U.S. Fish & Wildlife Service

FERAL SWINE DAMAGE MANAGEMENT PLAN FOR

THEODORE ROOSEVELT NATIONAL WILDLIFE REFUGE COMPLEX

Washington, Issaquena, Sharkey, Humphreys, Yazoo, Holmes, and Leflore Counties, Mississippi

Southeast Region

Feral Swine Damage Management Plan
Theodore Roosevelt National Wildlife Refuge Complex

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FERAL SWINE DAMAGE MANAGEMENT PLAN

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CHAPTER I. INTRODUCTION

In 2006, the United States Fish & Wildlife Service (USFWS) completed the Theodore Roosevelt National Wildlife Refuge Complex (TRNWRC) Comprehensive Conservation Plan (CCP) to guide management actions and direction for five refuges. These refuges included Hillside, Mathews Brake, Morgan Brake, Panther Swamp, and Yazoo National Wildlife Refuges. In 2014, the USFWS drafted a CCP for Holt Collier and Theodore Roosevelt National Wildlife Refuges which are also in the TRNWRC. This Draft CCP will be available in 2015. The CCP process includes an extensive public scoping and public comment process in which feral swine were identified as one of the most problematic invasive species (U.S. Fish and Wildlife Service, 2006; U.S. Fish and Wildlife Service, 2015). Feral swine are also recognized on the Global Invasive Species Database (IUCN Invasive Species Specialist Group, 2010) as one of the top 100 of the world's worst invasive alien species. This management plan will outline the objectives and details necessary to begin feral swine damage management throughout the TRNWRC.

Feral swine (*Sus scrofa*) are referred to as wild pigs, wild boars, hogs, piney woods rooters, and other common names (Mayer & Brisbin, 2008). Feral swine were introduced to the eastern United States from Eurasia by early European settlers as a source of food. Populations occurring on the TRNWRC mainly consist of offspring of domestic or neglected domestic swine that have become feral or offspring of feral swine that have been captured for the purpose of starting wild, free-living populations for sport hunting. Feral swine are classified by the State of Mississippi as a "nuisance animal," and liberal regulations apply to their hunting and trapping (Mississippi Department of Wildlife, Fisheries, and Parks, 2014).

Rooting, wallowing, and feeding activities of feral swine cause serious erosion to levees, river banks and areas along streams throughout much of the TRNWRC. Feral swine damage soil and plant communities and compete with native wildlife for food and cover. Feral swine in Mississippi are also known to carry diseases such as pseudorabies (Pedersen et al., 2013), swine brucellosis (Pedersen et al., 2012), toxoplasmosis, and trichinella (Hill et al., 2014). They compete with native wildlife for food, particularly acorns, which are an important food for waterfowl, wild turkey, and deer and negatively impact farmed areas specifically managed for wintering waterfowl (U.S. Fish and Wildlife Service, 2006). Problems on surrounding lands are commonly blamed on TRNWRC refuges for "harboring" feral swine.

The United States has seen a recent and dramatic increase in the distribution and abundance of feral swine (Figure 1). All the counties represented by TRNWRC property (Figure 2) have reported the presence of feral swine.

Refuges in the TRNWRC were primarily established to provide and maintain habitat for wintering waterfowl and other migratory birds traveling throughout the Mississippi Flyway. Refuges in the TRNWRC provide important habitat for resting, feeding, and breeding needs for waterfowl, other birds, and resident wildlife. Although the TRNWRC has an overriding purpose of providing for the habitat needs of migratory birds, with an emphasis on waterfowl, each refuge within the Complex has a unique purpose and establishing legislation (U.S. Fish and Wildlife Service, 2006; U.S. Fish and Wildlife Service, 2015). Additionally, The North American Waterfowl Management Plan establishes certain habitat objectives for the region, and the TRNWRC refuges play a critical role in accomplishing the objectives. For example, objectives for the TRNWRC are to provide a minimum of 8,287 acres of managed water, including 4,505 acres of flooded moist-soil plants, 2,760 acres of flooded timber, and 1,022 acres of unharvested crops. Feral swine damage must be appropriately managed to ensure these objectives and others are reached.

The target area for this Feral Swine Damage Management Plan is the entire TRNWRC (see Figure 2). However, feral swine are not known to currently exist on Holt Collier, Yazoo, or Mathews Brake National Wildlife Refuges. Significant and expanding populations exist on Panther Swamp, Morgan Brake, Theodore Roosevelt, and Hillside National Wildlife Refuges. Feral swine populations will have to be monitored by limited refuge staff to document newly damaged areas or expanding populations. Proper feral swine damage management will necessitate documentation of these expanding populations; therefore, all employees should communicate with refuge managers regarding seeing or receiving reports of feral swine. Management actions should be implemented on a case-by-case basis and only when approved by a Refuge Manager.

Figure 1. Distribution of feral swine in Mississippi in 1998 and 2009. (Mississippi Agricultural and Forestry Experiment Station, n.d.)

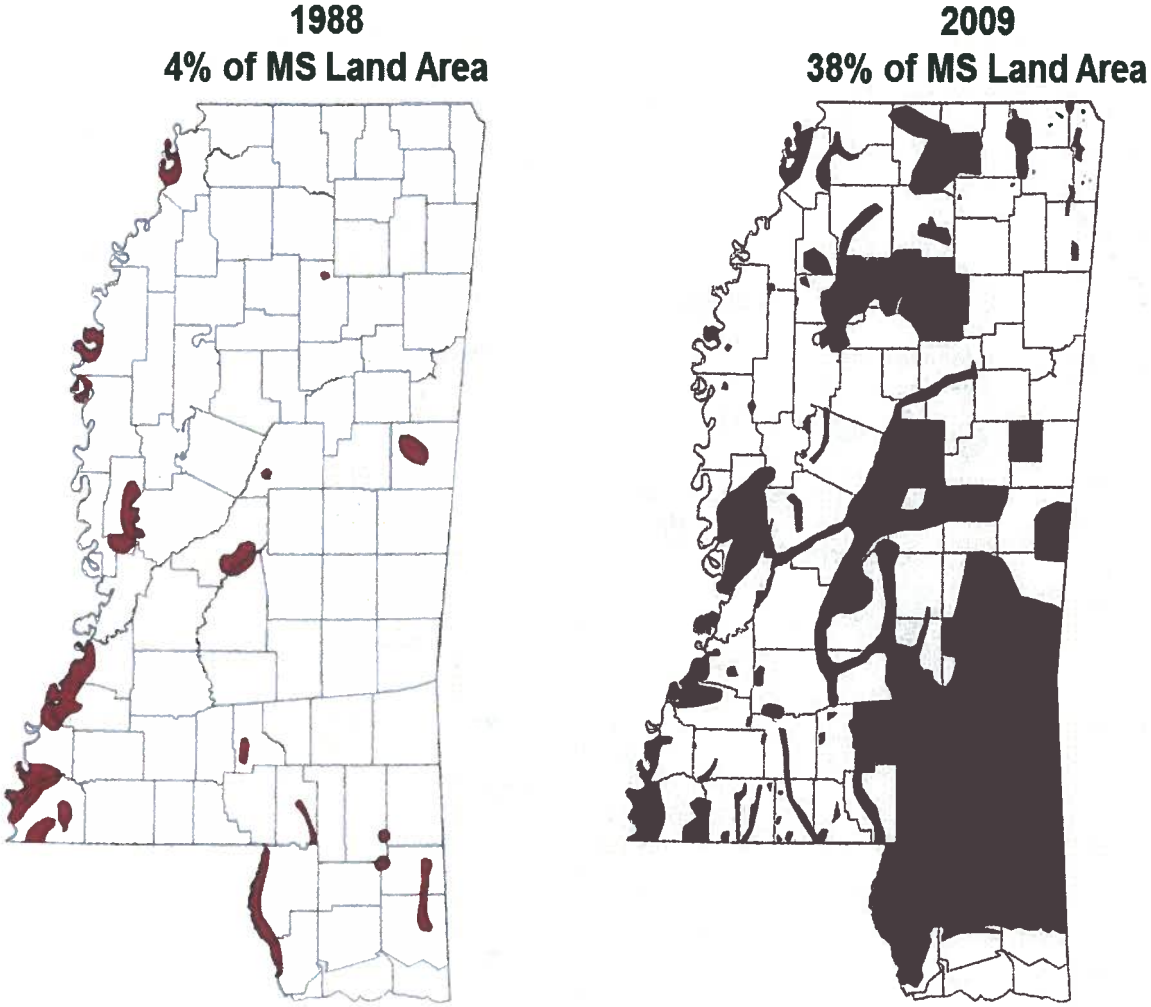
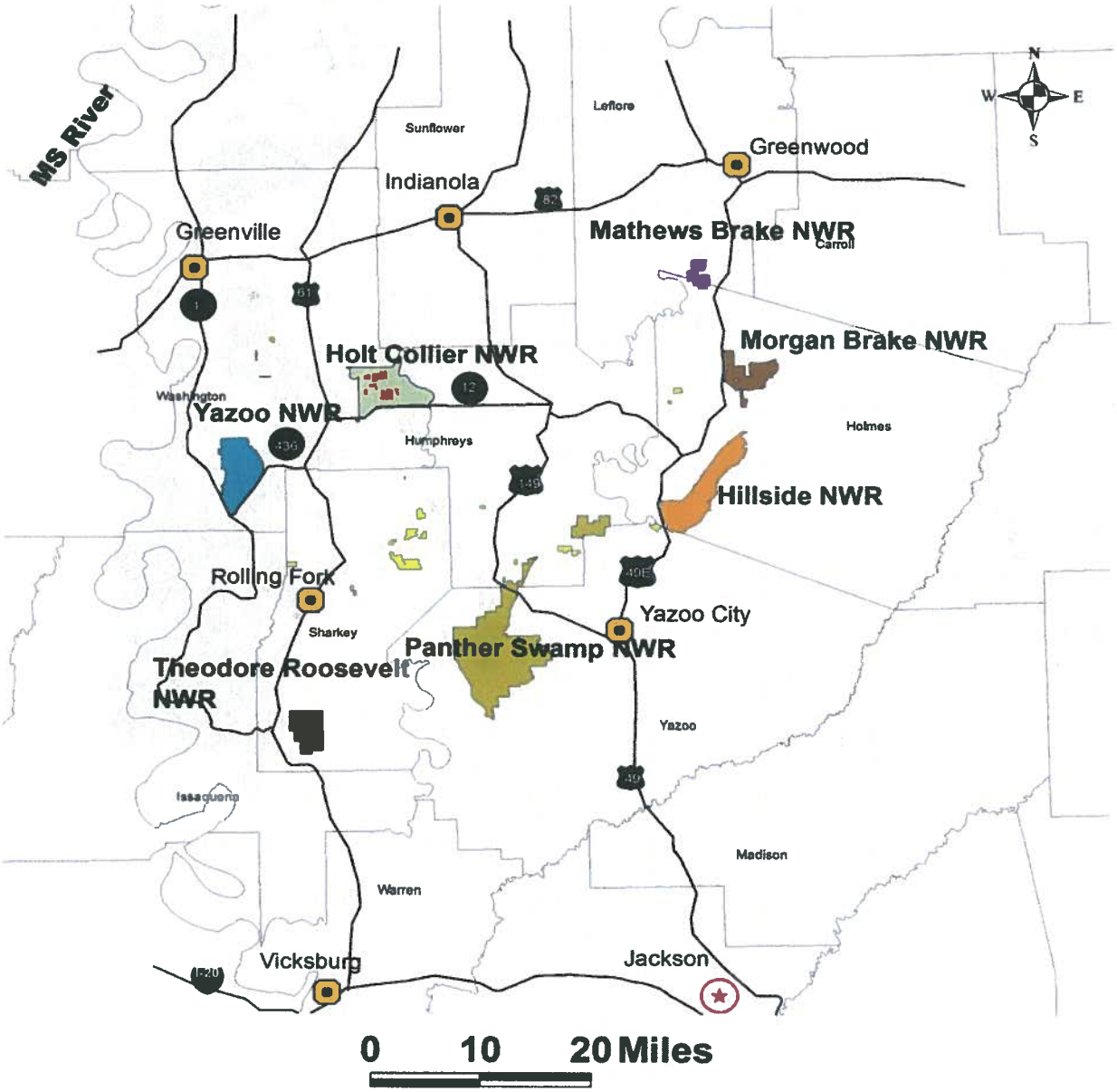


Figure 2. Theodore Roosevelt National Wildlife Refuge Complex refuges and additional lands managed in the South Delta of Mississippi.



CHAPTER II. CONFORMANCE WITH STATUTORY AUTHORITY

The TRNWRC maintains the policy of managing feral animals on refuges where it is compatible with the purposes for which the refuge was established and in close consultation with the Mississippi Department of Wildlife, Fisheries, and Parks. The following laws, regulations, and Executive Orders relate to the management of feral animals on Federal lands:

1. The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, permits the uses of refuges provided that the proposed use is compatible with the primary purpose for which a refuge was established.
2. The Refuge Recreation Act of 1962, as amended, authorizes public hunting on refuges where the hunting program is compatible with the other major purposes for which the area was established.
3. The Fish and Wildlife Act of 1956, as amended, authorizes development, advancement, management, conservation, and protection of fish and wildlife resources.
4. Executive Order 12996, "Management and General Public Use of the National Wildlife Refuge System" recognizes compatible wildlife-dependent recreational activities involving hunting, among others, as priority general public uses of the National Wildlife Refuge System.
5. Title 50 CFR, Section 31.2 lists hunting as a method of surplus wildlife population control.
6. 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.
7. 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.
8. 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.
9. Title 50 CFR 32.1 states that the opening of a wildlife refuge area to hunting will be dependent upon the provisions of law applicable to the area and upon a determination by the Secretary of the Interior that the opening of the area to hunting of migratory game birds, upland game, or big game will be compatible with the principles of sound wildlife management and will otherwise be in the public interest.

10. Title 50 CFR 32.2 provides provisions which apply to each person while engaged in public hunting on a wildlife refuge.

Establishing and Acquisition Authorities include, but are not limited to:

- Fish and Wildlife Service Coordination Act of 1958 (16 USC 661-667-E)
- Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901(b))
- Fish and Wildlife Act of 1956(16 U.S.C. 742f(b)(1))

The mission of the U.S. Fish & Wildlife Service is:

"...working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people."

In addition to the overall mission of the Service, the National Wildlife Refuge System also has its own mission as set forth by Congress in the National Wildlife Refuge System Improvement Act of 1997. It is as follows:

"...to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

A major component of feral swine damage management and other major TRNWRC objectives include the establishment of partnerships with volunteers, hunters/anglers, private organizations, state and federal natural resources agencies, among others. Agencies such as the Mississippi Department of Wildlife, Fisheries, and Parks and United States Department of Agriculture play critical roles in reaching refuge objectives.

CHAPTER III. STATEMENT OF PURPOSE AND OBJECTIVE

PURPOSE

Although the TRNWRC has an overriding purpose of providing for the habitat needs of migratory birds, with an emphasis on waterfowl, each refuge within the TRNWRC has a unique purpose and establishing Legislation (U.S. Fish and Wildlife Service, 2006; U.S. Fish and Wildlife Service, 2015). The management goals of TRNWRC are to:

- Maintain habitat and species representative of the Lower Mississippi River Valley, with special emphasis on waterfowl, other migratory birds, and threatened and endangered species;
- Control and Manage Invasive, Pest, and Nuisance Species;
- Expand Research and Monitoring on the Complex Through Partnerships;
- Develop Land Protection and Conservation Partnerships;
- Identify and Protect Cultural Resources; and
- Provide Visitor Services.

TRNWRC is managed to provide public access to traditional, wildlife-dependent outdoor recreational activities. Objectives are achieved using habitat management tools that include timber management, water management, removal of noxious non-native species, protected sanctuary where appropriate, partnerships, as well as environmental education and interpretation.

OBJECTIVE, DISCUSSION, AND STRATEGIES

OBJECTIVE

Intensively manage feral swine populations to reduce damage and overall population size to aid in achieving management goals identified in the CCP.

DISCUSSION

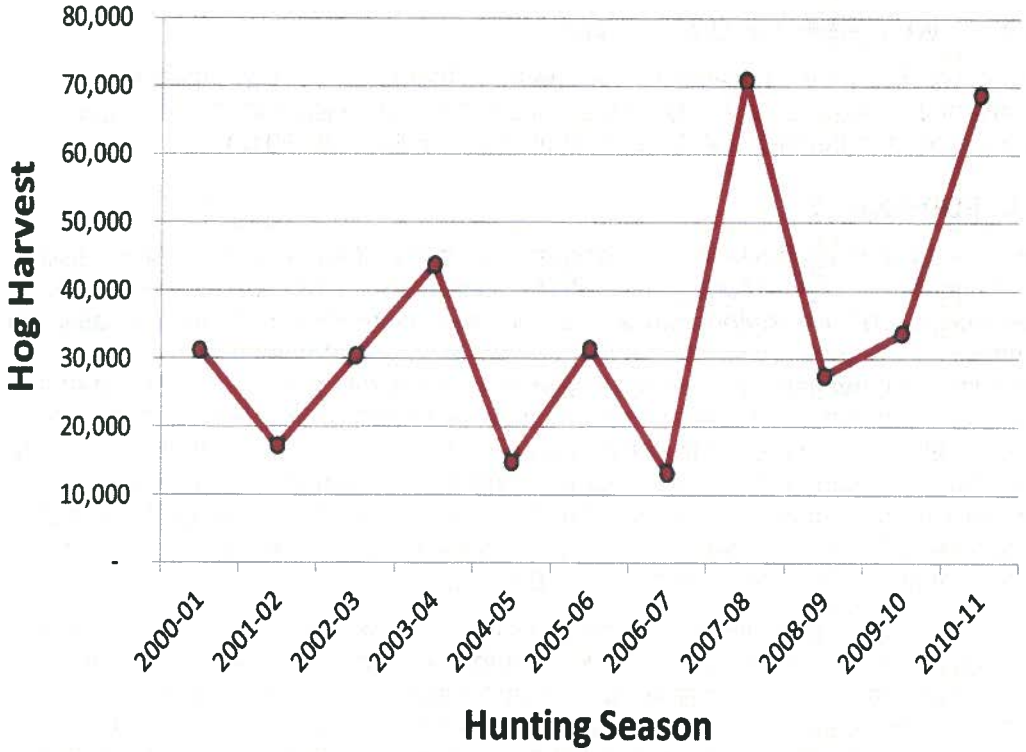
Hard data are lacking on populations of feral swine on TRNWRC and current population trends. Evidence of feral swine, such as rooting, wallowing, and trails, has been documented along levees, roadways, swamps, moist-soil units, and crop areas. Observations by refuge staff, visitors, and public hunters also suggest increases in feral swine numbers over the last few years. However, numbers of feral swine are unknown due to their high fecundity, lack of validated techniques to estimate populations, dense bottomland hardwood habitat, open population, and nocturnal behaviors. Currently and in past years, feral swine have roamed at large on private property adjacent to lands of TRNWRC. The ecologically-rich swamps and marshes of TRNWRC have not been immune to the invasion of these animals. Feral swine are currently causing significant damage to natural resources and safety issues to many users. Habitats throughout TRNWRC have been compromised because of extensive rooting and large concentrations of feral swine in these areas. The purpose of controlling feral swine is to protect ±83,653 acres of wildlife habitat from feral swine destruction. Additional acres on Farmers Home Administration tracts and other lands under the management responsibility of TRNWRC may be considered for management by refuge managers.

STRATEGIES

An integrated damage management approach is best suited to address feral swine problems at the TRNWRC. Partnerships will be necessary to accomplish most management objectives and may include the involvement of refuge employees, state and federal natural resource professionals, and hunters. Hunters play a significant role in helping address feral swine damage (Figure 3). Strategies should be closely coordinated with refuge law enforcement and local law enforcement when necessary. The following strategies have been/are currently being/will be implemented on TRNWRC, but may not be limited to the following list.

1. Public hunting in consultation with Mississippi Department of Wildlife, Fisheries, and Parks and TRNWRC refuge-specific seasons & regulations.
2. Trapping, ground-based shooting, including night shooting with artificial lights, and the use of dogs, conducted by USFWS personnel, volunteers, other governmental agencies, educational institutions, and/or contractors. All such operations by non-Service personnel would be covered by a refuge Special Use Permit.
3. Disease surveillance and monitoring conducted by USFWS personnel, other governmental agencies, and educational institutions.
4. Aerial gunning (from a helicopter or fixed-wing) operations conducted by USFWS personnel, other governmental agencies, and/or contractors.
5. Any other methods for controlling feral swine as approved by USFWS policy and refuge managers.
6. Supporting scientific research through partnerships with other governmental agencies and educational institutions.
7. Education and outreach to hunters and the general public regarding the negative impacts of feral swine.

Figure 3. Recent trends in feral swine harvested in Mississippi by deer hunters. (Mississippi Agricultural and Forestry Experiment Station, n.d.)



CHAPTER IV. ASSESSMENT

COMPATIBILITY WITH REFUGE OBJECTIVES

The objective of this Feral Swine Damage Management Plan is tiered to the complex CCPs and derives specifically from Goal 2, Objectives 2A and 2B (U.S. Fish and Wildlife Service, 2006) and from Goal 1, Objective 1.4 (U.S. Fish and Wildlife Service, 2015).

BIOLOGICAL SOUNDNESS

The purpose of reducing feral swine populations is to protect ±83,653 acres of wildlife habitat from various forms of damage. Rooting and wallowing activities cause serious erosion to river banks, infrastructure, and areas along streams as well as negatively impact water quality. Feral swine feed on crops planted for migratory birds and on native vegetation managed for waterfowl, reducing the availability of these resources for desirable wildlife. Feral swine also consume large quantities of acorns, which are an important food for waterfowl, turkey, squirrels, and deer. They carry diseases such as swine brucellosis and toxoplasmosis which are zoonotic. Pseudorabies can be transmitted to hunting dogs, panthers, and possibly wild canids. Furthermore, feral swine create wallows in wet sites, damaging soils and plant communities and reducing water quality. Feral swine have been shown to significantly reduce oak regeneration and survival of plantings (Sweitzer & VanVuren, 2002).

According to several Wild Hog Task Forces, such as in South Carolina, Missouri, and Mississippi, recent and dramatic increases in the distribution and abundance of feral swine have been documented. Feral swine had spread to at least 39 states by 2007 (Clay, 2007). Reported range of feral swine in Mississippi has increased by nine-fold in the last 2 decades (Figure 1). Damage to crops, ecosystems, livestock, and humans has also become more apparent. Some of the largest concentrations of feral swine in Mississippi exist on public lands which are located along streams, rivers, and swamps in sensitive habitats.

The current number of swine now on the TRNWRC is unknown due to high fecundity rates, secretive behavior, hunting pressure and control on surrounding lands, dense habitat, and unlimited area to roam due to the inaccessibility of tracts managed by TRNWRC. Evidence of feral swine presence and resulting damage is easily documented. Observations by USFWS staff, visitors, and public hunters also indicate recent increases in the population. Habitats throughout TRNWRC have been compromised because of extensive rooting and large concentrations of feral swine in these areas .

ECONOMIC FEASIBILITY

Financial resources needed to properly implement a feral swine damage management plan are high. Annual administration costs include salary, equipment, information and outreach, fuel, hunting publications, contract support & administration, and supplies such as bait and traps. Even public hunting results in a significant cost of salary and administration by refuge personnel. The Service will take an integrated approach which includes partnerships with other governmental agencies, opportunistic management by USFWS personnel, and public hunter support. When appropriate, the refuge may seek funding for feral swine management from grants and donations.

RELATIONSHIP WITH OTHER REFUGE PROGRAMS

Feral swine damage management activities will be coordinated through refuge managers to minimize major conflicts with users. Potential major and minor conflicts with users will be

evaluated on a case-by-case basis, with input from refuge law enforcement and supervisors. When practical, management activities will be conducted during low public use periods and/or in areas closed to the public. Final decisions regarding management activities will be the responsibility of the Refuge Manager and Project Leader. Federal Wildlife Officers (FWOs) will be made aware of final decisions of current feral swine management activities on TRNWRC.

RECREATIONAL OPPORTUNITY

Hunters are the largest public hunting group using the TRNWRC, with over 8,000 public use permits sold annually. Many public hunters are interested in taking feral swine. Therefore, public hunting is supported as a recreational tool and a control measure. The size and accessibility of each refuge associated with the TRNWRC varies and dictates when public hunting can be used as a control measure. Several factors contribute to this situation, such as season dates, habitat types, and weather.

CHAPTER V. DESCRIPTION OF MANAGEMENT

PUBLIC HUNTING

Public hunting on national wildlife refuges, state wildlife management areas, and private lands has been a time honored method of attempting to control feral swine throughout the United States. However, this management technique has not generally been successful by itself and usually needs to be used in conjunction with other tools to effectively reduce numbers and to achieve long term eradication goals of feral swine within a given geographical area. Where public hunting is used as a strategy to reduce swine populations, it can have the opposite effect because it sets up a perverse incentive for hog hunters to release swine illegally on public lands in order to augment swine populations and perpetuate hunting opportunities.

Currently, opportunistic take of feral swine by the general public is allowed during TRNWRC big game seasons, such as deer and turkey. Some states, including the neighboring state of Arkansas (Arkansas Game and Fish Commission, 2014), have banned or restricted hunting of feral swine on state WMAs because of concerns about perverse incentives and illegal transport/release of swine. The Service has followed the lead of Arkansas on refuges in that state, and may consider a similar action should the state of Mississippi enact similar regulations.

Hunting with dogs is also a popular sport, and in some cases can be effective for removing trap-shy individuals. Many factors come into play for this method to be successful. The experience of the dogs, the hunter, and the feral swine are all important. The Service typically does not allow hunting with dogs on refuges in order to avoid creating the incentives described above. Use of dogs by hog removal contractors operating under a Special Use Permit may be considered on a case-by-case basis. In this situation, care should be taken not to create an incentive for the contractor to maintain swine populations on the refuges, by, for example, using one-year, nonrenewable contracts. TRNWRC refuge managers may allow the use of dogs under special conditions which will be determined annually.

Conditions for the implementation of public hunting on TRNWRC are:

- Public take of feral swine will be opportunistic only, in conjunction with open season and with legal weapons for big game.
- Opportunistic take of feral swine by the public will be combined with other methods in an integrated management system.

TRAPPING

Trapping feral swine can be a very effective method of reducing populations and managing the damage they cause. Trapping has the following advantages relevant to TRNWRC: feral swine are relatively easy to trap, they may be dispatched humanely in the trap, and large traps which can trap entire sounders have relatively little effect on the social behavior of the remaining hog population. Disadvantages include the fact that a trapping program large enough to have a significant effect on the swine population requires high labor and cost inputs, bait attractiveness depends on the presence of alternative sources of food, monitoring by refuge personnel is required to ensure that trappers (if non-refuge personnel) are euthanizing all trapped animals and that traps are not damaged or tampered with by the public. In certain situations, particularly when only part of a sounder is trapped, the remaining members of the sounder may become trap-shy (Massei et al., 2011).

Many types of traps, doors and gates exist (Massei et al., 2011; West et al., 2009) and are currently being used on the TRNWRC. These devices can be used as a lethal control method if

captured feral swine are euthanized. Most designs are based on a basic box shape with some type of a gate door (Littauer, 1993). They may be used for single or multiple animal catches. Corrals or traps may have spring-loaded gates (Taylor, 1991), trip gates, drop gates, or hinged gates depending upon the trap-maker's preference (Littauer 1993). Technical guides, such as Managing Wild Pigs (West et al., 2009), help guide USFWS employees and others regarding trapping techniques.

Bait is needed to attract feral swine to the trap. Grain-based baits are preferred, and soured grain, usually fermented corn, is also commonly used. Pre-baiting the trap is important in order to achieve the maximum effectiveness of a cage trap. Letting feral swine become comfortable in and around the trap greatly increases the chance for multiple catches. The availability of natural foods may decrease attractiveness of trap baits and hence will hinder trap success. This is particularly true in the warm months of the year (Littauer, 1993). USFWS personnel, contractors, other governmental agencies, educational institutions, and/or volunteers may be used to implement this method .

Conditions for the implementation of trapping on TRNWRC are:

- All individuals engaged in pig trapping on TRNWRC lands will provide timely, up-to-date maps of the locations of traps to the Complex office.
- Traps and their immediate environs will be posted to prohibit entry by the public in order to avoid trap disturbance/damage, unauthorized removal of pigs, danger to the public, and legal jeopardy in regards to hunting over bait.
- All pigs in traps will be humanely killed in the trap; no pigs will be released or removed alive from the refuge.
- All trapped and euthanized pigs will be removed from the immediate trap area and left onsite. No parts of any feral swine will be used for meat or other purposes other than disease/parasite sampling or permitted research data collection (see below).

SHOOTING

Feral swine can be shot opportunistically or in baited areas, either during the day or at night with artificial lighting. The advantages of ground-based shooting include relatively low cost compared with trapping or aerial gunning, the potential for fairly quick reductions in population, and flexibility in response to changes in population numbers or locations. Disadvantages include the likelihood that pigs will quickly learn to avoid shooters and may relocate or shift activities to nighttime, requiring more expensive and potentially hazardous night shooting operations (Massei et al., 2011). While shooting has its place in an integrated feral swine damage management plan, this tool usually will not reduce the population to a great extent unless implemented intensively, day and night, throughout the year and in conjunction with other methods (Mapston, 2004).

Stand hunting or still hunting can be conducted in baited areas or at feeders. Intensive shooting may cause feral swine to shift their home range or become more nocturnal. When this happens, swine can be shot at night using a spotlight, night-vision, or infrared lighting. It is recognized that extended baiting for purposes of shooting or trapping could have an unintended positive effect on swine by providing supplemental feeding. Care will be taken to keep baiting short-term and with adequate monitoring such as trail cameras. USFWS personnel, contractors, other governmental agencies, educational institutions may be used to implement this method.

Conditions for the implementation of ground-based shooting of feral swine on TRNWRC are:

- Shooting will only be conducted by qualified personnel either employed by or contracted by the U.S. Fish and Wildlife Service or USDA APHIS Wildlife Services.
- All non-Service personnel implementing this method will operate under a Special Use Permit issued by TRNWRC.
- Safety will be the highest priority, and swine will be killed as humanely as possible. Wounded animals will be tracked and dispatched.
- All pigs shot will be left onsite. No parts of any feral swine will be used for meat or other purposes other than disease/parasite sampling or permitted research data collection (see below).

AERIAL GUNNING

Helicopters are the primary aircraft used for aerial control of feral swine. This is a very selective method, and depredation problems can be reduced quickly. Large numbers of feral swine can be taken in a single aerial control operation (Mapston, 1997). Advantages of aerial gunning for hog control include cost-effectiveness, efficiency, and the ability to cover large areas quickly and easily. Disadvantages of this method include the fact that as hog populations are reduced, per-unit cost of removal can become quite high due to the high fixed-cost component of helicopter gunning. Also, the method can be problematic in urban or suburban interface areas and is ineffective in densely vegetated habitats (Massei et al., 2011). For these reasons, aerial gunning should only be used as a component in a larger, integrated control program in which different methods are combined to maximize the advantages and compensate for the disadvantages of each method.

Aerial control conducted by USFWS personnel will be conducted in accordance with the Department of Interior Aerial, Capture Eradication and Tagging of Animals Handbook (351 DM-2-351 DM 3). Other governmental agencies and contractors may have additional requirements and policy. USFWS personnel, contractors, other governmental agencies, and educational institutions may be used to implement this method. In all cases, trained, experienced wildlife professionals will be used for aerial gunning operations. Safety of personnel and the public will be the first priority, and every effort will be made to kill the swine as humanely as possible. When aerial gunning is to occur, the complex Federal Wildlife Officer will be involved in the planning and implementation stages as additional measures will need to be taken such as, but not limited to, the following: closing county roadways, closing portions of the refuge to public entry, informing and coordinating with local sheriff department, Mississippi Department of Wildlife, Fisheries, and Parks, and refuge neighbors. Additional FWOs may need to be brought in to ensure the public's safety.

Conditions for the implementation of aerial gunning on TRNWRC:

- All aerial gunning will be conducted by qualified, experienced personnel either employed or contracted by the U.S. Fish and Wildlife Service or USDA APHIS Wildlife Services.
- All non-Service personnel implementing this method will operate under a Special Use Permit issued by TRNWRC.
- Safety will be the highest priority, and swine will be killed as humanely as possible. Wounded animals will be tracked if possible and dispatched.
- All pigs shot will be left onsite. No parts of any feral swine will be used for meat or other purposes other than disease/parasite sampling.

- Aerial gunning operations will be coordinated with the refuge Federal Wildlife Officer, Mississippi Department of Wildlife, Fisheries, and Parks, and, if appropriate, with local law enforcement agencies. Areas to be covered by aerial gunning operations may be closed to public access, and refuge or public roads may be closed as appropriate.

DISEASE SURVEILLANCE, EDUCATION/OUTREACH, AND RESEARCH

Ecological and economic damage associated with feral swine in the United States has been well documented in the scientific literature (Pimental et al., 2000; Pimentel et al., 2005). Plant regeneration, soil properties, and water permeation are often impacted by feral swine (Seward et al., 2004). Crop losses can be significant, and were estimated at $800 million in 2000 (Pimental et al., 2000). Swine are known to carry diseases, such as swine brucellosis, toxoplasmosis, pseudorabies, and many others (Straw et al., 1999; Seward et al., 2004). For these reasons, refuge managers may support continued disease surveillance, public education/outreach, and research. These activities will be conducted under the following conditions.

Conditions for implementation of disease surveillance:

- Sampling will be conducted by qualified personnel following established protocols for safety and effectiveness.
- A systematic approach will be taken to ensure that information obtained is timely and accurate.
- Sampling will be conducted on swine killed via any of the methods described above.

Conditions for implementation of public education/outreach:

- The goal of public education and outreach about feral swine damage management is to foster public understanding of feral swine damage and promote public support for Service efforts to control swine populations on TRNWRC.
- Messages to be used in public education and outreach include:
    - Feral swine are exotic pests which pose serious threats to wildlife, including game, crops, domestic animals, and humans.
    - The Service is working with a network of agency and academic partners to identify and implement the safest, most effective, and most humane methods to control feral swine populations and reduce the threats.
- Messages will be communicated to the public through any of the following media:
    - Printed material such as brochures and leaflets
    - Signs and kiosk information
    - Web-based information provided on FWS web pages
    - Environmental education program information including school programs

Conditions for implementation of feral swine damage research:

- All research will be conducted by qualified agency/academic partners and will be focused on one or more of the following objectives:
    - Characterize the nature and extent of the threats posed or damage caused by feral swine on TRNWRC. Threats and damage include disease, wildlife

competition and direct predation, damage to vegetation, soils, refuge infrastructure, and cultural resources.

  - Identify and test efficacy of swine control methods.

- All research will be conducted under an approved Special Use Permit issued by TRNWRC.
- No parts of any feral swine will be used for meat or other purposes other than obtaining data for specific research objectives.
- All research personnel will coordinate with TRNWRC Project Leader or his/her designee to ensure their safety and that of the public.

CHAPTER VI. MEASURES TAKEN TO AVOID CONFLICTS WITH OTHER MANAGEMENT OBJECTIVES

BIOLOGICAL CONFLICTS

Refer to (U.S. Fish and Wildlife Service, 2006).

PUBLIC USE CONFLICTS

Feral swine damage management may overlap with refuge hunting seasons to some degree during control activities, however; all efforts will be made to avoid conflicts. Visitor use is expected to be high, so work in closed areas and during lower use times (nighttime) will be conducted accordingly. The demand for non-consumptive wildlife oriented use on TRNWRC is expected to be low. Conflicts between feral swine damage management personnel and non-consumptive users may occur. Refuge managers and refuge law enforcement staff will address conflicts when necessary. Restrictions on lethal methods as well as designating specific sites away from highly used public use areas and trails will be used to reduce potential conflicts. Should serious conflicts arise, considerations will be given to time and space scheduling and/or zoning. The demand for consumptive uses on TRNWRC is expected to increase as additional land is acquired and opportunities increase. While conflicts within user groups are expected to be minimal, they may occur. To mitigate potential conflicts, when the public hunting tool is used, certain areas of the refuges in the TRNWRC may be closed to all other public use activities and/or users may be limited through a limited draw or Special Use Permit system.

ADMINISTRATIVE CONFLICTS

Limited resources are available to administer this plan. Actions will not be encumbered with unnecessary procedures requiring funds and manpower to enforce. The only considerations to be observed will be procedures to ensure that the resources are not significantly damaged and that participants are assured of safety. TRNWRC wildlife and recreational programs are administered utilizing current personnel and funds allocated to the Complex. Public Use Permits and Special Use Permits will be made as simple as possible, if needed, in order to minimize the personnel and funding needed to administer this plan. Assistance may be sought from other refuges, governmental agencies, and others if significant administrative conflicts arise. Refuge managers will be required to approve all feral swine damage management actions.

CHAPTER VII. CONDUCT OF THE PLAN

FEDERAL REGISTER PUBLICATION

Feral swine damage management via public hunting will be regulated through refuge-specific hunting regulations which are published annually in Title 50 of the Code of Federal Regulations. The feral swine damage management plan will also be conducted through volunteer agreements, Special Use Permits, and/or contracts.

REFUGE-SPECIFIC HUNTING REGULATIONS WHEN HUNTING IS USED AS A TOOL

The feral swine damage management plan currently provides for the use of 7 strategies (see Chapter 3 above). The only tool requiring specific public restrictions is public hunting, which will be regulated by Public Use Permits issued by TRNWRC. Annually, the TRNWRC sells Public Use Permits which are required to be signed by each hunter and in his/her possession at all times while hunting. Information specific to all public hunting opportunities on the TRNWRC is published in Title 50 of the Code of Federal Regulations and available on brochures found at http://www.fws.gov/trcomplex.

PUBLIC INVOLVEMENT

During 2006, the USFWS completed a Comprehensive Conservation Plan (CCP) which covered the five refuges then included in the TRNWRC: Hillside, Mathews Brake, Morgan Brake, Panther Swamp, and Yazoo NWRs (U.S. Fish and Wildlife Service, 2006). In 2014, the Service drafted a CCP for Holt Collier and Theodore Roosevelt National Wildlife Refuges, which were added to the TRNWRC. This document will be available sometime during 2015. Both documents went through an extensive public scoping and public comment process in which feral swine were identified as one of the most problematic invasive species. This Feral Swine Damage Management Plan is a step-down plan to the 2006 CCP, and its objective is tiered to that of the 2006 CCP.

Compliance with the National Environmental Policy Act (NEPA) for this Feral Swine Damage Management Plan was ensured by the preparation of a Draft Feral Swine Damage Management Plan and a Draft Environmental Assessment. Both documents were made available during a public comment period January5-February 4, 2015. Comments received during the public comment period were considered, and the Service responded to substantive comments (Appendix B). This Feral Swine Damage Management Plan is posted on the internet at http://www.fws.gov/refuge/panther_swamp/, and copies of the document are also available at the TRNWRC Headquarters Office in Yazoo City, MS.

HUNTER APPLICATION AND REGISTRATION PROCEDURES

This procedure is only applicable to the Public Hunting Tool when used. Management of feral swine take by hunters will occur in the same manner as all of the other hunting opportunities on the TRNWRC. Each hunter must be licensed in Mississippi and possess a TRNWRC Public Use Permit. The permit must be signed by the hunter and in his/her possession at all times while hunting on the TRNWRC. Hunters will also be required to complete and return User Information Cards to document each visit. Hunting permits will be available via the internet at http://www.fws.gov/refuge/panther_swamp/ or at offices located in Yazoo City, MS and Hollandale, MS.

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APPENDIX A. SECTION 7 BIOLOGICAL EVALUATION FORM

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: Mike Rich
Telephone Number: 662-836-3004
E-Mail: mike_rich@fws.gov
Date: December 2, 2014
PROJECT NAME: Feral Swine Damage Management Plan, Theodore Roosevelt National Wildlife Refuge Complex

I. Service Program:

___ Ecological Services
___ Federal Aid
___ Clean Vessel Act
___ Coastal Wetlands
___ Endangered Species Section 6
___ Partners for Fish and Wildlife
___ Sport Fish Restoration
___ Wildlife Restoration
___ Fisheries
_X_ Refuges/Wildlife

II. State/Agency: Mississippi/USFWS

III. Station Name: Theodore Roosevelt NWRC

IV. Description of Proposed Action

TRNWRC proposes to prepare a Feral Swine Damage Management Plan which expands the current set of strategies for reducing feral swine populations on the complex (trapping, ground-based shooting, opportunistic take by hunters) to include aerial shooting of hogs. Aerial shooting would be conducted in early spring (late February, early March) before bud break. This time was selected because it avoids conflict with hunting seasons and Neotropical songbird breeding season while allowing maximum visibility of hogs under the canopy of young forest plantations. Aerial shooting would be conducted either by trained USFWS personnel or USDA-APHIS Wildlife Services personnel and would be done from a rotary-wing aircraft. Potential impacts to non-target animals would be minimized by positively identifying animals at close range.

V. Pertinent Species and Habitat:

Species that should be considered in an effects analysis for your project:

Species	Status	Has Critical Habitat	Contact
Least tern (*Sterna antillarum*) Population: interior pop.	Endangered		Mississippi Ecological Services Field Office
Fat pocketbook (*Potamilus capax*) Population: Entire	Endangered		Mississippi Ecological Services Field Office
rabbitsfoot (*Quadrula cylindrica cylindrica*)	Threatened	Proposed critical habitat	Mississippi Ecological Services Field Office

Pallid sturgeon (*Scaphirhynchus albus*) Population: Entire	Endangered		Mississippi Ecological Services Field Office
pondberry (*Lindera melissifolia*)	Endangered		Mississippi Ecological Services Field Office
Louisiana Black bear (*Ursus americanus luteolus*) Population: Entire	Threatened	Final designated critical habitat	Mississippi Ecological Services Field Office

A. Species/habitat occurrence maps:

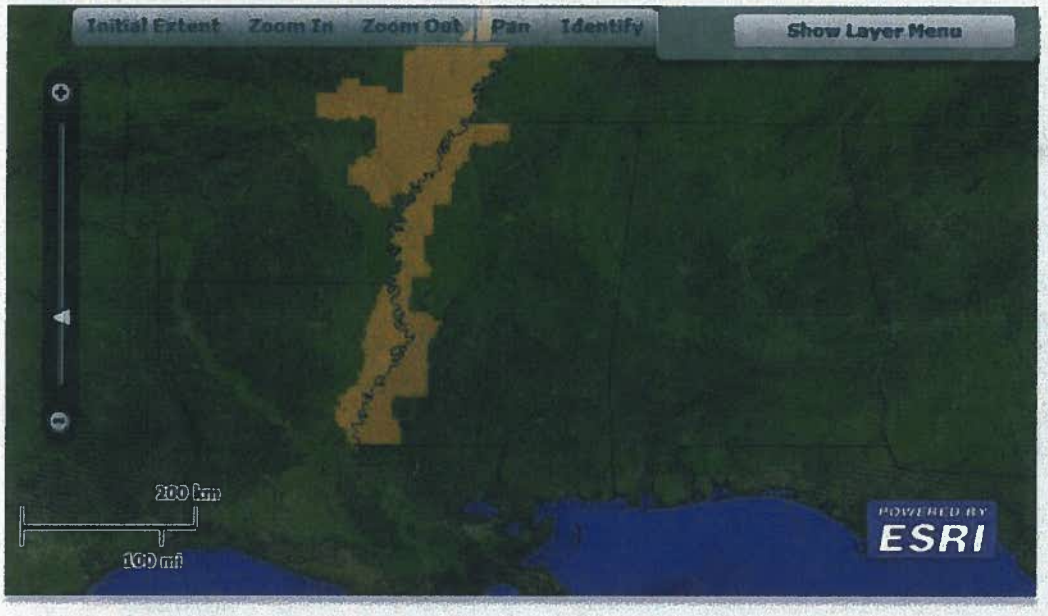
Least Tern:

Map of Species occurrence

This map represents our best available information about where a species is currently known to or is believed to occur; however, it should NOT be used as an official species list for Section 7 Consultation purposes. To obtain an official species list for this purpose, please visit the Information, Planning, and Conservation (IPaC) System (click here: http://ecos.fws.gov/ipac)

Fat Pocketbook:

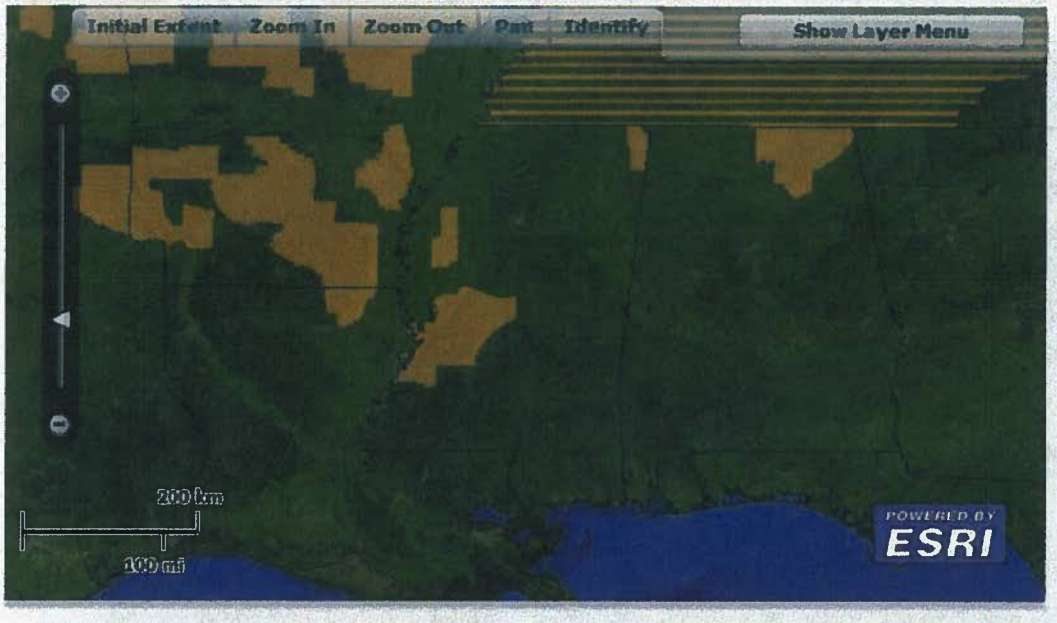
Map of Species occurrence



This map represents our best available information about where a species is currently known to or is believed to occur; however, it should NOT be used as an official species list for Section 7 Consultation purposes. To obtain an official species list for this purpose, please visit the Information, Planning, and Conservation (IPaC) System (click here: http://ecos.fws.gov/ipac)

Rabbitsfoot:

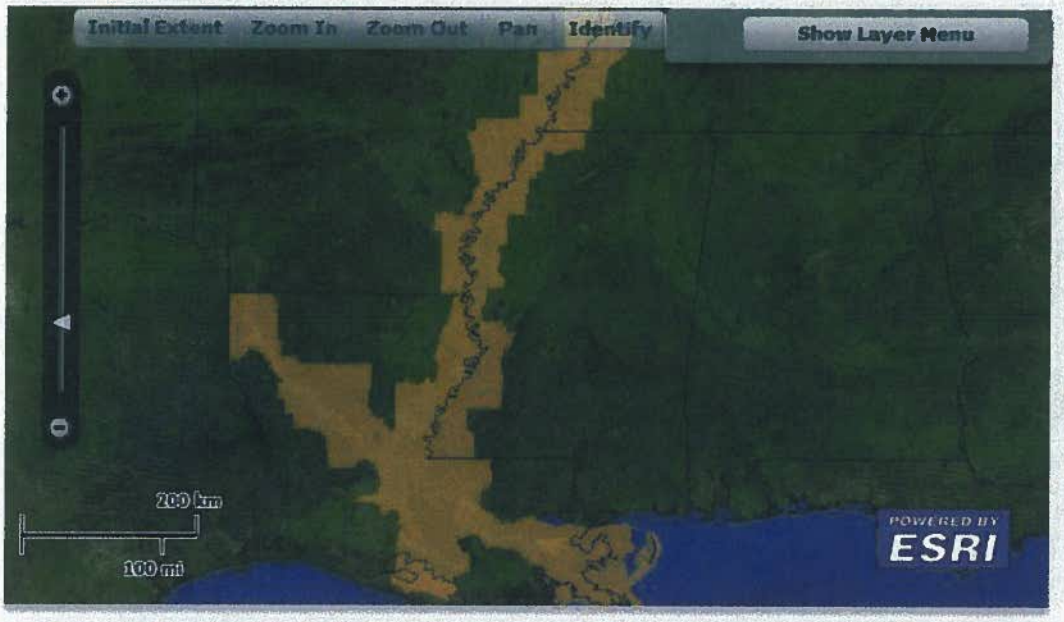
Map of Species occurrence



This map represents our best available information about where a species is currently known to or is believed to occur; however, it should NOT be used as an official species list for Section 7 Consultation purposes. To obtain an official species list for this purpose, please visit the Information, Planning, and Conservation (IPaC) System (click here: http://ecos.fws.gov/ipac)

Pallid sturgeon:

Map of Species occurrence



This map represents our best available information about where a species is currently known to or is believed to occur; however, it should NOT be used as an official species list for Section 7 Consultation purposes. To obtain an official species list for this purpose, please visit the Information, Planning, and Conservation (IPaC) System (click here: http://ecos.fws.gov/ipac)

Pondberry:

Map of Species occurrence

This map represents our best available information about where a species is currently known to or is believed to occur; however, it should NOT be used as an official species list for Section 7 Consultation purposes. To obtain an official species list for this purpose, please visit the Information, Planning, and Conservation (IPaC) System (click here: http://ecos.fws.gov/ipac)

Louisiana black bear:

Map of Species occurrence

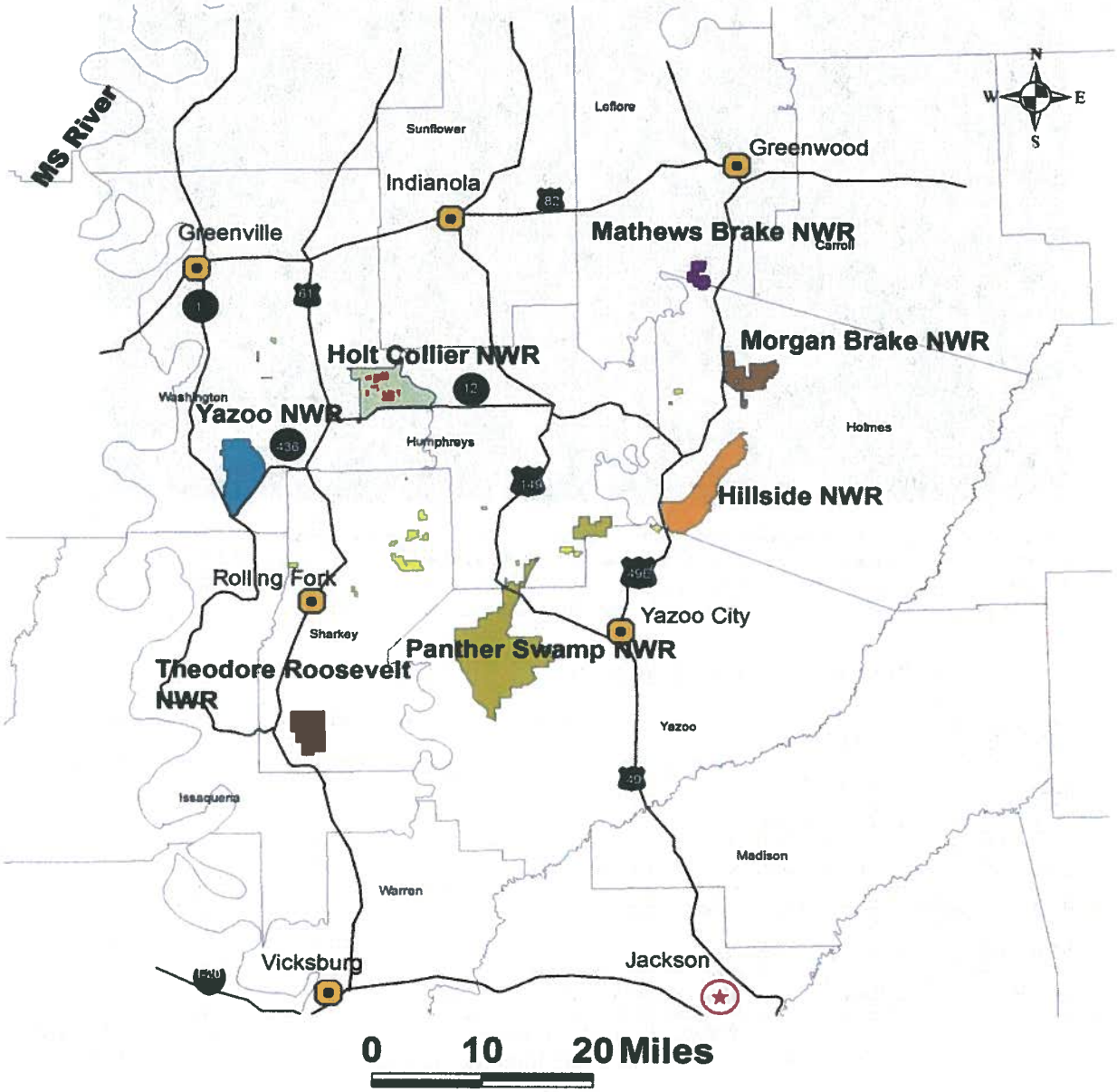
This map represents our best available information about where a species is currently known to or is believed to occur; however, it should NOT be used as an official species list for Section 7 Consultation purposes. To obtain an official species list for this purpose, please visit the Information, Planning, and Conservation (IPaC) System (click here: http://ecos.fws.gov/ipac)

B. Complete the following table:

SPECIES/CRITICAL HABITAT	STATUS[1]
Least Tern (*Sterna antillarum*)	E
Fat Pocketbook (*Potamilus capax*)	E
Rabbitsfoot (*Quadrula cylindrica cylindrica*)	T
Pallid sturgeon (*Scaphirhynchus albus*)	E
Pondberry (*Lindera melissifolia*)	E
Louisiana black bear (*Ursus americanus luteolus*)	T

[1]STATUS: E=endangered, T=threatened, PE=proposed endangered, PT=proposed threatened, CH=critical habitat, PCH=proposed critical habitat, C=candidate species, S/A=Similar Appearance

VI. Location (attach map):



A. Ecoregion Number and Name: Lower Mississippi River Alluvial Valley, 27

B. County and State: Washington, Issaquena, Sharkey, Humphreys, Yazoo, Holmes, and Leflore Counties, Mississippi

C. **Section, township, and range (or latitude and longitude):** The seven refuges of TRNWRC are bounded by latitudes 32° 34' N to 33° 24' N and longitudes 90° 08' W to 91° 02' W.

D. **Distance (miles) and direction to nearest town:** Refuges are situated between and among the towns of Greenwood, Indianola, Greenville, Rolling Fork, Vicksburg, and Yazoo City, Mississippi.

E. **Species/habitat occurrence:**

Least Tern: This species may nest on sandbars in the Mississippi River. None of the refuges in the TRNWRC contain this habitat.
Fat Pocketbook: This is an aquatic species found in large rivers with flowing water and stable substrates.
Rabbitsfoot: This is an aquatic species which occurs in small to medium-sized rivers in relatively stable substrates (Fobian, 2007).
Pallid Sturgeon: This is an aquatic species which is restricted to channels of large rivers and flooded overflow habitat.
Pondberry: Pondberry is a wetland shrub which occurs in bottomland hardwood forests including those in the vicinity of TRNWRC.
Louisiana black bear: This species occurs in bottomland hardwood forests including those on the refuges of the TRNWRC. Resident bears are not known to occur within TRNWRC; however, transient bears are sometimes sighted.

VII. Determination of Effects:

A. Explanation of effects of the action on species and critical habitats in item V. B:

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Least Tern (*Sterna antillarum*)	Action is not expected to have any impact except that reducing feral swine populations may benefit least tern nesting habitat.
Fat Pocketbook (*Potamilus capax*)	Action is not expected to have any impact on fat pocketbook mussels.
Rabbitsfoot (*Quadrula cylindrica cylindrica*)	Action is not expected to have any impact on rabbitsfoot mussels.
Pallid sturgeon (*Scaphirhynchus albus*)	Action is not expected to have any effect on pallid sturgeon.
Pondberry (*Lindera melissifolia*)	Action is not expected to have any negative effect on pondberry. Reducing feral swine populations may have a positive effect on this species by reducing habitat disturbance.
Louisiana black bear (*Ursus americanus luteolus*)	Action is not expected to have a negative effect on Louisiana black bear. There is a small risk of accidentally shooting a bear. Reducing feral swine populations may benefit Louisiana black bears by reducing competition for food and habitat resources.

B. Explanation of actions to be implemented to reduce adverse effects:

SPECIES/ CRITICAL HABITAT	ACTIONS TO MITIGATE/MINIMIZE IMPACTS
Least Tern (*Sterna antillarum*)	N/A
Fat Pocketbook (*Potamilus capax*)	N/A
Rabbitsfoot (*Quadrula cylindrica cylindrica*)	N/A
Pallid sturgeon (*Scaphirhynchus albus*)	N/A
Pondberry (*Lindera melissifolia*)	N/A
Louisiana black bear (*Ursus americanus luteolus*)	To minimize risk that bears will be accidentally shot, only highly trained wildlife professionals will be employed to conduct aerial gunning operations. Positive identification of feral swine will be made.

VIII. Effect Determination and Response Requested:

SPECIES/CRITICAL HABITAT	DETERMINATION[1]			REQUESTED
	NE	NA	AA	
Least Tern (*Sterna antillarum*)		x		Concurrence
Fat Pocketbook (*Potamilus capax*)	x			Concurrence
Rabbitsfoot (*Quadrula cylindrica cylindrica*)	x			Concurrence
Pallid sturgeon (*Scaphirhynchus albus*)	x			Concurrence
Pondberry (*Lindera melissifolia*)	x			Concurrence
Louisiana black bear (*Ursus americanus luteolus*)		x		Concurrence

[1]DETERMINATION/ RESPONSE REQUESTED:
NE = no effect. This determination is appropriate when the proposed action will not directly, indirectly, or cumulatively impact, either positively or negatively, any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested is optional but a "Concurrence" is recommended for a complete Administrative Record.

NA = not likely to adversely affect. This determination is appropriate when the proposed action is not likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat or there may be beneficial effects to these resources. Response Requested is a" Concurrence".

AA = likely to adversely affect. This determination is appropriate when the proposed action is likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested for listed species is "Formal Consultation". Response requested for proposed and candidate species is "Conference".

Literature Cited

Fobian, T., 2007. *Reproductive biology of the rabbitsfoot mussel (Quadrula cylindrica) (Say, 1817) in the upper Arkansas River system, White River system and the Red River system*. M.S. Thesis. Springfield, MO: Missouri State University.

Feral Swine Damage Management Plan, Theodore Roosevelt National Wildlife Refuge Complex

Signature (originating station) _____ Date 12/5/14

Project Leader
Title

IX. **Reviewing Ecological Services Office Evaluation:**

A. **Concurrence** X **Nonconcurrence** _____

B. **Formal consultation required** _____

C. **Conference required** _____

D. **Informal conference required** _____

E. **Remarks (attach additional pages as needed):**

Signature _____ Date 12/3/2014

Biologist
Title

MS ES Field Office
Office

David Felder
601 321 1131

APPENDIX B. OUTREACH

PUBLIC AVAILABILITY

On January 5, 2015, a Draft Feral Swine Damage Management Plan and Environmental Assessment were made available to the public, state officials, partners, and tribes for a 30-day comment period. The availability of the plan and EA was publicized by letters, email, and a press release sent to local newspapers, radio stations, and television stations. The Jackson (MS) *Clarion-Ledger* published a story on the plan and interviewed Project Leader Mike Rich. The online version of that story can be viewed at http://www.clarionledger.com/story/sports/outdoors/2015/01/07/outdoors-report/21426855/.

Letters requesting comment were sent to officials of the following Native American Tribes on January 5, 2015:

Mississippi Band of Choctaws, Choctaw Nation of Oklahoma, Jena Band of Choctaws, Quapaw Tribe of Indians, and Tunica-Biloxi Indian Tribe of Louisiana.

TRIBAL COMMENTS

We received the following comment from the Jena Band of Choctaws:

> RE: DRAFT FERAL SWINE DAMAGE MANAGEMENT PLAN AND THE ENVIRONMENTAL ASSESSMENT FOR THEODORE ROOSEVELT NATIONAL WILDLIFE REFUGE COMPLEX, LEFLORE, HOLMES, YAZOO, HUMPHREYS, SHARKEY, ISSAQUENA, AND WASHINGTON COUNTIES, MISSISSIPPI
>
> Dear Mr. Tom Greene:
>
> We are in receipt of your letter dated December 19, 2014 and upon review of the above referenced project, we concur with the Draft Plan and Environmental Assessment, so long as cultural resources and archaeological sites are considered and protected.
>
> We appreciate your efforts on this project and our ability to comment. Should you have any questions, please contact our office via the information below.
>
> Sincerely,
>
> Alina J. Shively
> Deputy THPO
> Jena Band of Choctaw Indians
> P. O. Box 14
> Jena, LA 71342-0014

Service Response: The Service appreciates the interest of the Jena Band of Choctaws in our Feral Swine Damage Management Plan. We will continue to protect all known cultural resources from damage and take necessary steps to avoid disturbing undiscovered archaeological sites or other cultural resources.

STATE OFFICIAL COMMENTS

We received the following three comments from Mississippi state officials:

> Mr. Greene,
>
> The Mississippi Department of Wildlife, Fisheries, & Parks (MDWFP) has received and reviewed the USFWS's Feral Swine Damage Management Plan and Environmental Assessment along with the proposed goals, objectives, and strategies for reducing feral swine damage at Theodore Roosevelt National Wildlife Refuge Complex.

On behalf of the MDWFP, we do not have any comments at this time.

Thank you for the opportunity for review.

Ricky Flynt
Wildlife Biologist
Alligator/Furbearer/Nuisance Wildlife
Program Coordinator
New Logo EMAIL
1505 Eastover Dr.
Jackson, MS 39211

Dear Sirs,

We understand the actual and potential damage caused by feral swine. It is likely swine will affect cultural resources more adversely than your control measures. Our only caveats would be if you are planning to dig holes or mechanically excavate more than 2 yards of earth (about the payload of a pickup truck) in one or multiple locations, we would like to review those kinds of earth-disturbing projects in advance. Otherwise, we have no concerns about the effect of the management control measures proposed.

Let me know if you would like a formal letter.

Best

Greg

Greg Williamson (601) 576-6538
Review and Compliance Officer
Mississippi Department of Archives and History
Historic Preservation
P. O. Box 571
Jackson, MS 39205-0571

Service Response: The Service appreciates the comments from the State Historic Preservation Office. The Feral Swine Damage Management Plan does not envision any soil disturbance beyond the temporary installation of steel posts for anchoring traps. We will continue to protect all known cultural resources from damage and take necessary steps to avoid disturbing undiscovered archaeological sites or other cultural resources.

Mr. Greene,

On behalf of the Mississippi Department of Transportation (MDOT), I have reviewed the Draft EA for the subject Management Plan and we have no further comments.

If you have any questions or need additional information, please feel free to give me a call.

Thanks,

Kim

Kim D. Thurman
Environmental Division Administrator
Mississippi Department of Transportation

PUBLIC COMMENTS

Approximately 11 members of the public commented on the plan, either via email, telephone, or in person to refuge personnel. Comments, which were generally supportive, can be summarized by the following:

- questions about the process, or about the possibility of opportunities for the public to hunt feral swine on the refuge complex;
- offers of assistance (aviation support, dogs, shooting).

No opposition to the plan was noted among any of the comments received from the public.

APPENDIX C. FINDING OF NO SIGNIFICANT IMPACT

INTRODUCTION

The U.S. Fish and Wildlife Service proposes to use aerial gunning to remove feral swine on Theodore Roosevelt National Wildlife Refuge Complex in west-central Mississippi. An Environmental Assessment has been prepared to inform the public of the possible environmental consequences of implementing the Feral Swine Damage Management Plan for Theodore Roosevelt National Wildlife Refuge Complex. A description of the alternatives, the rationale for selecting the preferred alternative, the environmental effects of the preferred alternative, the potential adverse effects of the action, and a declaration concerning the factors determining the significance of effects, in compliance with the National Environmental Policy Act of 1969, are outlined below. The supporting information can be found in the Environmental Assessment written for the Feral Swine Damage Management Plan.

ALTERNATIVES

In developing the Feral Swine Damage Management Plan for Theodore Roosevelt National Wildlife Refuge Complex, the Fish and Wildlife Service evaluated two alternatives:

No-action Alternative: Integrated Management Using Ground-based Methods (Current Management)

Proposed Alternative: Aerial Gunning as a Component of Integrated Management (Preferred Action)

The Service adopted the Proposed Alternative as the "Preferred Action" for feral swine damage management.

NO-ACTION ALTERNATIVE

The no-action alternative represents no change from current management of the Refuge. Under this alternative, the following methods are used in an integrated management approach to reduce feral swine populations and the damage they cause: opportunistic take by the public during legal big game hunts, trapping with baited corral and cage-type traps, ground-based shooting by refuge personnel and/or contractors, and fencing of high-value assets such as agronomic fields.

PREFERRED ALTERNATIVE

This alternative is the same as the No-Action Alternative with the addition of aerial gunning as a component of an integrated management approach for managing feral swine damage. This alternative also includes opportunistic take by the public, trapping, ground-based shooting, and fencing.

SELECTION RATIONALE

The Preferred Alternative is selected for implementation because it has the greatest probability of successfully reducing feral swine populations and the damage they inflict on refuge resources in a cost-effective and efficient manner. Incorporating aerial gunning into the available methods for feral swine removal on Theodore Roosevelt NWRC will add flexibility to refuge management and allow the Service to combine methods to exploit advantages and minimize weaknesses of each.

ENVIRONMENTAL EFFECTS, INCLUDING POTENTIAL ADVERSE EFFECTS

Implementation of the Service's management action is expected to result in environmental, social, and economic effects as outlined in the Feral Swine Damage Management Plan and accompanying Environmental Assessment. In addition, certain non-significant adverse effects were identified in the Environmental Assessment.

HUMAN HEALTH AND SAFETY

The action poses non-significant risks to human health and safety. Risks associated with use of firearms, contact with feral swine (confined or not), and low altitude aerial operations were analyzed in the Environmental Assessment. Reducing feral swine populations may have a modest beneficial effect by reducing the risk of transmission of zoonotic diseases to humans and by reducing the risk to refuge visitors posed by aggressive feral swine.

REFUGE PHYSICAL ENVIRONMENT

Direct effects of the preferred action were found to have non-significant effects on the physical environment of the refuges. Soil, water quality, hydrology, and air quality would be unaffected or negligibly affected by any of the methods in the preferred action. Reducing feral swine populations may have a positive effect on soil and water quality on the refuges because of the reduction in rooting and wallowing which would occur.

Aerial operations may pose a slight risk to the physical environment of the refuges. The effects of fuel/oil/fluid spills and fires was determined to be non-significant due to their low risk and small scale.

CULTURAL RESOURCES

None of the methods described in the preferred action would have a significant effect on any known or unknown cultural resources on TRNWRC refuges. Reducing populations of feral swine may reduce risk to cultural resources by reducing rooting and wallowing activity.

HABITATS

None of the methods described in either alternative would have a significant negative effect on habitats on any of the refuges of TRNWRC. Non-significant, transitory effects may occur from placement of traps. Positive effects of reducing feral swine populations would accrue on forested habitat, cropland, moist soil habitat, and aquatic habitats due to reduction of rooting, wallowing, defecation, and acorn consumption by feral swine.

EFFECTS ON WILDLIFE

Game Animals, Including Waterfowl

Direct negative effects of methods in the preferred action (trapping, opportunistic take by hunters, and aerial and ground-based shooting) on deer, turkey, waterfowl, squirrels, rabbits, and other game animals would be negligible. Reduction of feral swine populations would have beneficial effects on native wildlife populations by reducing resource competition, direct predation, and disease transmission from feral swine to native wildlife.

Nongame Migratory Birds

The direct negative effects of ground-based shooting, trapping, and opportunistic take by hunters on nongame migratory birds is negligible. Likewise, aerial or ground-based shooting of feral swine by Service personnel or contractors and activity related to trapping would not be expected to have a significant effect on migratory birds.

Threatened and Endangered Species

No significant adverse effects of any of the feral swine control measures in the preferred action are expected on least tern, fat pocketbook, rabbitsfoot, pallid sturgeon, or pondberry. Some beneficial effects of reducing feral swine populations may occur for least tern and pondberry, because of reduction of habitat disturbance, and in the case of least tern, direct predation of nests, by feral swine.

The presence of Louisiana black bears warrants consideration of the risk that measures in the preferred action, including trapping, shooting, and aerial operations will result in an unintentional "take" of this species. The potential exists for adverse effects to Louisiana black bear from measures in the preferred action. It is possible that take of bears could occur in a cage-type trap or because of disturbance during aerial operations. It is also possible that lethal take of a bear could occur from shooting operations or because of mistaken identification by a hunter. Analysis in the Environmental Assessment concluded that these effects would be successfully mitigated and thus would be non-significant.

Reducing the population of feral swine on TRNWRC refuges would reduce resource competition from swine and improve habitat quality for bears.

Effects on Feral Swine Populations

Although aerial operations are hoped to provide a more effective means of reducing feral swine populations on TRNWRC, the scale of any operations mounted on the refuge complex would be minor in comparison to the overall population of feral swine in Mississippi and would result in, at best, a local, temporary reduction in swine numbers. Therefore, we conclude that the effects of aerial gunning on feral swine populations would be insignificant.

HUMANENESS OF CONTROL MEASURES

All of the methods in the preferred action were analyzed for humaneness in the Environmental Assessment. Euthanasia of swine in traps by gunshot as well as shooting of unconfined feral swine from the ground or from the air are considered by some members of the public to be inhumane; however, the use of generally accepted protocols for euthanizing confined animals and killing unconfined animals was considered to have a non-significant, temporary effect on animal suffering.

MITIGATION MEASURES FOR POTENTIAL ADVERSE EFFECTS

HUMAN HEALTH AND SAFETY

Safety of public hunting on national wildlife refuges in Mississippi is managed by regulations promulgated by the State of Mississippi and by the U.S. Fish and Wildlife Service. Trapping and shooting of feral swine on refuges is conducted by trained wildlife professionals in a manner which protects the health and safety of the public as well as those of Service employees and contractors. Notifications, area closures, road closures, and signage will all be used as needed

to protect health and safety. Agencies including the U.S. Fish and Wildlife Service and USDA APHIS WS conduct internal safety reviews and training on a regular basis to minimize risk to agency personnel and the public.

The U.S. Department of the Interior and the Service have developed policy (DM Parts 350-353; 330 FW 1-4) and Department of the Interior has published a handbook (U.S. Department of the Interior, n.d.) to ensure that aerial wildlife operations are conducted in as safe a manner as possible. In a Memorandum of Understanding (MOU) dated January 14, 2014, the Service and USDA APHIS Wildlife Services agreed to procedures and guidelines for joint operations for wildlife damage management activities on national wildlife refuges. Under this MOU, the most restrictive limitations on flight and duty (DOI) apply to joint operations.

REFUGE PHYSICAL ENVIRONMENT

Protocols designed to protect human health and safety would also protect refuge physical environments from fuel/oil/fluid spills and fires resulting from aviation accidents.

CULTURAL RESOURCES

Risk to cultural resources from the preferred action is exceedingly remote. Known cultural resources would be protected during feral swine removal operations by standard procedures outlined in Service policy 614 FW 4.

HABITATS

Placement of traps by Service personnel would be done with a minimum of soil or vegetation disturbance. Likewise, authorized contractors will be governed by terms of Special Use Permits which restrict the degree to which habitat can be disturbed in the placement of traps or other activities.

EFFECTS ON WILDLIFE

Game Animals Including Waterfowl

Trapping protocols call for frequent trap checks and immediate release of non-target animals. Disturbance to wildlife would be minimal and not different from that caused by other common activities on refuges such as hunting and vehicle operation. A small risk of accidental lethal take of non-target wildlife by shooting or trapping exists. This risk would be minimized, rendering the effect negligible, by using only trained wildlife professionals for trapping and shooting operations.

Nongame Migratory Birds

Hunting seasons do not coincide with the breeding seasons of most nongame migratory birds on TRNWRC. Aerial operations would be conducted after most wintering migratory birds have left the refuge complex and before breeding migratory birds begin nesting.

Threatened and Endangered Species

If a bear were to be sighted during aerial operations, the pilot would make every effort to avoid disturbing it by avoiding direct overflight and maintaining a reasonable distance. The risk of accidentally shooting a Louisiana black bear, although non-zero, is very remote. All personnel

involved in ground-based shooting and aerial gunning operations are trained wildlife professionals. Positive identification of feral swine would in all cases be made before they are targeted. Trapping protocols require frequent trap checks and immediate release of non-target animals, including Louisiana black bears.

USFWS Ecological Services has issued a Biological Opinion (BO) stating that proposed swine management activities proposed by USDA APHIS Wildlife Services (including all of those in the Service's preferred action) "would not jeopardize the continued existence of the Louisiana black bear" (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2014). This BO, which would carry over to the entire listed range of the Louisiana black bear (Weller, 2014), contained lists of Reasonable and Prudent Measures and Terms and Conditions (reproduced in the attached Environmental Assessment) designed to minimize incidental take of Louisiana black bears. The Service has determined that adhering to these Reasonable and Prudent Measures and Terms and Conditions will ensure that any effects of the preferred action on Louisiana black bears would be non-significant.

Feral Swine Populations

No mitigation measures were deemed necessary or identified for protecting feral swine populations.

HUMANENESS OF CONTROL MEASURES

Trapping protocols call for frequent trap checks to ensure that trapped animals, both feral swine and non-target animals, do not suffer unduly because of long confinement. Trapped feral swine would be euthanized by gunshot in accordance with generally accepted protocols. Trapping, ground-based shooting and aerial gunning operations would in all cases be carried out by experienced wildlife professionals and follow protocols designed to minimize animal suffering. For operations conducted by USDA APHIS Wildlife Services, lethal control will be governed by WS Directive 2.505.

EXECUTIVE ORDERS 11990 AND 11988

The management action is not expected to have significant adverse effects on wetlands and floodplains, pursuant to Executive Orders 11990 and 11988.

COORDINATION

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

- All affected landowners
- Congressional representatives
- Governor of Mississippi
- Mississippi Department of Wildlife, Fisheries, and Parks
- Mississippi State Historic Preservation Officer
- Federally recognized Tribes with ties to Theodore Roosevelt NWRC
- County officials
- Interested citizens
- Conservation organizations and advocacy groups

FINDINGS

It is my determination that the management action does not constitute a major federal action significantly affecting the quality of the human environment under the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969 (as amended). As such, an environmental impact statement is not required. This determination is based on the following factors (40 C.F.R. 1508.27), as addressed in the Environmental Assessment of the Draft Feral Swine Damage Management Plan for Theodore Roosevelt National Wildlife Refuge Complex:

1. Both beneficial and adverse effects have been considered and this action will not have a significant effect on the human environment. (Environmental Assessment, pages 7, 12).

2. The actions will not have a significant effect on public health and safety. (Environmental Assessment, pages 8, 12).

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 8, 13).

4. The effects on the quality of the human environment are not likely to be highly controversial. (Environmental Assessment, pages 7-16).

5. The actions do not involve highly uncertain, unique, or unknown environmental risks to the human environment. (Environmental Assessment, pages 7-16).

6. The actions will not establish a precedent for future actions with significant effects nor do they represent a decision in principle about a future consideration. (Environmental Assessment, page 14).

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, page 14).

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 8, 13).

9. The actions are not likely to adversely affect threatened or endangered species, or their habitats. (Environmental Assessment, pages 9, 13,).

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 1, 4, 9-11, 13).

SUPPORTING REFERENCES

Fish and Wildlife Service. 2015. Draft Feral Swine Damage Management Plan and Environmental Assessment for Theodore Roosevelt National Wildlife Refuge Complex. U.S. Department of the Interior, Fish and Wildlife Service, Southeast Region.

DOCUMENT AVAILABILITY

The Environmental Assessment was produced as a companion document to the Draft Feral Swine Damage Management Plan and is available on the complex web page: http://www.fws.gov/refuge/theodore_roosevelt/. Copies may be obtained by writing Mike Rich, Project Leader, U.S. Fish and Wildlife Service,12595 MS Hwy. 149, Yazoo City, MS 39194, Phone: 662-836-3004.

David Viker
Refuge Chief

2-18-15
Date

U.S. Fish & Wildlife Service

ENVIRONMENTAL ASSESSMENT

FERAL SWINE DAMAGE MANAGEMENT PLAN

THEODORE ROOSEVELT NATIONAL WILDLIFE REFUGE COMPLEX

Washington, Issaquena, Sharkey, Humphreys, Yazoo, Holmes, and Leflore Counties, Mississippi

Southeast Region

ENVIRONMENTAL ASSESSMENT

for

Feral Swine Damage Management Plan

Theodore Roosevelt National Wildlife Refuge Complex

U.S. Department of the Interior

Fish and Wildlife Service

Southeast Region

February, 2015

Prepared by:
U.S. Department of the Interior
Fish and Wildlife Service
Yazoo City, Mississippi

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CHAPTER 1 BACKGROUND

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) is a Federal bureau operated within the Department of the Interior (DOI). The Service manages 556 national wildlife refuges totaling over 150 million acres. The Service is responsible for protecting threatened and endangered species, migratory birds, anadromous and interjurisdictional fish, and certain marine mammals. The Service maintains a national network of lands and waters consisting of national wildlife refuges, other managed lands, and wetland management districts, to manage and protect these resources.

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The Mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The Theodore Roosevelt National Wildlife Refuge Complex consists of 7 National Wildlife Refuges. The overriding purpose for the Complex is: "providing for the habitat needs of migratory birds, with an emphasis on waterfowl" (U.S. Fish and Wildlife Service, 2006). Each refuge has a purpose given in establishing legislation or Executive Order. These purposes are listed in the Complex CCP (U.S. Fish and Wildlife Service, 2006) and the Draft CCP for Theodore Roosevelt and Holt Collier NWRs, which will be available in 2015.

The following laws, regulations, and Executive Orders relate to the management of feral animals on Federal lands:

1. The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, permits the uses of refuges provided that the proposed use is compatible with the primary purpose for which a refuge was established.
2. The Refuge Recreation Act of 1962, as amended, authorizes public hunting on refuges where the hunting program is compatible with the other major purposes for which the area was established.
3. The Fish and Wildlife Act of 1956, as amended, authorizes development, advancement, management, conservation, and protection of fish and wildlife resources.
4. Executive Order 12996, "Management and General Public Use of the National Wildlife Refuge System" recognizes compatible wildlife-dependent recreational activities involving hunting, among others, as priority general public uses of the National Wildlife Refuge System.
5. Title 50 CFR, Section 31.2 lists hunting as a method of surplus wildlife population control.
6. 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.

7. 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.
8. 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.
9. Title 50 CFR 32.1 states that the opening of a wildlife refuge area to hunting will be dependent upon the provisions of law applicable to the area and upon a determination by the Secretary of the Interior that the opening of the area to hunting of migratory game birds, upland game, or big game will be compatible with the principles of sound wildlife management and will otherwise be in the public interest.
10. Title 50 CFR 32.2 provides provisions which apply to each person while engaged in public hunting on a wildlife refuge.

ACTION

The Service is preparing a Draft Feral Swine Damage Management Plan as a step-down plan from the Complex CCP (U.S. Fish and Wildlife Service, 2006) and the Draft CCP for Theodore Roosevelt and Holt Collier NWRs, which will be available in 2015. Control of feral swine by baiting, ground-based shooting, and trapping has been previously analyzed in the EA produced for the 2006 CCP (U.S. Fish and Wildlife Service, 2005). The Service is proposing to add aerial gunning to the list of methods available to it for controlling feral swine on TRNWRC. This EA is to analyze the impacts to the human environment of implementing a feral swine damage management plan on Theodore Roosevelt National Wildlife Refuge Complex.

PURPOSE AND NEED FOR ACTION

PURPOSE

The purpose of the proposed Feral Swine Damage Management Plan is to identify goals and objectives and evaluate and prescribe strategies for mitigating the threats posed by feral swine (*Sus scrofa*), and reducing or eliminating the damage that feral swine do, to refuge resources on TRNWRC lands. The purpose of adding aerial gunning to the list of available methods for feral swine control is to enable the refuge complex to use this method in conjunction with other methods already in place at the refuge complex. The Service believes this addition will greatly enhance its ability to control feral swine populations and reduce the amount of damage caused by these animals.

NEED

The action is needed because feral swine pose an unacceptable and growing threat to refuge resources, the accomplishment of refuge purposes, and the health and safety of the public. The Service believes that developing and implementing a plan which includes aerial gunning as a component of an integrated management approach is the best way to address the problems that feral swine cause on the TRNWRC.

DECISION FRAMEWORK

Based on the analyses in this Environmental Assessment, the Service will select the alternative that best serves the purposes for which the refuges within the TRNWRC were established and supports the mission of the NWRS, and determine if the selected alternative is a major Federal action which significantly negatively affects the quality of the human environment, thus requiring the preparation of an Environmental Impact Statement. The Service identified issues, concerns, and needs through discussions with the public, organizations, agency managers, conservation partners, Tribes, local, state, and federal government agencies, and others. The Service identified priority issues, developed a range of alternatives, evaluated the possible consequences of implementing each of the alternatives, and selected the proposed alternative as the proposed action. The draft plan was developed for implementation based on this recommendation.

CHAPTER 2 AFFECTED ENVIRONMENT

For a description of the affected environment, see relevant portions of the 2006 CCP for Theodore Roosevelt National Wildlife Refuge Complex (U.S. Fish and Wildlife Service, 2006) which is incorporated into this Environmental Assessment by Reference. A Draft Comprehensive Conservation Plan for Theodore Roosevelt and Holt Collier National Wildlife Refuges, is being prepared, and will be available in 2015. The 2006 CCP can be accessed at: http://www.fws.gov/southeast/planning/PDFdocuments/Theo%20Roosevelt%20NWR%20Complex%20CCP/TRfinalCCP/TRFinalCCPformatted.pdf

CHAPTER 3 ALTERNATIVES INCLUDING THE PROPOSED ACTION

FORMULATION OF ALTERNATIVES

Alternatives are different approaches or combinations of management actions designed to fulfill the Purpose and Need and help the refuge complex achieve its purposes. The National Environmental Policy Act requires that a range of alternatives be considered including the No Action alternative. Through internal scoping and intergovernmental consultation, the Service has identified two alternatives, including the No Action alternative, which constitute the full range of reasonable alternatives for this action.

DESCRIPTION OF ALTERNATIVES

Goal 2 in the 2006 CCP (U.S. Fish and Wildlife Service, 2006) is to "control and manage invasive, pest, and nuisance species." Both alternatives described here would be expected to achieve that goal. The alternatives represent two approaches to achieving this goal.

NO-ACTION ALTERNATIVE

This alternative reflects current management. The refuge complex currently uses the following methods of feral swine control in an integrated management approach to reduce feral swine populations and the damage they cause. For a more complete description of each method, please see the descriptions in Chapter V of the Draft Feral Swine Damage Management Plan, companion to this document.

Opportunistic Take by the Public

Big game hunters may currently take feral swine as an incidental species with any legal weapon during TRNWRC big game seasons. Because of concerns about creating incentives for illegal release of swine on refuges, the refuge complex does not allow special hunts for feral swine.

Trapping

Baited traps, including corral-type and cage-type, are currently used on TRNWRC refuges by refuge personnel and contractors to trap feral swine, which are then euthanized on site. Non-target animals are released on site.

Ground-based shooting

Shooting is used on TRNWRC refuges as part of an integrated management program. Feral swine may be shot by refuge personnel on an incidental basis, or during focused operations

which may include baiting and the use of blinds during daylight or nighttime hours, with artificial light.

Fencing

The refuge may use fencing to protect high-value areas, e.g. impoundments planted to agronomic crops, from feral swine. Fence may be installed by Service personnel or by farm cooperators.

PROPOSED ALTERNATIVE

This alternative would be the same as the No-Action Alternative with the addition of aerial gunning as a component of the integrated management approach for managing feral swine damage which also includes opportunistic take by the public, trapping, and ground-based shooting (discussed above).

Aerial Gunning

Aerial gunning would be conducted by trained wildlife personnel employed by or under contract to the Service or USDA APHIS Wildlife Services. All feral swine control by non-Service personnel would be conducted under a Special Use Permit. Aerial operations would be conducted in compliance with the Department of the Interior Aerial Capture, Eradication, and Tagging of Animals (ACETA) Handbook (U.S. Department of the Interior, n.d.). Aerial gunning operations would be 100% selective for feral swine.
For a more detailed description of aerial gunning, see the description in Chapter V of the Draft Feral Swine Damage Management Plan, companion to this document.

ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

The following alternative was considered because of known concerns about animal welfare among the public and advocacy groups. However, the Service determined during internal scoping that major aspects of the alternative are currently infeasible. We therefore did not analyze its effects on the human environment.

Non-lethal-only Control of Feral Swine

Non-lethal control of feral swine has been proposed for use where lethal methods are not feasible or to supplement lethal control methods. Methods include the use of fertility control, construction and maintenance of fencing, the use of repellents, the application of diversionary feeding, and translocation of animals (Massei et al., 2011). The Service has determined that none of these methods is currently feasible for control of feral swine populations on TRNWRC.

Fertility Control

This method consists of treating sows to cause long-term (1-5 year) infertility. Because of the cost, slow results, and uncertain efficacy, this method is currently applicable only to small-scale situations and/or to aid in the prevention of wildlife diseases (Massei et al., 2011; Killian et al., 2007).

Large-scale Fencing

Fences have been used successfully in small-scale settings and to protect high-value resources such as agronomic crop fields. However, construction and maintenance of large-scale swine-

proof fencing for TRNWRC lands would be cost-prohibitive. Even if fences were to be used, feral swine inside the fence would have to be removed and either euthanized or translocated.

Repellents

No repellents are currently labeled for use on swine in the United States. This method is therefore not available.

Diversionary Feeding

This method can be used for short-term diversion of feral swine to protect a resource such as a crop field (Massei et al., 2011). However, long-term diversionary feeding amounts to supplemental feeding, which has been shown to support swine populations (Geisser & Reyer, 2005) and is counter-productive in an integrated control strategy. Diversionary feeding also poses potential problems because feeding sites also may act as baiting stations where deer or other wildlife could be illegally hunted.

Translocation

This method involves the capture by trapping and removal of feral swine to a location where they will not impact the resources of interest. This method is infeasible because translocation and subsequent release of feral swine is illegal in Mississippi. Even were it to become legal, serious issues with the spread of wildlife diseases and feral swine themselves would preclude the use of this method.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

This chapter outlines the foreseeable environmental consequences of implementing the two alternatives described in Chapter 3 above in order to provide information necessary to make an informed decision when selecting an alternative to address the purpose and need described above in Chapter 1.

EFFECTS COMMON TO BOTH ALTERNATIVES

Because the proposed alternative differs from the no-action alternative by adding one control method only, most of the environmental effects are common to both alternatives. These effects have been analyzed in the following Environmental Assessments, the relevant portions of which are incorporated into this Environmental Assessment by reference.

- Environmental Assessment 2012 Nuisance Animal Plan on North Louisiana Refuges Complex (U.S. Fish and Wildlife Service, 2012)
- Feral Hog Management Environmental Assessment for Southwest Louisiana National Wildlife Refuge Complex (U.S. Fish and Wildlife Service, 2010)
- Environmental Assessment Mammal Damage Management in Mississippi (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2012)
- Environmental Assessment Reducing Feral Hog Damage through an Integrated Wildlife Damage Management Program in the State of Georgia (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2005)
- Environmental Assessment Feral Swine Damage and Disease Management in Louisiana (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2014)

Results of those analyses which are relevant to the alternatives in this Environmental Assessment will be summarized and cited below.

ENVIRONMENTAL JUSTICE

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was signed by President 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 with access to public information and opportunities for participation in matters relating to human health or the environment.

Neither of the management alternatives described in this environmental assessment will disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. Implementation of the action alternative is anticipated to provide a benefit to the residents residing in the surrounding communities.

CLIMATE CHANGE

Because of the relatively small scale of the actions in the alternatives in this Environmental Assessment, anticipated emissions of greenhouse gases from implementation of either of the alternatives would have a negligible effect on climate change (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2012; U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2014).

HUMAN HEALTH AND SAFETY

Each alternative would have negligible effects on public health and safety (U.S. Fish and Wildlife Service, 2010; U.S. Fish and Wildlife Service, 2012). Safety of public hunting on national wildlife refuges in Mississippi is managed by regulations promulgated by the State of Mississippi and by the U.S. Fish and Wildlife Service. Trapping and shooting of feral swine on refuges is conducted by trained wildlife professionals in a manner which protects the health and safety of the public as well as those of Service employees and contractors. Notifications, area closures, road closures, and signage will all be used as needed to protect health and safety. Agencies including the U.S. Fish and Wildlife Service and USDA APHIS WS conduct internal safety reviews and training on a regular basis to minimize risk to agency personnel and the public (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2005; U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2014).

REFUGE PHYSICAL ENVIRONMENT

Direct effects of actions covered by both alternatives would have insignificant effects on the physical environment of the refuges. Soil, water quality, hydrology, and air quality would be unaffected or negligibly affected by any of the methods described in either alternative. Reducing feral swine populations may have a positive effect on soil and water quality on the refuges because of the reduction in rooting and wallowing which would occur (U.S. Fish and Wildlife Service, 2010; U.S. Fish and Wildlife Service, 2012).

CULTURAL RESOURCES

None of the methods described in either alternative would have a significant effect on any known or unknown cultural resources on TRNWRC refuges. Reducing populations of feral swine may reduce risk to cultural resources by reducing rooting and wallowing activity (U.S. Fish and Wildlife Service, 2012).

HABITATS

None of the methods described in either alternative would have a significant negative effect on forest, moist soil, cropland, or aquatic habitats on any of the refuges of TRNWRC. Non-significant effects on forest habitat may occur from placement of traps due to minor cutting of brush, attachment of corral panels to trees, and trampling of vegetation inside the trap. Any effects would be transitory and minor. Positive effects of reducing feral swine populations (under either alternative) would accrue on forested habitat, cropland, moist soil habitat, and aquatic habitats due to reduction of rooting, wallowing, defecation, and acorn consumption by feral

swine. Reduction of rooting and wallowing would allow natural vegetation to recover and provide forage and cover for native wildlife. Reducing soil disturbance and defecation in riparian areas would reduce sedimentation and the introduction of coliform bacteria into water bodies, improving water quality and aquatic habitats. Reducing acorn and other forage consumption by feral swine would increase supplies of those food resources for native wildlife.

EFFECTS ON WILDLIFE

Effects on Non-target Wildlife, Including Listed Species

Game Animals, Including Waterfowl

Direct negative effects of methods common to both alternatives (trapping, opportunistic take by hunters, and ground-based shooting) on deer, turkey, waterfowl, squirrels, rabbits, and other game animals would be negligible. Trapping protocols call for frequent trap checks and immediate release of non-target animals. Disturbance to wildlife would be minimal and not different from that caused by other common activities on refuges such as hunting and vehicle operation. A small risk of accidental lethal take of non-target wildlife by shooting or trapping exists. This risk would be minimized, rendering the effect negligible, by using only trained wildlife professionals for trapping and shooting operations. Reduction of feral swine populations would have beneficial effects on native wildlife populations by reducing resource competition, direct predation, and disease transmission from feral swine to native wildlife.

Nongame Migratory Birds

As for game animals, the direct negative effects of ground-based shooting, trapping, and opportunistic take by hunters on nongame migratory birds is negligible. Some small amount of disturbance would result from opportunistic take by hunters, but this would not differ from that which accompanies take of game animals. Hunting seasons do not coincide with the breeding seasons of most nongame migratory birds on TRNWRC. Likewise, ground-based shooting of feral swine by Service personnel or contractors and activity related to trapping would not be expected to have a significant effect on migratory birds.

Threatened and Endangered Species

Six listed species occur or may occur in the 7-county area covered by TRNWRC: least tern (interior population) (*Sterna antillarum*), Endangered, fat pocketbook mussel (*Potamilus capax*), Endangered, rabbitsfoot mussel (*Quadrula cylindrica cylindrica*), Threatened, pallid sturgeon (*Scaphirhynchus albus*), Endangered, pondberry (*Lindera melissifolia*), Endangered, and Louisiana black bear (*Ursus americanus luteolus*), Threatened. No significant adverse effects of any of the feral swine control measures common to both alternatives are expected on least tern, fat pocketbook, rabbitsfoot, pallid sturgeon, or pondberry. Some beneficial effects of reducing feral swine populations may occur for least tern and pondberry, because of reduction of habitat disturbance, and in the case of least tern, direct predation of nests, by feral swine (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2014).

The potential exists for adverse effects to Louisiana black bear from actions common to both alternatives. It is possible that take of bears could occur in a cage-type trap. It is also possible that lethal take of a bear could occur from shooting operations or because of mistaken identification by a hunter. USDA APHIS Wildlife Services analyzed the effects of their feral swine management program in Louisiana and made a "may affect, likely to adversely affect" determination for Louisiana black bear based on the potential for take during swine control activities. USDA APHIS Wildlife Services initiated a formal consultation with USFWS Ecological

Services, which issued a Biological Opinion (BO) stating that their proposed swine management activities "would not jeopardize the continued existence of the Louisiana black bear" (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2014). This BO, which would carry over to the entire listed range of the Louisiana black bear (Weller, 2014), contained a list of Reasonable and Prudent Measures designed to minimize incidental take of Louisiana black bears:

1. USDA-WS personnel shall take all necessary precautions to minimize the likelihood of incidental capture of Louisiana black bears (e.g., avoid trap sites and techniques with a high potential to capture non-targets, and use technical assistance opportunities to educate landowners about techniques used to avoid capturing non-targets).
2. USDA-WS personnel shall minimize impacts to Louisiana black bear breeding and/or critical habitat if "minor habitat management" techniques are performed during the implementation of the feral swine damage management program.
3. USDA-WS personnel shall monitor incidental take to ensure compliance with exempted take levels.

The BO also contained a set of Terms and Conditions under which USDA APHIS Wildlife Services must operate to be exempt from section 9 of the Endangered Species Act:

1. USDA-WS shall fully adhere to all snaring zone restrictions as stated in the "Factors to be Considered" section of this document. USDA-WS shall also provide copies of the snaring zone map and the verbal description of the zone boundaries to all personnel utilizing cable restraints/snares as part of their feral swine damage management program.
2. USDA-WS shall provide information to cooperators participating in the feral swine damage management program about appropriate techniques and precautions for avoiding incidental capture of Louisiana black bears.
3. USDA-WS shall inform cooperators that they should immediately contact LDWF communications (225-765-2706) or their nearest LDWF office in the event of an incidental capture of a Louisiana black bear.
4. USDA-WS shall ensure that all personnel responding to a report of a captured Louisiana black bear in a cable restraint/snare be formally trained in the administration of chemical immobilization drugs for wildlife.
5. USDA-WS shall immediately cease snaring operations in any area where evidence of bear presence is discovered, regardless of the snare-zone association of the subject site. Snaring shall only be resumed following coordination with, and concurrence from, the Louisiana Ecological Services Office.
6. USDA-WS shall coordinate with the Service prior to any "minor habitat management" that would impact Louisiana black bear breeding and/or critical habitat as a component of the feral swine damage management program. Such coordination shall focus on the development of techniques that would completely avoid, or significantly reduce, detrimental effects to those habitats (e.g., avoiding all impacts to trees greater than 36 inches in diameter, using small-scale hand clearing methods rather than large-scale mechanical clearing, implementing techniques that would facilitate the reversion of

habitats to their previous/unmodified state, and restoring modified habitats as necessary after management activities are completed on impacted sites).

7. USDA-WS shall immediately notify the Louisiana Ecological Services Office, the Service's Law Enforcement Office in Lafayette, Louisiana, and the LDWF if a dead, injured, or sick Louisiana black bear is discovered in or adjacent to a feral swine trap site operated by its personnel. Injured individuals shall be handled appropriately and dead specimens disposed of in coordination with the Service and LDWF (USDA-WS shall coordinate with LDWF on the transfer of dead bears to an LDWF wildlife veterinarian for a necropsy).
8. USDA-WS shall submit annual monitoring reports to the Louisiana Ecological Services Office. Those reports shall contain the following information: parishes within which trap sites were located, the type of trapping activities conducted, the number of Louisiana black bears trapped and/or killed, the types of traps responsible for Louisiana black bear captures, as well as any other pertinent information.

Neither alternative in this Environmental Assessment proposes the use of snares or cable restraints; therefore, restrictions on that method in the BO are not relevant to TRNWRC's Feral Swine Damage Management Plan. If snaring were to be proposed on TRNWRC lands, further consultation with the Mississippi Ecological Services office of USFWS would be necessary to establish zones similar to those established for Louisiana (Weller, 2014). Reasonable and prudent measures and Terms and Conditions which apply to trapping, provision of information to cooperators, notification, and habitat modification would apply to operations on TRNWRC. Any reports and consultations for TRNWRC actions would be conducted with the Mississippi Ecological Services office of USFWS. With these measures, terms, and conditions in place, effects of methods common to both alternatives would be non-significant.

An Intra-Service Section 7 Evaluation was conducted for the action proposed in the accompanying Feral Swine Damage Management Plan. It was determined that the actions proposed in this plan would not be likely to adversely affect Louisiana black bear or any other known listed species on TRNWRC lands.

Beneficial effects of both alternatives on Louisiana black bear would be similar to those listed above for deer, turkey, and waterfowl. Reducing the population of feral swine on TRNWRC refuges would reduce resource competition from swine and improve habitat quality for bears.

Effects on Feral Swine Populations

USDA APHIS Wildlife Services analyzed the effects of their state-wide control programs in Georgia and Louisiana on the population of feral swine in those states (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2005; U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2014). Although lethal removal of feral swine has the potential to adversely affect swine populations, USDA APHIS Wildlife Services concluded that their proposed actions, which could result in the removal of 10,000 feral swine per year in Louisiana and 1,000 per year in Georgia, would have a negligible effect on overall populations of feral swine in those states. In Mississippi, USDA APHIS Wildlife Services analyzed the effect of their lethal removal efforts on feral swine populations and concluded that, because their portion of the annual take was less than 1 percent of the total harvest by hunters in the state, their efforts would have a negligible effect on feral swine populations there (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2012). The much smaller scale efforts at TRNWRC would

also be expected to have a negligible effect on the Mississippi population of feral swine, although local reductions may occur.

HUMANENESS OF CONTROL METHODS

USDA APHIS Wildlife Services analyzed the animal welfare effects of their control methods in Mississippi, Louisiana and Georgia on feral swine in those states (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2005; U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2012; U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2014). All of the methods common to both alternatives in this Environmental Assessment are included in those analyses. Trapping protocols call for frequent trap checks to ensure that trapped animals, both feral swine and non-target animals, do not suffer unduly because of long confinement. Euthanasia of swine in traps by gunshot as well as shooting of unconfined feral swine are considered by some members of the public as inhumane; however, the use of generally accepted protocols for euthanizing confined animals and killing unconfined animals was considered to have a non-significant, temporary effect on animal suffering.

SUMMARY OF EFFECTS

The proposed alternative differs from the no-action alternative only by the addition of aerial gunning as a control method. Therefore, this summary will focus on unique effects of that method in the proposed alternative. There are no unique effects of the no-action alternative.

CLIMATE CHANGE

No significant effects of aerial gunning would be expected on global climate change. Although the operation of aircraft involves the burning of fossil fuel and the emission of atmospheric carbon, the scale of the operations proposed in this plan are insignificant.

HUMAN HEALTH AND SAFETY

Low altitude aerial operations inherently involve certain risks for personnel involved and for the public. The U.S. Department of the Interior and the Service have developed policy (DM Parts 350-353; 330 FW 1-4) and Department of the Interior has published a handbook (U.S. Department of the Interior, n.d.) to ensure that aerial wildlife operations are conducted in as safe a manner as possible. In a Memorandum of Understanding (MOU) dated January 14, 2014, the Service and USDA APHIS Wildlife Services agreed to procedures and guidelines for joint operations for wildlife damage management activities on national wildlife refuges. Under this MOU, the most restrictive limitations on flight and duty (DOI) apply to joint operations. USDA APHIS Wildlife Services analyzed the effects of aerial wildlife operations on human health and safety (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2014), including the possibility of starting wildfires, fuel spills, oil/fluid spills, and human safety. They concluded that "[t]he risks to human safety from the use of non-lethal and lethal methods, when used appropriately and by trained personnel, is considered low."

REFUGE PHYSICAL ENVIRONMENT

Aerial operations may pose a slight risk to the physical environment of the refuges. The effects of fuel/oil/fluid spills and fires, discussed above, has been analyzed and determined to be non-significant due to their low risk and small scale.

CULTURAL RESOURCES

There is a remote risk that an aircraft would crash into a historic structure and a slightly less remote risk of starting a fire which damaged a historic structure. However, conditions which would allow a wildfire to propagate in the environments of TRNWRC (bottomland hardwoods, moist soil areas, crop lands) are exceedingly rare. For these reasons, the effects of aerial operations on cultural resources are considered non-significant.

HABITATS

No effects of aerial operations on habitats other than those discussed above under Refuge Physical Environment could be identified.

EFFECTS ON WILDLIFE

Effects on Non-target Wildlife, Including Listed Species

There is a risk of disturbance of non-target wildlife associated with low-altitude overflights by aircraft involved in aerial gunning. USDA APHIS Wildlife Services provided a detailed analysis of possible effects on waterbirds, waterfowl, raptors, passerine birds, domestic livestock, and large and small mammals, and concluded that, because the disturbance from aircraft overflights would be infrequent and brief, available research indicates that the effects of such disturbance would not be significant (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2014). Effects on migratory birds would be further mitigated by timing the aerial operations to precede the breeding season for these birds. Any possible effects on waterfowl would be mitigated by restricting operations to areas where waterfowl are not present (i.e. non-flooded areas) and/or by conducting operations after wintering migratory waterfowl have started their spring migration and are no longer present on the refuge complex.

The presence of Louisiana black bears warrants consideration of the risk that aerial operations will result in an unintentional "take" of this species. Because of the rarity of this species on the refuges and the infrequent and brief nature of proposed aerial operations, the risk of disturbing a Louisiana black bear is remote. If a bear were to be sighted during aerial operations, the pilot would make every effort to avoid disturbing it by avoiding direct overflight and maintaining a reasonable distance. The risk of accidentally shooting a Louisiana black bear, although non-zero, is very remote. All personnel involved in aerial gunning operations are trained wildlife professionals. Positive identification of feral swine would in all cases be made before they are targeted.

An Intra-Service Section 7 Evaluation was conducted for the action proposed in the accompanying Feral Swine Damage Management Plan. U.S. Fish and Wildlife Service Ecological Services concurred that the actions proposed in this plan would not be likely to adversely affect Louisiana black bear or any other known listed species on TRNWRC lands.

Effects on Feral Swine Populations

Although aerial operations are hoped to provide a more effective means of reducing feral swine populations on TRNWRC, the scale of any operations mounted on the refuge complex would be minor in comparison to the overall population of feral swine in Mississippi and would result in, at best, a local, temporary reduction in swine numbers. Therefore, we conclude that the effects of aerial gunning on feral swine populations would be insignificant.

HUMANENESS OF CONTROL MEASURES

As with the humaneness of other lethal control measures, public perception of the humaneness of aerial gunning of feral swine depends on individual beliefs and conceptions about killing animals. Aerial gunning operations would in all cases be carried out by experienced wildlife professionals and follow protocols designed to minimize animal suffering. For operations conducted by USDA APHIS Wildlife Services, lethal control will be governed by WS Directive 2.505 (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2011).

CUMULATIVE IMPACTS ANALYSIS

A cumulative impact is defined as an impact on the natural or human environment, which results from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such other actions (40 Code of Federal Regulations, 1508.7).

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

ENVIRONMENTAL JUSTICE

Neither of the management alternatives described in this environmental assessment, when added to impacts from other past, present, and reasonably foreseeable future actions, are expected to disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. Implementation of the action alternative is anticipated to provide a benefit to the residents residing in the surrounding communities. Reduction of feral swine populations resulting from either of the alternatives on TRNWRC is expected to result in modest improvement in the human environment.

CLIMATE CHANGE

No activities in either of the alternatives would have a significant effect on atmospheric carbon or climate. Non-significant releases of atmospheric carbon may be offset by deferral of swine

population management efforts by other agencies or individuals due to swine population reductions achieved by the actions in the alternatives. Efficiencies achieved by aerial gunning (proposed alternative) may result in an overall reduction in greenhouse gas emissions when swine population management efforts across all agencies is considered.

HUMAN HEALTH AND SAFETY

All of the methods described in both alternatives would be employed on a temporary basis and have no residual effects, and therefore none would cause cumulative impacts to human health and safety.

REFUGE PHYSICAL ENVIRONMENT, CULTURAL RESOURCES, AND HABITATS

All of the methods in both alternatives would be deployed on a short-term basis and over limited spatial extent, and none have residual effects. No actions by other agencies would be conducted on refuge lands, and the only actions by individuals (opportunistic take by hunters) are already included in the analysis of the two alternatives in this EA. Therefore, no adverse cumulative effects would be expected on refuge physical environment, cultural resources, or habitats.

EFFECTS ON WILDLIFE

Effects on Non-target Wildlife, Including Listed Species

All of the methods in both alternatives would be deployed on a short-term basis and over limited spatial extent, and none have residual effects. As noted above, any cumulative effects of these actions would be non-significant because of the ephemeral nature of the potential disturbance or interaction. No actions by other agencies or individuals are anticipated whose effects, when combined with those of the actions in the alternatives, would produce a significant cumulative impact on non-target wildlife.

Effects on Feral Swine Populations

Feral swine population reduction methods described in both alternatives would, by definition, be intended to have an effect on feral swine populations. However, as we have seen above, those effects are expected to be small-scale and temporary. It is possible that Service efforts, combined with those of other agencies, for example, the State of Mississippi, would have a larger effect on feral swine populations in the state. However, feral swine populations have risen and swine have become more widespread in Mississippi over the past two decades, despite ongoing efforts by State and Federal agencies and others to reverse the trend (U.S. Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, 2012). It is unlikely that actions in the proposed alternative would, if combined with reasonably foreseeable future actions by the State of Mississippi or other actors, be able to have long-term, significant cumulative effects on feral swine populations.

HUMANENESS OF CONTROL MEASURES

The ephemeral nature of euthanasia of confined animals and shooting of unconfined animals precludes the possibility that there could be cumulative impacts on the animals killed. When some, but not all, members of a group of feral swine (sounder) are killed, there is the possibility

that a form of suffering could be experienced by the remaining members of the sounder. No less an authority than Charles Darwin (Darwin, 1872) recognized and documented apparent expressions of grief in non-human primates, elephants, and other animals. Popular accounts of behavior resembling human grief in many species of mammals and birds abound (Bekoff, 2009). These behavioral changes may persist for a few weeks before the surviving animal or group of animals resumes normal behavior. There is some evidence that when social bonds in swine are broken by the death of a sibling they may not suffer distress, since their primary interactions are competitive (Keeling & Gonyou, 2001). However, there is very little information specific to pigs which would indicate the extent to which surviving members of a sounder may suffer when some members are killed. Therefore, while it is possible that removing some members of a sounder has a negative effect on surviving members, this effect is thought to be temporary and non-significant and would not constitute a cumulative impact under any reasonably foreseeable combination of actions by Federal, State, and other actors.

CHAPTER 5 CONSULTATION AND COORDINATION

Extensive planning has been conducted for all of the refuges in TRNWRC. A CCP was completed for the five refuges which then composed TRNWRC in 2006. Input from Tribes, the State of Mississippi, partner organizations, and the general public was solicited at scoping and during a public comment period on the draft CCP/EA (U.S. Fish and Wildlife Service, 2005). In 2013, the CCP planning process was begun for Holt Collier and Theodore Roosevelt NWRs, which had been added to the complex. Again, scoping was conducted with Tribes, the State, partner organizations, and the public. The Draft CCP/EA will be available for public comment in 2015. Both of these planning documents provide for feral swine management through lethal removal.

Internal and Intergovernmental (Tribal) scoping was conducted for the Draft Feral Swine Damage Management Plan that accompanies this Environmental Assessment. The Service will make this Draft Plan and EA available on its website and as a hard copy obtainable at the Refuge Complex office for a 30-day public comment period in January, 2015. Notifications will be sent to the media, partner organizations, Tribes, County, State and Federal elected officials, Mississippi Department of Wildlife, Fisheries, and Parks, and other interested parties.

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