Unit 3 have been found to be available at densities significantly above the level required for efficient waterfowl use (Winslow 2003). The target water management level is 1.8 feet to enhance the growth and survival of desirable plant communities for waterfowl (USFWS 1996). Water depths can be reduced, but only rainfall can increase water levels in these impoundments.

Coastal Marsh

The Refuge contains 91,173 acres of fresh, intermediate, and brackish marshes interspersed with low prairie ridges, man-made levees, meandering bayous, and canals. Traditionally, the area fluctuates from being a predominantly fresh marsh to a predominantly brackish marsh and reverts back from brackish to fresh, dependent upon weather cycles and precipitation.

Prescribed fire is one of the primary habitat management tools used on the Refuge. Between 1984 and 2006, 85 prescribed fires covering 241,304 acres were conducted reestablishing early stage succession. These fires increase plant productivity, in addition to reducing the dangers of uncontrolled fires. From fiscal years 2003 to 2006, over 80 wildfires burned 50,279 acres. Wildfires on the Refuge are primarily caused by lightning strikes and seismic surveying activity.

Restoration and Mitigation Sites

Marsh re-creation using dredge material from channel dredging and linear terrace construction is currently being employed on the Refuge. The basic principle behind both practices is to re-create habitat lost when areas convert from emergent marsh to open water.

Dredge Material

The Calcasieu Ship Channel that borders Sabine Refuge to the east is dredged on a two-year cycle to allow for large ship passage to the Port of Lake Charles. Sabine was chosen for a demonstration site to use dredged material to re-create marsh that had been lost. This use of dredge material will, ideally, allow managers to not only restore these marshes, but to connect the restored sites with the greater landscape, restoring hydrology, and improve habitat quality and diversity. To address concerns about dredge material contaminants, the U.S. Army Corps of Engineers (USACE) analyzes soil samples along the channel used for beneficial use. Thus far, four sites on the Refuge have received dredge material for marsh re-creation efforts. Since 1975, 1,400 acres of marsh have

been restored on Sabine using dredge-fill (Louisiana Coastal Wetlands Conservation and Restoration Task Force; CWPPRA 2002).

Research has found that elevation of these constructed wetlands has more impact than the age of the restoration on achieving “natural” soil processes (Chiasson, R.L., Proffitt, C.E., Edwards, K.R. 2002); however, decomposition rates on the sites do appear comparable to natural areas (Proffitt, C.E., Edwards, K., Travis, S., and others. 2003). The belowground biomass on restored sites is significantly lower than natural sites (Ford, M. A., D. R. Cahoon, and J. C. Lynch. 1999). There appears to be some difference between small mammal use rates of restored sites as compared to natural sites, though this may be due to elevation difference. Many of these studies are ongoing. Studies are being conducted to assess patterns of vegetation (breeding system, colonization, cover, dominance, genetic diversity, growth, and succession); levels of metal contaminants in the sediment and biota; and use of the habitat by small mammals. Further studies of selected faunal use, dominant plant productivity, and elevation over time are currently being conducted. Analysis of the sites that experienced the brown marsh phenomenon is also underway.

Earthen Terraces

In 1990, “checker board” terraces were constructed in ponds along Calcasieu Lake in the West Cove Unit. These were followed in 2001, by the construction of 18,000 linear feet of planted, earthen terraces in Units 6 and 7 to mitigate for impacts due to oil and gas activities. The ACE and the Louisiana Department of Natural Resources (LDNR) require compensatory mitigation for acreage loss due to dredge and fill activities in wetlands. Terraces are discontinuous low ridges constructed with bottom sediments excavated from adjacent pond bottoms. They are designed to reduce wind related wave intensity, slow water movement allowing fine sediments to settle within the area, provide favorable conditions for submerged aquatic vegetation (SAV) establishment, and increase abundance and habitat of fish and other aquatic species.

Ideal sites for terrace construction are areas where water bodies join or are threatening to join. No significant benefit to SAV has been found in two studies conducted on terraces at the Refuge (Stone, G.W., J.M. Grymes, III, K.D. Robbins, S.G. Underwood, G.D. Steyer, and R.A. Muller. 1993), but research on other terrace configurations is ongoing. An unexpected secondary benefit is they have provided nesting habitat for seabirds such as least terns, forrester’s terns, and black skimmers; while also enhancing fish habitat quality as compared to sparsely vegetated open ponds. Terrace construction for 2002 exceeded 40,000 linear feet in Unit 6. Terrace construction is also proposed for areas of Unit 5 as part of the CWPPRA East Sabine Lake Hydrologic Restoration (CS-32) project.

Coastal Prairie

The prairie region of southwestern Louisiana was once very extensive (about 2.5 million acres) but today is limited to small, remnant parcels (Lester 2005). An abundance of wildlife and plant species can occur on coastal prairie, making the restoration of remnant sites very important for wildlife and their habitat.

Two remnant coastal prairie sites (about 100 acres) occur in Unit 5 of SNWR. The 65-acre Marceaux Island Prairie is registered in the Louisiana Department of Wildlife and Fisheries Natural Areas Registry. Other isolated tracts of native prairie also occur on the Refuge. The Marceaux Island Prairie occurs on an island (ridge) surrounded by marsh. Vegetation is quite diverse and is dominated by grasses and an abundance of forbs. Punctate cupgrass (*Eriochloa punctata*), a state rare plant, is common on Marceaux Island Prairie. Prescribed fire is used to reduce encroachment of woody species. Vast areas of this valuable ecosystem have been lost through: conversion of prairie to agriculture or other forest types; development and maintenance of pipelines, roads, and utilities; fire suppression and/or practices; and encroachment of invasive species. All have, resulted in habitat destruction, disturbance, fragmentation, or altered composition and structure.

The need for restoring and conserving coastal prairie is clear, but the scale of restoration adequate for conserving prairie biodiversity has not been determined. A useful approach is to manage for sensitive animal species considered indicators of environmental stress. From an ecological point of view, recruitment of grassland birds to restored prairie may be an indicator of the restoration of ecosystem function (USFWS 2003).

3.3 Wildlife Resources

Species of FWS Management Concern

A comprehensive list of bird species of FWS Management Concern was compiled from three national plans. These plans include: Partners in Flight, U.S. Shorebird Conservation Plan, and the North American Waterbird Conservation Plan. Current conservation assessment scores for each species were taken from the three plans, which were based on several factors, including population trends, threats, distribution and abundance, and area importance.

Species of Refuge Management Concern

Species of special management concern, including threatened or endangered, occur infrequently at Sabine. Calcasieu and Sabine lakes provide habitat for two species of sea turtles: the federally endangered Kemp's ridley and the federally threatened loggerhead. The Refuge provides access and habitat for these species, both species have been observed on the Refuge, in addition, loggerheads have been radio-tracked on the Refuge. The Refuge could potentially be used by the bald eagle, which formerly nested in Cameron Parish, and the endangered wood stork.

Birds of Conservation Concern 2002 (USFWS 2002d) (*BCC 2002*) is an effort to carry out a mandate (Public Law 100-653, Title VIII) to identify species, subspecies, and populations of all migratory nongame birds that are likely to become candidates for listing under the Endangered Species Act of 1973 (ESA). The report strives to accurately identify migratory and non-migratory bird species that represent the Service's highest conservation priorities. *BCC 2002* lists birds of conservation concern at three geographic scales—North American Bird Conservation Initiative Bird Conservation Regions, U.S.

FWS Regions, and National—to maximize the utility of the lists for partners and agencies.

While all the bird species included in *BCC 2002* are priorities for conservation action, the lists make no finding with regard to whether they warrant consideration for ESA listing. The Service’s goal is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions. Table 1 lists the birds of management concern that are known or expected to occur on the Refuge.

Table 1. Birds of management concern to the Refuge.

Common Name	Bird Conservation Region 37 List	USFWS Region 4 List	National List
Prairie Warbler		X	X
Worm-eating Warbler		X	X
American Bittern	X		
Louisiana Waterthrush			X
Little Blue Heron		X	X
Kentucky Warbler	X		X
Reddish Egret	X	X	X
Canada Warbler			X
White Ibis	X		
Le Conte’s Sparrow	X	X	X
Northern Harrier	X		X
Nelson’s Sharp-tailed Sparrow			X
Sharp-shinned Falcon	X	X	X
Yellow Rail	X	X	X
Black Rail	X	X	X
American Golden-Plover	X		X
Wilson’s Plover	X	X	
Upland Sandpiper			X
Whimbrel	X	X	X
Long-billed Curlew	X	X	X
Marbled Godwit	X	X	X
Red Knot	X	X	X
Stilt Sandpiper	X		X
Short-billed Dowitcher	X		X
Buff-breasted Sandpiper	X	X	X
Gull-billed Tern	X	X	X
Common Tern			X
Least Tern	X	X	X
Black Tern	X		
Black Skimmer	X	X	X
Black-billed Cuckoo			X
Burrowing Owl		X	X
Short-eared Owl	X	X	X
Chuck-will’s Widow		X	X
Whip-poor-will			X
Red-headed Woodpecker	X	X	X
Olive-sided Flycatcher		X	X
Scissor-tailed Flycatcher			X
Sedge Wren	X		X
Wood Thrush			X
Golden-winged Warbler		X	X

Mottled Ducks – The mottled duck is a dabbling native to Southern North America and a close relative of the mallard. This year-round resident nests in coastal marshes and lagoons along the Gulf Coast. Its diet consists mostly of aquatic invertebrates with lesser quantities of seeds, green plant matter and fish. The Louisiana Chenier Plain population estimate is approximately 170,000 birds, making this region one of the most important in the world for this species. Mottled ducks must meet all their life cycle requirements from their year-round home of Gulf Coast marshes and associated agricultural habitats. These habitat requirements vary seasonally. As such, special consideration is warranted to ensure that the unique needs of this species are met.

Mottled ducks have a long potential nesting period, from February through mid-July, and as a result, frequent re-nesting attempts are common. Typical mottled duck nesting habitats are cordgrass ridges and other elevated sites within coastal marsh complexes, cattle pasture and rice production zone of the former coastal prairie. Mottled ducks frequently select nest sites with some overhead cover, but typically abandon sites once they are overgrown with baccharis, willow, or Chinese tallow.

Waterfowl

Migratory waterfowl use the Refuge and are vital economically to the area. Mottled ducks, wood ducks, and fulvous whistling-ducks are known to nest and raise young on the Refuge. The Refuge provides excellent wintering habitat for many other waterfowl species including white-fronted geese, lesser snow geese, and Canada geese. At least 20 duck species including gadwall, green-winged teal, blue-winged teal, American widgeon, mallards, and ring-necked ducks winter on Sabine. Aerial waterfowl surveys have recorded over 100,000 ducks on the Refuge three out of five winters, 1994-95 and 1998-99, respectively, and one of those years over 200,000 ducks were counted. Gadwall, green-winged teal, and lesser snow geese frequent the Refuge in higher numbers than other waterfowl species. Winter population surveys over the last ten years averaged almost 25,000 gadwall and 10,000 green-wing teal and snow geese, respectively (USFWS 2002c). Table 2 shows the approximate peak wintering waterfowl numbers for Sabine for the years 1990 to 1998. Figure 8 relates the various waterfowl species and their relative numbers using the marshes of SNWR.

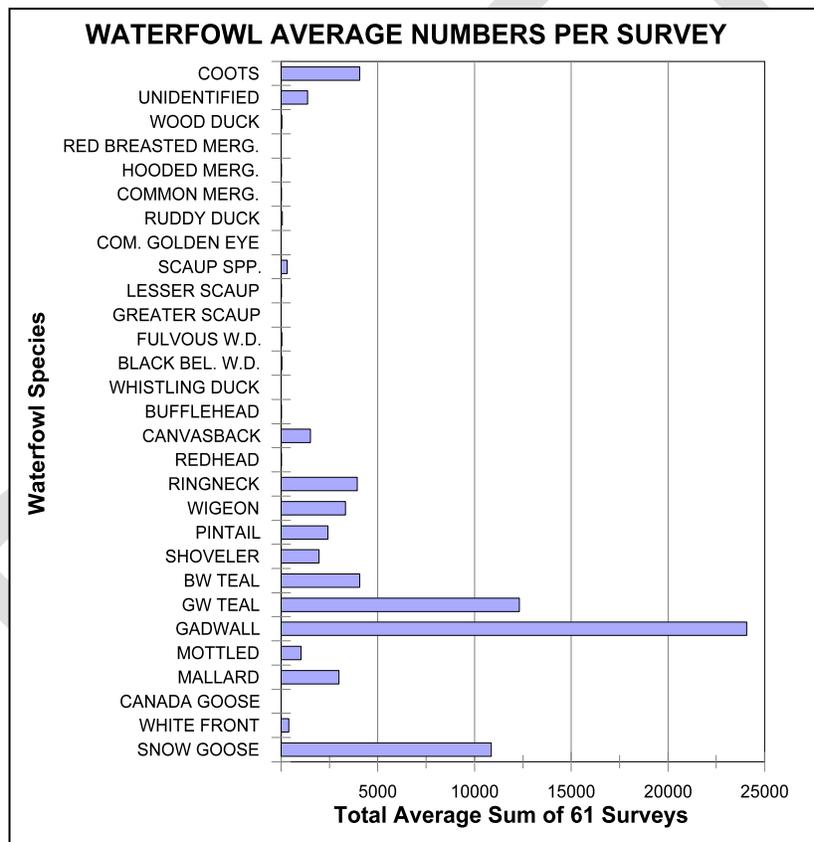
Table 2. Annual peak wintering waterfowl populations on SNWR.

Year	No. of Waterfowl Observed
1990	138,107
1991	134,909
1992	279,427

1993	204,804
1994	204,881
1995	153,912
1996	72,057
1997	136,977
1998	38,538

Source: USFWS, unpublished data

Figure 5. Waterfowl survey results for SNWR.



Wading Birds (Water and Marsh Birds)

Numerous wading bird species are present on the Refuge year-round. Winter surveys have revealed great egrets, white and white-faced ibis, and roseate spoonbills as the most abundant wading birds on the Refuge and feed throughout the marshes during the winter months. Species such as white pelicans, tricolored herons, black-crowned night herons, green herons, great blue herons, and snowy egrets are also present in great numbers. Hundreds of cormorants utilize the Refuge as well.

Many species of colonial nesting birds such as herons, egrets and cormorants have been observed nesting in trees and shrubs within Management Units 1, 1A, and 3. There are five active rookeries on the Refuge (as indicated in a May 10, 2001 survey). Favored nesting areas include islands and abandoned levees. During the 1990s, as many as 5,000 white and white-faced ibis nested in bullwhip marsh on Unit 1B. Breeding bird surveys, conducted by boat from canals, have indicated that common moorhens and least bitterns are the most abundant species of this group during the summer. Numbers of more secretive species such as clapper rails and purple gallinules have not been determined.

The Refuge has a sizable breeding population of purple gallinules (*Porphyryla martinica*), common moorhens (*Gallinula chloropus*), bitterns, and rails. Surveying of these species is difficult due to dense marsh vegetation.

Shorebirds, Gulls, Terns, and Allied Species

Over 30 shorebird species utilize habitat on the Refuge during their spring and fall migrations. As part of the International Shorebird Survey, a three-year study was conducted at several sites near Calcasieu Lake along the eastern portion of the Refuge. The results of the survey indicated that dowitcher species were the most abundant, with black-necked stilts second and small shorebirds including sandpipers and plovers, third in abundance. Other species sighted include American avocets, yellowlegs, willets, dunlins and killdeer. A June survey of black-necked stilt nests indicated that as many as 214 nests occurred in a 384-acre, muskrat eat-out area.

Raptors

Many species of hawks, owls, and vultures utilize the Refuge as a wintering ground. Red-tailed hawks, which are observed throughout the Refuge in trees lining canal banks, are the most abundant of the wintering hawks. Year-round residents include barn owls, great horned owls, and black and turkey vultures. Black vultures can usually be found roosting in trees and on structures on Club House Island at the intersection of the Beach and Central canals.

Other Migratory Birds

Seventy-five species of migratory songbirds use the Refuge levees during their spring migration. Several species of passerines are known to breed/nest on Refuge levees during the summer months, including the orchard oriole, yellow-billed cuckoo, eastern kingbird, mourning dove, white-eyed vireo, northern cardinal, and common yellowthroat. Species such as the red-winged blackbird, boat-tailed grackle, eastern meadowlark, marsh wren, and seaside sparrow are known to nest in and among the marsh vegetation. Belted

kingfishers and eastern kingbirds can be seen perched on trees and power lines above the canals along State Highway 27. Refuge personnel participate in two Christmas bird counts and a breeding bird survey route on the Refuge each year.

Amphibians and Reptiles

SNWR harbors at least 35 species of amphibians and reptiles. Species most commonly encountered include: American alligator, snapping turtle, alligator snapping turtle, red-eared slider, Mississippi green water snake, broad-banded water snake, western ribbon snake, speckled kingsnake, western cottonmouth, green anole, ground skink, Gulf coast toad, green treefrog, and southern leopard frog. Another species of note is the diamondback terrapin, a medium-size turtle that prefers open water in coastal salt marshes and estuaries (USFWS 2002a).

Hunting and Trapping

Hunting of waterfowl and alligators is permitted on the Refuge. Hunting and trapping of other wildlife species is not permitted on the Refuge. During the 1993–1994 through the 2004–2005 waterfowl hunting seasons, an average of 3,166 hunters per year used the Refuge.

Waterfowl

Hunting of ducks, geese, and coots is allowed in designated areas of the Refuge during the state waterfowl seasons set by the LDWF. All hunters are required to have a Refuge-issued permit. Waterfowl hunting on Sabine is open to the public four days per week. Refuge-regulations do not permit the use of ATVs off of designated trails. Public waterfowl hunting usually does not exceed one hunter per 250 acres. Vehicles are confined to existing roads and parking lots.

Alligator

Alligator season generally occurs during September after alligator hatching occurs, but prior to winter hibernation. The season is set by LDWF and may vary slightly depending on the duration of the nesting season. The Refuge harvest follows state regulations, but may be more restrictive under certain conditions.

Refuge hunters must have at least two years of hunting experience and have the necessary equipment. A Special Use Permit from the Refuge is required. Alligators are processed at a check station prior to leaving the Refuge or being sold. Data collected from each alligator include tag number, sex, weight, and length and girth measurements.

Alligators can be taken during daylight hours, between sunrise and sunset. The primary method for harvesting alligators on the Refuge is by setting a line with a baited hook along bayous, canals or open lakes.

Fishing and Boating

Fishing is permitted on designated waterways at Sabine. Between calendar years 2000–2005, an average of 107,030 people fished on the Refuge annually. Fishing with rod and reel, pole and line, or jug and line is permitted. The use or possession of other types of fishing gear is prohibited on the Refuge. Bank fishing along Highway 27 is permitted year-round. A special permit is required from the Refuge for cast netting for shrimp.

Fishing and public access is permitted from March 15 through October 15 on designated waterways and on Management Unit 3 (motors up to 40 horsepower). Management Units 1A and 1B are open from March 15 to October 15 to non-motorized boats only. Aside from Management Unit 3, trolling motors only are allowed in Refuge marshes. The saltwater boat launch at West Cove is open year-round for fishing access into Calcasieu Lake. The West Cove Canal is closed to fishing from October 16 through March 14, and is used for boat passage only during this time.

Aquatic Species

Fish associated with the Refuge marshes include Gulf menhaden, Atlantic croaker, gobies, pipefish, bay anchovy, inland silverside, western mosquitofish, pinfish, striped and white mullet, silver perch, bay whiff, bayou and rainwater killifish, speckled worm eel, sand sea trout, red drum, crappie, gar, sunfishes, largemouth bass, and catfish. Shellfish associated with these areas include blue and mud crab, and white, grass, and brown shrimp. Many of these fish spend time maturing in these marshes before they return to the ocean. Recreational fishery populations have been greatly reduced over the last decade because of drops in water levels due to management and drought (USFWS 2002a). Restocking efforts on the Refuge failed and low populations are expected to continue in the future.

Invasive Plant Species

Several invasive plant species are present on the Refuge. The Chinese tallowtree (*Sapium sebiferum*), the most prevalent, is found on canal and impoundment spoil banks and may be found on ridges. It is an introduced ornamental that has escaped to become the dominant woody species in Louisiana coastal marshes. Larger tallowtrees can be controlled by herbicide application or cleared, and small plants can be removed by burning woody growth before it reaches maturity.

Salt cedar (*Tamarix gallica*) is found sparsely along canal banks and ridges throughout the Refuge. It was introduced from Europe and can be an aggressive invader on dewatered, disturbed wetlands and especially on hydraulically deposited soils. Drought conditions probably contribute to its establishment and propagation. Methods of control include long-term deep flooding or application of herbicides licensed for aquatic use.

Chinaberry trees (*Melia azedarach*) are present on canal and spoil banks on the Refuge. It was introduced as an ornamental, but has escaped and now can be found on higher

elevated areas of the Refuge. No methods of control or elimination were found in the literature, but may be similar to tallowtree.

Water hyacinth (*Eichhornia sp.*) was found in old borrow pits used to construct ring levees for oil and gas development in Management Unit 2. This is a South American and African plant introduced as an ornamental that produces quickly and has no natural predator in the United States. Repeated applications of the herbicide 2,4-D is the most practical method of reducing infestations.

Eurasian milfoil (*Myriophyllum spicatum*) is rapidly colonizing areas that have converted from emergent marsh to open water, and was found to be one of the most common species near terraces placed in an open water area in Unit 7. Though Eurasian milfoil is not native and is of less value to wildlife than other aquatic species, its presence is desired over the absence of vegetation in recently disturbed open water areas. The species is native to Eurasia and Africa and is believed to have arrived in North America during the late 19th century, possibly from shipping ballast. Methods of control include application of 2-4-D or biocontrol by introducing American Weevil.

Non-native Invasive Animal Species

The most common invasive animal on the Refuge is the feral hog. Feral hogs are common on the Refuge and can be detrimental to nesting bird success. Hogs degrade habitat and contribute to land loss by damaging healthy plants that hold the fragile marsh soils together. No harvest of feral hogs is conducted on the Refuge at this time. Feral hogs (Family Suidae) are considered by many biologists and land managers as a serious threat to native flora and fauna. They compete with native wildlife for food and shelter and can even pose a threat to humans, pets and domestic livestock through the spread of disease (MDC, web source). Feral hogs spend much of their time rooting and wallowing in wet areas such as river bottoms and marsh areas. Rooting and digging behaviors can contribute to erosion and destruction of native plant species, resulting in changes of successional patterns and soil properties (Miller, Synatzke. 1993). Feral hogs are voracious omnivores, eating almost anything they encounter. Grasses, roots and succulent green vegetation are preferred foods but they will eat fruits, nuts, and animal matter. They commonly eat the eggs of ground nesting-birds, rabbits and turtles, and are reported to kill and eat fawns. Additional concerns regarding feral swine are that the species is very adaptable in wild ecosystems and are potential disease and parasite reservoirs (Miller, Synatzke. 1993).

Currently and in past years, feral hogs have roamed at large on private property adjacent to SNWR and have gone unchecked and unmanaged. The rapidly expanding distribution of feral hogs in the United States has caused great concern for many land and resource managers. The ecologically-rich marshes of SNWR have not been immune to the invasion of these animals. cursory observations suggest accelerated increases over the last few years. Feral hogs are omnivores devouring flora and fauna alike.

According to the Louisiana State University Agricultural Center (LSU AgCenter), feral hog populations are growing and expanding in the state and throughout the southeastern states. Hogs are becoming one of the most serious concerns for wildlife managers. They root up food plots, eat the corn at feeders, tear up hardwood stands looking for acorns, and scare other wildlife away. Hogs also prey on young game animals, compete with native wildlife, carry diseases and pollute streams. Feral hogs damage forest regeneration and other agricultural crops like sugarcane, corn and rice.

Feral hogs are a result of domestic hogs that have been released or a hybrid of domestic hogs and introduced Russian boars. Feral hogs are adaptable to a wide range of habitats -- from piney woods to bottomland hardwoods and even marshlands. Their average size is 100 to 150 pounds, but they can reach over 400 pounds. Feral hogs are the most prolific large wild mammal in North America with the population able to double in four months. Sows breed throughout the year or seasonally beginning at eight to 10 months of age. They can produce two litters every 12 to 18 months with an average of four to eight piglets per litter. Older sows may have litters of 10 to 13.

Feral hogs carry many diseases that can transmit to humans. Brucellosis is the most dangerous but also the most preventable disease. The disease causes Undulant Fever in humans, which can result in fever, orchitis or oophoritis. Treatment can last for months, and the problems can re-occur at any time. The disease is contracted when butchering or handling the meat of feral hogs. The simple solution is to wear rubber or latex gloves when processing a hog or handling uncooked meat. Properly cooked meat is safe to eat (LSU AgCenter).

Many biologists and wildlife managers recommended trapping or shooting as the best control methods. Feral hogs are considered unregulated quadrupeds in Louisiana. They can be shot by anyone with a legal hunting license during legal daylight shooting hours year-round.

Nutria (*Myocaster coypus*) is another invasive species of concern. However, numbers have decreased dramatically in the last few years. The nutria can cause harm to fragile marshes when they occur in high densities. When warranted, harvest is used to control the population.

Another invasive animal species of concern potentially found on the Refuge is the zebra mussel, which has caused great problems wherever it has become established in North America. Refuge personnel annually monitor canals throughout the Refuge for this highly invasive mussel, but none have been found to date.

3.4 Threatened, Endangered and Species of Concern

Diamond-backed Terrapins

The diamond-backed terrapin is a medium-sized turtle (4–9 inches long) whose preferred habitats include coastal marshes, sheltered coves, tidal channels fringed by cordgrass, and lagoons behind barrier beaches. It has an unusually sculptured shell that is greenish or

yellowish on the bottom, plates that bear deep growth rings, black prominent eyes and light-colored jaws. Females are twice as large as males and mature more slowly. In the southern reaches of their range, along the Gulf Coast, they nest in April or May.

3.5 Fishery Resources

SNWR boasts more than 132 fish species, shrimp, crab and oyster beds (CCP 2007).

3.6 Cultural Resources

SNWR contains several archeological sites with artifacts from the Native Atakapa people, who inhabited much of southwest Louisiana and southeast Texas before European colonization in the mid-1700s. Known sites can be found in almost all units of the Refuge, though details are known for few of the sites. State regulations prohibit the disclosure of the contents of most of these sites, and several sites have only been identified from aerial photographs. Most of the known site locations on the Refuge were identified by a cultural resource survey. There are no programs allowing the public access to these sites, and there is little for the public to view on these sites due to the high subsidence and burial rates found in coastal Louisiana. Most sites abandoned before 800 A.D. are buried. Cultural sites have been damaged inadvertently due to canal construction and maintenance, mostly before the Refuge was acquired.

Three archeological sites on the Refuge are located at the “Club House” at the intersection of the Central and Beach canals, and two oyster shell concentrations observed in the East Cove Unit. The cultural significance of these sites is unknown, but a cursory survey was conducted on the “Club House” site. The survey indicated that the material at the “Club House” was probably transported from nearby Shell Hill in order to raise the elevation of the “Club House.” The materials from this site are still of concern, but may not have originated on the site.

An Atakapa site, which may have served as a seasonal settlement, has been found near the Refuge at the Hackberry Salt Dome. The Atakapa, named by the early French explorers for the Choctaw Indian word for “man-eater,” are believed to be one of the most technologically primitive Native American cultural groups in North America. The culture did not feature hierarchical leadership or an organized religious structure, though shamans were prominent members of the community. Most of their technological development centered on subsistence hunting, and their reputation as cannibals kept the group isolated from the Europeans until the mid-1700s.

The Atakapa probably subsisted by hunting, foraging, and fishing. Common foods probably included: deer, raccoon, muskrat, turtle, alligator, and various fish and shellfish. Shell mounds are believed to have been a prominent feature in coastal Atakapa settlements. The Atakapa were semi-nomadic and probably only spent the spring and summer subsisting in small family groups on coastal lands, such as those currently occupied by the Sabine Refuge; the fall and winter were spent in larger settlements further inland.

The area was a “no-man’s land” between Spanish Mexico and French (later American) Louisiana frequented only by trappers and outlaws until the early 1800s. European settlement of southwest Louisiana during the late 1700s consisted mostly of isolated communities of Acadian, French, and Spanish settlers. After Louisiana was purchased by the United States in 1803, new Scottish-Irish settlers began to settle the area, but it was not until the railroads connected the area with the outside world after the Civil War that major settlements, most notably the City of Lake Charles, were founded.

The area now occupied by the Sabine Refuge was relatively undisturbed until oil was discovered in the region in the 1920s. The fur industry became a secondary source of income for the Texas Company, an oil company that owned much of the area currently occupied by the Refuge. Declines in muskrat populations during the late 1920s and early 1930s led to the Texas Company (now ChevronTexaco) selling surface rights to the federal government for the purpose of establishing SNWR. The company retains the subsurface rights to this day.

It may be presumed that many undiscovered archeological sites exist at Sabine. These sites may never be discovered due to the difficult survey conditions imposed by the marsh environment. The Refuge at present does not have a Cultural Resources Management Plan. This plan, when completed, will specify the measures that need to be taken on the Refuge to identify, protect, and interpret the area’s archeological and historical sites.

3.7 Socio Economic

SNWR is located in 1,313 square-miles Cameron Parish, Louisiana, one of the largest parishes (i.e., county equivalent) in the state. Cameron Parish is situated in the extreme southwestern corner of Louisiana, abutting the Gulf of Mexico to the south and Texas to the west. In 2003, the population of the parish was estimated at 9,708, a slight decline (3%) from the 2000 Census (U.S. Census Bureau 2004). The median household income of the parish in 1999 was \$34,232, compared to \$32,566 for Louisiana as a whole. The same relative prosperity is reflected in a poverty rate below the state average. Approximately 12% of Cameron Parish residents lived below the poverty line in 1999, compared to almost 20% for all of Louisiana. Educational attainment is below the state average, however, with only 8% of the population aged 25 or higher having a Bachelor’s degree or higher, as opposed to the statewide average of 19%.

In 2003, transportation and warehousing was the largest of 20 major economic and employment sectors in the parish (STATS Indiana 2004). The U.S. Census Bureau classified occupations in Cameron Parish are shown in Table 3.

In terms of employment by industrial sector, the primary industries lumped as “agriculture, forestry, fishing and hunting, and mining” predominate in Cameron Parish, as shown in Table 4.

In terms of its racial and ethnic breakdown, as reported in the 2000 Census, Cameron Parish is 92.5% white, non-Hispanic; 3.9% black or African American; 0.4% American Indian; 0.4% Asian; and 2.2% Hispanic or of Latino origin (U.S. Census Bureau 2004). (These percentages do not add up precisely to 100% because of the difference between designated races—white, black, Native American, and Asian—and ethnicities, which are Latino and non-Latino.) In addition, 1.6% in the Census reported some other race or two or more races. Overall, the population of Cameron Parish has a greater percentage of non-Hispanic whites (92.5%) than the state as a whole (62.5%). That is, it is less diverse and has fewer minorities.

TABLE 3. CAMERON PARISH - OCCUPATIONS OF EMPLOYED CIVILIAN POPULATION 16 YEARS AND OLDER (2000).

CAMERON PARISH - OCCUPATIONS OF EMPLOYED CIVILIAN POPULATION 16 YEARS AND OLDER (2000)		
OCCUPATION	NUMBER	PERCENT
MANAGEMENT, PROFESSIONAL, AND RELATED OCCUPATIONS	772	18.5
SERVICE OCCUPATIONS	718	17.2
SALES AND OFFICE OCCUPATIONS	954	22.8
FARMING, FISHING AND FORESTRY OCCUPATIONS	199	4.8
CONSTRUCTION, EXTRACTION AND MAINTENANCE OCCUPATIONS	594	14.2
PRODUCTION, TRANSPORTATION, AND MATERIAL MOVING	947	22.6
SOURCE: U.S. CENSUS BUREAU, CENSUS 2000, SUMMARY FILE 3, PROFILE OF SELECTED ECONOMIC CHARACTERISTICS		

TABLE 4. CAMERON PARISH - EMPLOYMENT OF CIVILIAN POPULATION 16 YEARS AND OLDER BY INDUSTRY (2000).

CAMERON PARISH – EMPLOYMENT OF CIVILIAN POPULATION 16 YEARS AND OLDER BY INDUSTRY (2000)

INDUSTRY	NUMBER	PERCENT
AGRICULTURE, FORESTRY, FISHING AND HUNTING, AND MINING	696	16.6
CONSTRUCTION	470	11.2
MANUFACTURING	295	7.1
WHOLESALE TRADE	143	3.4
RETAIL TRADE	426	10.2
TRANSPORTATION AND WAREHOUSING, AND UTILITIES	396	9.5
INFORMATION	52	1.2
FINANCE, INSURANCE, REAL ESTATE, AND RENTAL AND LEASING	155	3.7
PROFESSIONAL, SCIENTIFIC, MANAGEMENT, ADMINISTRATIVE, AND WASTE MANAGEMENT SERVICES	206	4.9
EDUCATIONAL, HEALTH AND SOCIAL SERVICES	677	16.2
ARTS, ENTERTAINMENT, RECREATION, ACCOMMODATION AND FOOD SERVICES	269	6.4
OTHER SERVICES (EXCEPT PUBLIC ADMINISTRATION)	213	5.1
PUBLIC ADMINISTRATION	186	4.4
SOURCE: U.S. CENSUS BUREAU, CENSUS 2000, SUMMARY FILE 3, PROFILE OF SELECTED ECONOMIC CHARACTERISTICS		

Chapter 4 Environmental Consequences

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

4.1 Effects Common to all Alternatives

4.1.1 Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Bill Clinton on February 11, 1994, to focus federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities’ access to public information and participation in matters relating to human

health or the environment. This assessment has not identified any adverse or beneficial effects for either alternative unique to minority or low-income populations in the affected area. Neither alternative will disproportionately place any adverse environmental, economic, social, nor health impacts on minority or low-income populations.

4.1.2 Public Health and Safety

Each alternative would have similar effects or minimal to negligible effects on human health and safety.

4.1.3 Refuge Physical Environment

Impacts of each alternative on the Refuge physical environment would have similar minimal to negligible effects. Some disturbance to surface soils, topography, and vegetation would occur in areas selected for hunting; however, effects would be minimal. Hunting would benefit vegetation and wildlife as it would aid in reducing feral hog populations within the Refuge. The Refuge would also control access to minimize habitat degradation.

Impacts to the natural hydrology would have negligible effects. The Refuge expects impacts to air and water quality to be minimal and only due to Refuge visitors' automobile and off-road vehicle emissions and run-off from road and trail sides. The effect of these Refuge-related activities on overall air and water quality in the region are anticipated to be relatively negligible. Existing State water quality criteria and use classifications are adequate to achieve desired on-refuge conditions; thus, implementation of the proposed action would not impact adjacent landowners or users beyond the constraints already implemented under existing State standards and laws. Impacts associated with solitude are expected to be minimal given time and space zone management techniques, such as seasonal access and area closures, used to avoid conflicts among user groups.

4.1.4. Cultural Resources

Under each alternative, hunting, regardless of method or species targeted, is a consumptive activity that does not pose any threat to historic properties on and/or near the Refuge.

4.1.5. Facilities

Maintenance or improvement of existing facilities (i.e. parking areas, roads, trails, and boat ramps) will cause minimal short term impacts to localized soils and waters and may cause some wildlife disturbances and damage to vegetation. The Service defines

facilities as: “Real property that serves a particular function(s) such as buildings, roads, utilities, water control structures, raceways, etc.”

4.2 Summary of Effects

4.2.1 Direct and Indirect Impacts to Habitat

Alternative 1. No Action

Under this alternative, no effort would be made to control feral hogs on the refuge.

Direct Effect: Feral hog damage to SNWR would continue to increase affecting the flora and fauna dependant on wetland habitat.

Indirect Effect: Landscape damage caused by feral hogs would cause long term impact to wildlife and wildlife related activities on SNWR and potentially spread to adjacent private lands.

Alternative 2. Proposed Action : Implement the Feral Hog Management Plan

Under this alternative, the Refuge purpose of conserving wetlands for wildlife would be achieved and the goals of the SNWR Comprehensive Conservation Plan would be fully met.

Direct Effect: The biological integrity of the Refuge would be protected. The management of feral hogs would positively impact wildlife habitat by promoting plant health, and be beneficial to both migratory and nesting wildlife populations.

Indirect Effect: The addition taking of feral hogs might cause minor vegetation damage and increase noise disturbance. However both impacts are short term and very localized. Controlling hog on federal lands may reduce the number of hogs destroying vegetation and wildlife on adjacent private land

4.2.2 Direct and Indirect Impacts to Hunted Wildlife (Waterfowl)

Alternative 1. No Action

Direct Effect: Uncontrolled, Feral hog populations will increase causing additional refuge disturbance. Disturbances will include but are not limited to: mottled duck nest destruction, wetland vegetation destruction, competition for food with all other migratory and nesting species.

Indirect Effect: Destruction of marsh habitat would contribute to a decline in migratory wetland species’ use of the Refuge. Vegetative seed sources would be reduced as feral hogs “root” wetland plants beneficial to wintering waterfowl. They directly compete for food that native species need for winter survival.

Alternative 2. Proposed Action: Implement the Feral Hog Management Plan

Direct Effect: Migratory bird hunting would continue to occur on 34,000 acres of the Refuge. Hunting is allowed four days (Wed, Thurs, Sat and Sun) a week. A decrease in the population of feral hogs along with a decrease in habitat damage and nest depredation would occur under this alternative.

Indirect Effect: Feral hog management could cause some disturbance to other game species depending on proximity to the actual hunt. However, time and space zoning established by Refuge regulations would minimize incidental disturbance.

4.2.3 Direct and Indirect Impacts to Non-hunted Wildlife

Alternative 1. No Action

Direct Effect: Degradation of populations of non-hunted species would continue as nest disturbance and niche encroachment by feral hogs would continue to increase at a prolific rate.

Indirect Effect: The sensitive wetland ecosystem on the Refuge would be degraded over an extended period of time by increases in feral hog populations on the Refuge which could expand to private land.

Alternative 2. Proposed Action: Implement the Feral Hog Management Plan

Direct Effect: Disturbance to non-hunted wildlife could increase slightly during the implementation of the hog management plan or trapping and relocation proposal. However, impact will be localized and short term due to careful hog management techniques. Disturbance to daily wintering activities of birds might occur, but will be transitory as FWS personnel, and/or hunters traverse habitat. Disturbance to birds would probably be commensurate with that caused by non-consumptive users and normal refuge maintenance activities. Increased disturbance to non-hunted wildlife will be minimal.

Indirect Effect: Public wildlife observation may be reduced on occasion. However, no feral hog management will occur in areas easily accessible for wildlife observation (non-consumptive) by the public at times of high non-consumptive public use. Most feral hog management activities will occur in the winter in areas open only to hunters.

4.2.4 Direct and Indirect Impacts to Endangered and Threatened Species

Alternative 1. No Action

There are no endangered species to be impacted

Alternative 2. Proposed Action: Implement the Feral Hog Management Plan

There are no endangered species to be impacted

4.2.5 Direct and Indirect Impacts to Refuge Facilities (roads, trails, parking lots, levees)

Alternative 1. No Action

Additional damage to roads due to hunter use during wet weather periods would not occur; however, other users would still be using roads, thereby necessitating periodic maintenance. Additionally, costs associated with an expanded management program in the form of road and levee maintenance, instructional sign needs, and law enforcement would not be applicable.

Alternative 2. Proposed Action : Implement the Feral Hog Management Plan

The current Refuge management program has shown minimal damage to roads/ trails due to hunter use during wet weather periods. There would be some costs associated with a management program in the form of helicopter rental, USDA (WS) contract costs, road maintenance, instructional sign needs, and law enforcement. These costs should be minimal relative to total Refuge operations and maintenance costs and would not diminish resources dedicated to other Refuge management programs.

4.2.6 Direct and Indirect Impacts to Wildlife Dependant Recreation

Alternative 1. No Action

Degradation to SNWRs flora and fauna would continue to increase as feral hog populations increase. The public would not have the opportunity to harvest feral hogs, participate in wildlife-oriented recreation that is compatible with the purposes for which the Refuge was established and have an increased awareness of SNWR and the National Wildlife Refuge System.

Alternative 2. Proposed Action: Implement the Feral Hog Management Plan

As public use levels expand across time, unanticipated conflicts between user groups may occur. Experience has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. Conflicts between hunters and non-consumptive users might occur, but would be mitigated by time (non-hunting season) and space zoning.

As the feral hog populations decreases, less damage and degradation would occur. The public would have an increased awareness of SNWR, the National Wildlife Refuge System and public demand for more hunting would be met. The public would also have

the opportunity to harvest a renewable resource in a traditional manner, which is culturally important to the local community.

4.3 Cumulative Impacts Analysis

4.3.1.1 Migratory Birds

Over time, regular application of the tools identified in the SNWR Feral Hog Management Plan, in conjunction with other habitat management techniques such as prescribed burning, water level management and water salinity management should increase waterfowl food production and furnish habitats and sanctuary needs for migrating, wintering, and breeding ducks (particularly the mottled duck) and geese of the Chenier Plain system of southwest Louisiana. The wetland habitat's overall value to waterfowl, other waterbirds, and aquatic species like fish and the alligator would also be improved and extended under the proposed action.

4.3.1.2 Resident Wildlife (Exotic and Native)

4.3.1.2.1 Feral Hogs

Feral hogs can have detectable influences on wildlife and plant communities. Extensive disturbance of vegetation and soil occurs as a result of their foraging (rooting) habits. The disturbed area may cause a shift in plant succession on the immediate site. Feral hogs also compete, to some degree, with several species of wildlife for certain foods (Engeman et al.). Feral hogs are often the single greatest vertebrate modifiers of natural plant communities (Bratton 1977, Wood and Barrett 1979, Stone and Keith 1987, Engeman et al. in press). Habitat damage by hogs is most pronounced in wet areas (e.g., Choquenot et al. 1996, Engeman et al. in press). Their shallow waters are dominated by herbs and shrubs (Florida Natural Inventory 1990), making them desirable for foraging by hogs.

Invasive feral hog populations can also lead to outbreaks of diseases such as swine fever (hog cholera), brucellosis, and pseudo rabies.

4.3.1.3 Non-hunted Wildlife

Non-hunted wildlife would include migratory birds such as songbirds, wading birds, raptors, and woodpeckers; small mammals such as voles, moles, mice, shrews, and bats; reptiles and amphibians such as snakes, skinks, turtles, lizards, salamanders, frogs and toads; and invertebrates such as butterflies, moths, other insects and spiders. Except for migratory birds and some species of migratory bats, butterflies and moths, these species have very limited home ranges and hunting could not affect their populations regionally; thus, only local effects will be discussed.

The cumulative effects of disturbance to non-hunted migratory birds under the proposed action are expected to be negligible for the following reasons. The removal of hogs will be carefully planned to not coincide with the nesting season. Long-term future impacts

that could occur if reproduction was reduced by the taking of hogs are not relevant for this reason. Disturbance to the daily wintering activities, such as feeding and resting, of birds might occur. Disturbance to birds by hunters would probably be commensurate with that caused by non-consumptive users.

The cumulative effects of disturbance to small animals under the proposed action are expected to be negligible for the following reasons. Small mammals are generally inactive during winter when hogs will most likely be taken. These species are also nocturnal. Both of these qualities make hunter interactions with small mammals very rare. Hibernation or torpor by cold-blood reptiles and amphibians also limits their activity during the hunting season when temperatures are low. Personnel involved with the removal of hogs either private or professional would rarely encounter reptiles and amphibians during most of the removal period. Encounters with reptiles and amphibians in the early fall are few and should not have cumulative negative effects on reptile and amphibian populations. Invertebrates are also inactive during cold weather and would have few interactions with personnel during the removal period. Refuge regulations further mitigate possible disturbance by hunters to non-hunted wildlife. Vehicles are restricted to roads and the harassment or taking of any wildlife other than the targeted species is not permitted.

Some species of bats, butterflies and moths are migratory. Cumulative effects to these species at the “flyway” level should be negligible. These species are in torpor or have completely passed through South Louisiana by peak control period. Some taking of feral hogs may occur when these species are migrating; however, human interaction would be commensurate with that of non-consumptive users.

Positive effects of the proposed action would include quality habitat, decreased predation by hogs on ground nesting species or pre-fledgling birds that may prematurely fall from their nests, increased fecundity due to decreased competition for native foods and the enhanced potential for increased population levels.

4.3.1.5 Endangered Species

Species of special management concern, including threatened or endangered, occur infrequently at Sabine. Calcasieu and Sabine lakes provide habitat for two species of sea turtles: the federally endangered Kemp’s ridley and the federally threatened loggerhead. The Refuge provides access and habitat for these species. As well, the Refuge could potentially be used by the endangered wood stork. The implementation of feral hog hunting “will not affect” Kemp’s ridley and/or the loggerhead turtles. Migratory birding hunting was taken into consideration during this analysis.

4.3.2.1 Wildlife-Dependant Recreation

As public use levels expand across time, unanticipated conflicts between user groups may

occur. The Refuge's visitor use programs would be adjusted as needed to eliminate or minimize each problem and provide quality wildlife-dependent recreational opportunities. Experience has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups.

The level of recreation use and ground-based disturbance from visitors would be largely concentrated at trails and the Refuge's office and maintenance areas. This, combined with the addition of increased hunting opportunity, could have a negative effect on nesting bird populations. However, the hunting will be limited to non-nesting periods for birds that utilize the Refuge.

The Refuge would control access under this alternative to minimize wildlife disturbance and habitat degradation, while allowing current and proposed compatible wildlife-dependent recreation. Some areas, such as waterfowl sanctuaries, would be closed seasonally to hunting to minimize disturbance to wintering waterfowl.

4.3.2.2 Refuge Facilities

The Service defines facilities as: "Real property that serves a particular function(s) such as buildings, roads, utilities, water control structures, raceways, etc." Under the proposed action those facilities most utilized by people engaged in hog removal are: roads, parking lots and trails. Maintenance or improvement of existing facilities (i.e. parking areas, roads, and trails) will cause minimal short term impacts to localized soils and waters and may cause some wildlife disturbances and damage to vegetation. The facility maintenance and improvement activities described are periodically conducted to accommodate daily refuge management operations and general public uses such as wildlife observation and photography. These activities will be conducted at times (seasonal and/or daily) to cause the least amount of disturbance to wildlife. Disturbed sites will be restored to as natural a condition as possible. During times when roads are impassible due to flood events or other natural causes those roads, parking lots, trails and boat ramps impacted by the event will be closed to vehicular use.

4.3.2.3 Cultural Resources

The removal of feral hogs from the SNWR, regardless of method or species targeted, is an activity that does not pose any threat to historic properties on and/or near the Refuge. Feral hog removal meets only one of the two criteria used to identify an "undertaking" that triggers a federal agency's need to comply with Section 106 of the National Historic Preservation Act.

These criteria, which are delineated in 36 CFR Part 800, state:

- 1- An undertaking is any project, activity, or program that can alter the character or use of an archaeological or historic site located within the "area of potential effect;" and

2- The project, activity, or program must also be either funded, sponsored, performed, licenses, or have received assistance from the agency.

Consultation with the pertinent State Historic Preservation Office and federally recognized Tribes are, therefore, not required.

4.3.2.4 Anticipated Impacts if Proposed Feral Hog Management Plan is used on Refuge Environment and Community

The Refuge expects no sizeable adverse impacts of the proposed action on the Refuge environment which consists of soils, vegetation, air quality, water quality and solitude. Some disturbance to surface soils and vegetation would occur in areas selected for feral hog management; however, impacts would be minimal. Feral Hog Management would benefit vegetation and various wildlife species by regressing habitat damage and predation caused by feral hogs. The Refuge would also control access to minimize habitat degradation.

The Refuge expects no impacts to air and water quality. Existing State water quality criteria and use classifications are adequate to achieve desired on-refuge conditions; thus, implementation of the proposed action would not impact adjacent landowners or users beyond the constraints already implemented under existing State standards and laws.

Impacts associated with solitude are expected to be minimal given time and space zone management techniques, such as seasonal access and area closures, used to avoid conflicts among user groups.

The Refuge would work closely with State, Federal, and private partners to minimize impacts to adjacent lands and its associated natural resources; however, no indirect or direct impacts are anticipated. The newly opened hunts would result in a net gain of public hunting opportunities positively impacting the general public, nearby residents, and refuge visitors. The Refuge expects increased visitation and tourism to bring additional revenues to local communities but not a significant increase in overall revenue in any area.

4.3.2.5 Other Past, Present, Proposed, and Reasonably Foreseeable Feral Hog Management and Anticipated Impacts

Cumulative effects on the environment result from incremental effects of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative effects may result from individual minor actions, they may, viewed as a whole, become substantial over time. The proposed management plan has been designed so as to be sustainable through time given relatively stable conditions. Changes in refuge conditions, such as sizeable increases in refuge acreage or public use, are likely to change the anticipated impacts of the current plan and would trigger a new planning and assessment process.

The implementation of any of the proposed actions described in this assessment would have both direct and indirect effects (e.g., new site inclusion would result in increased public use, thus increasing vehicular traffic, disturbance, etc); however, the cumulative effects of these actions are not expected to be substantial.

4.3.2.6 Anticipated Impacts if Individual Hunts are Allowed to Accumulate

When hunting is used as a management tool to control feral hogs on the Refuge the program would be managed within the framework of State and Federal regulations. By maintaining regulations that are as, or more, restrictive than the State, individual refuges ensure that they are maintaining seasons which are supportive of management on a more regional basis. This is a time honored process and has been used to successfully manage alligator hunting within the Southwest Louisiana National Wildlife Refuge Complex. Additionally, Refuges coordinate with LDWF annually to maintain regulations and programs that are consistent with the State management program.

Chapter 5 Consultation and Coordination with Others

A 30 day public review and comment process will be announced via a U S FWS News Release. The draft environmental assessment can be found on the internet at <http://www.fws.gov.swlarefugecomplex> or by contacting the Southwest Louisiana National Wildlife Refuge Complex at 337-598-2216.

Appendix 1

Literature References

Bratton, S.P. 1977. Wild hogs in the United States- origin and nomenclature. Pp. 1-4 in Research and Management of Wild Hog Populations (G.W. Wood,ed.). The Belle W. Baruch Forest Science Institute of Clemson University, Georgetown, South Carolina.

Chabreck, R. H. 1970. Marsh Zones and Vegetative Type in the Louisiana Coastal Marshes. Ph.D. dissertation. Louisiana State University, Baton Rouge, LA. 112. pp.

Chiasson, R.L., Proffitt, C.E., Edwards, K.R., and others, 2002, Recruitment and growth of high marsh plants on dredged sediment mudflats: the influence of *Spartina alterniflora* clonal growth [abs.], in 6th Biannual Basics of the Basin Research Symposium Addressing the Condition of the Lake Pontchartrain Basin, The Pontchartrain Research Committee and the Gulf Estuarine Research Society -- Annual Meeting, May 16 and 17, 2002, University of New Orleans, New Orleans, La., p. 95.

Choquenot, D., J. McIlroy, and T. Korn. 1996. Managing Vertebrate Pests: Feral Pigs. Canberra, ACT: Bureau of Resources Sciences, Australian Government Publishing Service. 163 pp.

Engeman, Richard, M., et al. USDA National Wildlife Research Center: Wildlife Damage Management. by Staff Publications, NE: University of Nebraska, 2003.

Ford, M. A., D. R. Cahoon, and J. C. Lynch. 1999. Restoring marsh elevation in a rapidly subsiding salt marsh by thin-layer deposition of dredged material. *Ecological Engineering* 12:189–205.

Bratton, S.P. 1977. Wild Hogs in the United States-origin and nomenclature. Pp. 1-4 in Research and Management of Wild Hog Populations (G.W. Wood, ed.) The Belle W. Baruch Forest Science Institute of Clemson University, Georgetown, South Carolina.

Kaller, M. H., J.D. Hudson, Achberger, E.C., and W.E. Kelso. 2007. Feral hog research in western Louisiana: expanding populations and unforeseen consequences. *Human-Wildlife Conflicts* 1(2): 168-177.

Lester, Gary D., Stephen G. Sorensen, Patricia L. Faulkner, Christopher S. Reid, and Ines E. Maxit. 2005. Louisiana Comprehensive Wildlife Conservation Strategy. Louisiana Department of Wildlife and Fisheries, Baton Rouge, Louisiana. Pages 105-109.

Louisiana Coastal Wetlands Conservation and Restoration Task Force. 2002. <http://www.lacoast.gov/reports/>. Web source

Miller, J.E., Synatzke, D.R. 1993. A National Prospective on Feral Swine in: Feral Swine: A Compendium for Resource Managers, March 24-25, 1993.

O'Neil, T. 1949. The Muskrat in the Louisiana Coastal Marshes. Louisiana Department of Wildlife and Fisheries, New Orleans, LA. 152. pp.

Proffitt, C.E., Edwards, K., Travis, S., and others, 2003, Field experiments involving *Spartina alterniflora* in saline wetlands created from dredged sediment: colonization, growth, and interactions with other plant species [abs.], *in* Wetland Stewardship: Changing Landscapes and Interdisciplinary Challenges, 24th Annual Conference of the Society of Wetland Scientists, New Orleans, La., p. 171.

(STATS Indiana, 2004) Indiana Department of Commerce. 2004. USA Counties in Profile. Accessed at:

http://www.stats.indiana.edu/uspr/a/usprofiles/22/us_over_sub_pr22023.html.

Stone, C.P., and J.O. Keith. 1987. Control of feral ungulates and small mammals in Hawaii's National Parks: research and management strategies. Pp. 277-287 *in* Control of Mammal Pests (C.G.H. Richards and T.Y. Ku, eds.). Taylor and Francis, London.

Stone, G.W., J.M. Grymes, III, K.D. Robbins, S.G. Underwood, G.D. Steyer, and R.A. Muller. 1993. A chronologic overview of climatological and hydrological aspects associated with Hurricane Andrew and its morphological effects along the Louisiana coast, USA. *Shore and Beach*. 61(2): 2-12.

Thompson, Francis, C. 2009. **ANIMALS** - Provides relative to transportation and release of animals and prohibits importation or release of feral hogs. Senate Bill 126. Louisiana Legislature. <http://www.legis.state.la.us/>

(USCB, 2004) U.S. Census Bureau. 2004. Louisiana Quick Facts: Cameron Parish. Accessed at: <http://quickfacts.census.gov/qfd/states/22/22023.html>

U.S. FWS. 1993. Refuges 2003, Draft Environmental Impact Statement, A Plan for the Future of the National Wildlife Refuge System.

U.S. FWS. 2002a. Cameron Prairie National Wildlife Refuge, Biological Review Notebook.

U.S. FWS. 2002c. Southwest Louisiana Refuges Complex, Visitor Services Review, June 17–20, 2002.

U.S. FWS. 2002d. *Birds of Conservation Concern 2002*. Division of Migratory Bird Management, Arlington, Virginia. 99 pp.

U.S. FWS. 2003. Cameron Prairie Refuge – Wildlife and Habitat (Biological Review). Draft Final Report.

Wood, G.W., and R.H. Barrett. 1979. Status of wild pigs in the United States. *Wildlife Society Bulletin* 7:237-

Winslow, J.W. 2003. Estimation of Waterfowl Food Abundance in Coastal Freshwater Marshes of Louisiana & Texas. Thesis, Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College.

Wood, G.W., and R.H. Barrett. 1979. Status of wild pigs in the United States. Wildlife Society Bulletin 7:237-246.

DRAFT

APPENDIX 2.

Aerial Capture, Eradication and Tagging of
Animals (ACETA) Handbook

DRAFT

APPENDIX 3.

Non Law Enforcement Firearms Policy for the Southwest Louisiana National Wildlife
Refuge Complex

DRAFT