SUPPLEMENT TO THE ENVIRONMENTAL ASSESSMENT

MAMMAL DAMAGE MANAGEMENT IN ILLINOIS

Prepared by the

United States Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services

In Cooperation with

United States Department of Agriculture,
Forest Service
Shawnee National Forest

and the

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INTRODUCTION

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program completed an Environmental Assessment (hereafter referred to as "the EA") and Finding of No Significant Impact (FONSI) on the management of mammal damage in the state of Illinois in 2009 (USDA 2009). The EA evaluated the need for WS activities and the relative effectiveness of four alternatives for addressing mammal damage complaints, and assessed the potential environmental effects of these activities. The Illinois Department of Natural Resources (IDNR), Illinois Department of Health (IDPH), and USDA Forest Service (USFS) Shawnee National Forest were consulted in the preparation of the EA. Based on analysis in the EA and response to public comments, WS selected Alternative 2 "Continue the current WS integrated mammal damage management (MDM) program (No Action/Proposed Action)" in which WS provides technical assistance and direct control activities to alleviate mammal damage and conflicts. This Supplement considers new management alternatives for addressing conflicts with feral swine in Illinois. Proposed changes to the EA include increasing annual take of feral swine from 200 to 2,000 animals per year and the addition of aerial sharpshooting and hunting with dogs as methods which may be used to search for and remove feral swine. The United States Department of Agriculture, Forest Service Shawnee National Forest and U.S. Department of the Interior, Fish and Wildlife Service Region 3 Division of Refuges (USFWS) were cooperating agencies in the preparation of the supplement. Wildlife Services also consulted with the IDNR and Illinois Department of Agriculture (IDOA) during the preparation of the Supplement to ensure that state agency concerns and regulations were addressed in the analysis. The Supplement adds to the analysis and information in the 2009 EA and FONSI and all information and analyses in the 2009 EA remain valid unless otherwise noted below.

Wildlife damage management is the alleviation of damage or other problems caused by or related to the presence of wildlife, and is recognized as an integral part of wildlife management (The Wildlife Society 1992). The mission of Wildlife Services is to provide federal leadership in managing problems caused by wildlife. Congress established the primary authorities for the WS program in the Act of March 2, 1931, as amended (46 Stat. 1468; 7 U.S.C. 426-426b) and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c). The WS program responds to requests for assistance from individuals, organizations and agencies experiencing damage caused by wildlife.

The current MDM program is conducted in coordination with the IDNR, IDPH, and the IDOA. Wildlife Services typically provides assistance with problems involving mammal damage to crops and property, natural resources, general nuisance complaints, and threats to human health and safety, including risk of disease transmission. The program emphasizes the use of technical assistance (education/advice) supplemented by operational assistance with methods such as selective trapping and removal of nuisance animals. Technical assistance includes providing brochures, other written information, personal or telephone consultations, or workshops. Wildlife Services may also conduct

demonstrations, lend equipment such as frightening devices (when equipment is available), and provide information on animal husbandry. Resource owners are responsible for implementing most non-lethal methods. All WS wildlife damage management activities are in compliance with applicable state, federal and local laws and regulations including the Endangered Species Act (ESA) of 1973.

I. NEED FOR ACTION - DAMAGE AND CONFLICTS CAUSED BY FERAL SWINE

Feral swine are a non-native invasive species which can damage native habitats, crops, pastures and private property while foraging, compete with native wildlife for food, and prey on newborn livestock and native wildlife such as small mammals, ground-nesting birds, reptiles, amphibians, and white-tailed deer fawns (West et al. 2009). Feral swine are vectors of a number of diseases including pseudorabies (PRV), swine brucellosis (SB), porcine respiratory and reproductive syndrome (PRRS), and swine influenza virus (SIV) which may be passed to livestock, native wildlife, domestic animals, and in some cases, humans (Hutton et al. 2006). Some feral swine in Illinois have tested positive for exposure to pseudorabies and influenza virus. Nationwide, feral swine damage to agriculture and natural resources has been estimated at approximately $1.5 billion per year (Pimentel 2007). Details on the impacts of feral swine on agricultural resources and natural resources are provided in EA sections 1.2.2, and 1.2.4. The following information is provided to augment these sections in the EA.

Impacts on Human Health and Safety: Feral swine are known to carry numerous parasites and diseases which may be transmitted to humans including brucellosis, leptospirosis, salmonellosis, toxoplasmosis, bovine tuberculosis, influenza and *Escherichia coli* (West et al 2009, Hutton et al. 2006). Infection may result from direct exposure to swine (e.g., hunters handling carcasses), through contamination of food crops (California Food Emergency Response Team 2007), or through secondary infection of a third host (West et al. 2009). When diseases are transmitted through a third host, feral swine transmit the diseases to other wild mammals, birds, and reptiles, which in turn may transmit them to domestic livestock or humans. Although incidence of disease transmission from feral swine to humans is relatively uncommon, some diseases like brucellosis, tuberculosis and tularemia can be fatal. Feral swine also pose threats to motorists who may collide with the animals on public roadways.

Impacts on Property: Rooting by feral swine can cause damage to roadbeds, dikes and other earthen structures. Feral swine have broken through livestock and game fences to consume animal feed and mineral supplements. In some areas, foraging swine have damaged landscaping, golf courses and other ornamental plantings.

Impacts on Natural Resources: The EA discusses feral swine competition for natural resources with game and nongame species of native wildlife, predation on

native species and adverse impacts on wetlands (Section 1.2.4). In addition to the factors discussed in the EA, feral swine also cause problems for forest regeneration through consumption of hard mast (e.g., acorns and hickory nuts and uprooting and consumption of seedlings (Campbell and Long 2009, West et al. 2009). Areas disturbed by feral swine rooting are also vulnerable to colonization by non-native invasive plant species. Rooting also accelerates plant decomposition and loss of soil nutrients (Campbell and Long 2009).

Feral swine damage wetland and riparian areas. In Louisiana, feral swine have been implicated as the cause of elevated waterborne bacteria levels in streams, including levels which exceeded thresholds for the protection of human health (Kaller et al. 2007). Results from DNA fingerprinting indicated that feral swine were the primary source of the *E. coli* in the stream. Freshwater mussel and insects declined in stream reaches with swine activity. There are 10 species of mussel federally-listed as candidate, proposed or endangered in Illinois (USFWS 2011). Clubshell, rabbitsfoot, and snuffbox occur in small streams which could be impacted by feral swine. A table of all listed species potentially harmed by feral swine, and their scientific names, is provided in Table 2 and Appendix A.

In Illinois, feral swine may also be adversely impacting hunting of native species of wildlife and wildlife watching opportunities. Landowners report shifts in white-tailed deer movement patterns and disturbance of wild turkey roosting and feeding sites which have negatively impacted hunter success. Feral swine have also damaged wildlife food plots intended for native species.

The danger of transmitting disease to native wildlife, costly damage to the land, and negative impacts to wildlife from the further spread of feral swine in Illinois are considerable (Marc Miller, IDNR Director, Press Release, November 4, 2011) Feral swine pose a substantial threat to the Illinois domestic swine industry as the wild hogs are very mobile and can spread a variety of viral and bacterial diseases, as well as dozens of parasites that can affect domestic pigs and other livestock, wildlife, people and their pets (Jim Larkin, Acting Director IDOA, Press Release, November 4, 2011).

II. SUMMARY OF FERAL SWINE MANAGEMENT IN ILLINOIS

Illinois WS became involved in feral swine management in Fiscal Year (FY) 2009 in response to a request for assistance with swine damage to agriculture. To date, Illinois WS has provided assistance to 19 cooperators who have sought expertise in mitigating feral swine damage (Table 1). Technical assistance provided to landowners includes educational materials on identifying and reducing damage and reducing risk of disease transmission to domestic swine operations. Wildlife Services has assisted with the removal of feral swine for the reduction of damage to agricultural and natural resources, reduction of risks to human health and safety, and disease surveillance and management.

Table 1. Information on feral swine take, damage, and assistance from FY 2008 - FY 2011 (MIS 2011)

Year	Feral Swine Removed	Samples Submitted for Testing	Number of TA Encounters for F. Swine	Reported Damage[1]
FY 2008	0	0	0	$0
FY 2009	1	3	24[2]	$0
FY 2010	20	60	90	$0
FY 2011	22	83	4,647	$12,680

[1] *This column only contains damage reported to WS. Some times of damage, such as risks to human or livestock health and impacts on natural resources are difficult to assess and are usually not included.*
[2] *These encounters included persons contacted at exhibits, fairs, and other events.*

III. GOALS

The goals of this portion of the WS MDM program are to provide effective and efficient assistance with swine damage management and to help landowners/managers prevent the increase of feral swine populations in Illinois while minimizing the risk of adverse impact on the human environment from management actions. To meet these goals, WS is proposing to cooperate with multiple entities in implementing an integrated program to assist landowners/mangers in reducing threats to native wildlife, threats to agricultural resources, damage to the environment, and disease transmission risks associated with feral swine.

IV. AFFECTED ENVIRONMENT

This Supplement evaluates feral swine damage management by WS to protect: 1) property; 2) agricultural resources; 3) wildlife and other natural resources; and 4) public health and safety wherever such management is requested from the WS program on public and private property including, but not limited to, agricultural land, and natural areas such as wildlife refuges, wildlife management areas, and wetlands in Illinois.

V. LAWS AND REGULATIONS

Section 1.6 of the EA lists agency authorities and state and federal laws applicable to MDM in Illinois. The following additional regulations are relevant to feral swine management in Illinois.

Fish and Wildlife Act of 1956 (section 742j-1) Airborne Hunting**.** This Act, approved in 1971 was added to the Fish and Wildlife Act of 1956 and is commonly referred to as the Airborne Hunting Act or Shooting from Aircraft Act. The Act allows shooting animals from aircraft for certain reasons including protection of wildlife, livestock and human life under conditions in the Act. The USFWS is responsible for implementation of the Airborne Hunting Act but has delegated implementation of the Act to the states. If an alternative which includes aerial hunting is selected WS would obtain all necessary permits.

Federal Meat Inspection Act. The Federal Meat Inspection Act (FMIA) applies to all meat or products obtained from any cattle, sheep, swine, goat, horse, mule, or other equines intended for distribution in commerce. Animals falling under jurisdiction of the FMIA must be inspected pre- and post mortem. Animals that are killed before they reach a slaughter facility are classified as "adulterated meat", and cannot be used for human food per the FMIA. Feral swine fall under authority of the FMIA, and therefore could only be donated to charitable organizations for use as food by needy individuals if they are delivered alive to a USDA approved feral swine slaughter facility. Chapter 12, subchapter 1, section 623 of the FMIA provides an exemption for persons having animals of their own raising and game animals slaughtered for their own use without inspection. This provision allows landowners to utilize feral swine removed from their own property, with the understanding that meat derived from these feral swine will be consumed only by the farmer, his/her immediate family and/or nonpaying guests

Executive Order 13112 of February 3, 1999. This order directs federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm, or harm to human health. To comply with Executive Order 13112, WS may cooperate with other federal, state, or local government agencies, or with industry or private individuals to reduce damage to the environment or threats to human health and safety.

Illinois Swine Disease Control and Eradication Act and Regulations. Section 105.90 of the regulations requires that feral swine entering the state be accompanied by an entry permit and an official health certificate. In addition, the swine must be negative to an official test for brucellosis conducted within 30 days prior to entry and negative to an official test for pseudorabies conducted within 30 days prior to entry. After importation, a percentage of the swine must be tested and be negative to an official test for pseudorabies conducted not less than 21 or more than 60 days after entering Illinois.

V. MONITORING

The Illinois WS program monitors the implementation of the MDM program to help ensure the cumulative impacts of WS actions are consistent with analyses and conclusions in the EA. Wildlife Services' monitoring also determines if the analyses and determinations in the EA adequately address anticipated future program activities.

VI. PUBLIC INVOLVEMENT

The EA was available for public review and comment during a 30-day period (03/14/08 – 04/14/08), in accordance with Council on Environmental Quality (CEQ) and APHIS NEPA implementing regulations and WS public notification practices published in the federal register FR 72(54):13237-13238. Notices included a Legal Notice of Availability placed in The State Journal Register, posting on the WS NEPA web site, and notices of availability and/or copies of the EA mailed directly to individuals and organizations that WS knew

might have an interest in the EA. Notification regarding the 2009 Decision/FONSI and this Supplement were conducted using the same process. This Supplement will be available for public comment for 30 days from April 1, 2012 through May 7, 2012.

VII. MAJOR ISSUES

Several issues relevant to the analysis were identified during preparation of the EA. The issues are also relevant to the need to manage increased conflicts with feral swine in Illinois and will be used to guide review of the alternatives:

1. Effects on target mammal species
2. Effects on other wildlife species, including Threatened and Endangered species
3. Effects on human health and safety
4. Impacts to stakeholders, including aesthetics
5. Humaneness and animal welfare concerns of methods used
6. Effects on wetlands

VIII. ALTERNATIVES

The scope of this supplement is limited to review of methods for reducing damage and risks to human health and safety caused by feral swine. Alternative 1 is the No Action Alternative and would involve no change to the methods currently used by WS to reduce damage by feral swine. Alternatives 2 and 3 are modifications of the current program specific to feral swine.

<u>Alternative 1: Integrated Mammal Damage Management Program (No Action)</u>

The No Action Alternative, as defined here, is consistent with guidance from the CEQ (CEQ 1981). In this guidance, the No Action Alternative for situations where there is an ongoing management program may be interpreted as "no change" from current management direction or level of management intensity.

Under this Alternative, WS would continue the current integrated feral swine damage management program which uses technical and operational assistance to reduce feral swine damage in Illinois. Nonlethal methods which could be used or recommended include resource management and exclusion. Frightening devices do not appear to be effective with feral swine and there are no repellents or contraceptives currently registered for use in feral swine. Lethal methods include shooting, live-capture followed by euthanasia, snares, and “Judas pigs” (pigs live captured and fitted with radio transmitters used to identify groups of feral swine which are subsequently removed using the methods listed for this alternative). A maximum of 200 feral swine could be removed per year.

Licensed hunters are also encouraged to remove feral swine when they encounter them if they have landowner permission. Hunters are asked to report take to IDNR district

biologist or WS (1-866-4USDAWS). However, sport hunting is generally ineffective at reducing feral swine populations and hunting pressure can cause feral swine to alter movements and become more nocturnal, further reducing the chance of hunter success (West et al. 2009).

Wildlife Services usually gives preference to nonlethal methods where practical and effective (WS Directive 2.101). However, most nonlethal methods have limited efficacy in the management of feral swine (West et al. 2009). Although nonlethal methods can be used to protect limited areas such as individual farms, the feral swine are still free to damage natural resources. As noted above and in the EA, the adverse impacts of feral swine on natural resources are serious enough that allowing the swine to remain at large is undesirable. Consequently, in most situations WS recommendations will include a combination of nonlethal and lethal methods or exclusive use of lethal methods.

The FMIA permits donation of carcasses of feral swine to landowners for their own use, and WS will offer the swine removed to landowners. Wildlife Services will be unable to donate carcasses to charities for human consumption because the program will be unable to have animals inspected before they are killed. The FMIA requires that swine be inspected pre- and post mortem at an approved facility if they are to be used for human food. Currently, there are no USDA approved feral swine slaughter facilities in Illinois. Additionally, swine traps are often placed in difficult to access-locations which would make it logistically prohibitive to load and transport live animals. Swine not taken for human consumption may be buried on site, taken to a landfill or rendering facility for disposal or potentially to an approved IDOA facility for chemical digestion in accordance with the Illinois Dead Animal Disposal Act.

Alternative 2. Increase Annual Take of Feral Swine

Under this alternative, WS would use all the methods discussed in Alternative 1 and add aerial surveillance and pursuit with dogs followed by shooting as a method which could be used (West et al. 2009). Aerial surveillance would be conducted throughout the year by low level helicopter flight to determine the presence of feral hogs prior to initiating other control methods, but aerial sharpshooting would not occur under this alternative. Aerial surveillance would be conducted in accordance with the policies established in WS Directive 2.62 – Aviation Safety and Operations and the WS Aviation Safety and Operations manuals. Tracking dogs or trailing dogs are commonly used to track and “tree” or “hold” target wildlife species such as black bears, mountain lions, bobcats, raccoons, and feral swine. The dogs become familiar with the scent of the animal they are to track, and will strike (howl) when they smell them. Tracking dogs are trained to follow the scent of target species and to ignore non-target species scents. If the track of the target species is not too old, the dogs can follow the trail and temporarily surround or hold the feral hog at bay. The dogs stay with the animal until the WS employee arrives and dispatches, tranquilizes, or releases the animal, depending on the situation. A possibility exists that dogs will switch to a fresher trail of a non-target species while pursuing the target species. This sometimes occurs if the hounds being used are less experienced, but running less-experienced hounds with more-experienced hounds reduces the likelihood of this

occurrence. In addition, as soon as the WS employee realizes that the dogs have switched from a target species to a non-target species, the dogs are removed from the situation and the non-target animal is allowed to escape. Radio tracking collars will be used on trailing dogs to facilitate recovery and prevent dogs from getting lost. The use of dogs is expected to be infrequent and dogs may not be used at all in some years.

Maximum allowed annual take would increase to 2,000 feral swine per year. However, the use of traps, snares, and hunting from the ground to remove feral swine is time and labor intensive. Consequently, WS will probably be unable to remove 2,000 swine per year under current time and financial constraints.

Alternative 3. Intensive Feral Swine Management (Preferred Alternative)

Under this alternative WS would implement all the same methods used in Alternative 2, and would also add aerial surveillance and sharpshooting from helicopters to the list of methods which may be used. Aerial surveillance would be conducted throughout the year by low level helicopter flight to determining presence of feral hogs prior to initiating other control methods. Aerial sharpshooting would be conducted during the winter (approximately January through March) after leaves have fallen from trees. Wildlife Services would not conduct aerial sharpshooting on a property without the consent of the landowner/manager. All aerial activities would be conducted in accordance with the policies established in WS Directive 2.62 – Aviation Safety and Operations and the WS Aviation Safety and Operations manuals. Aerial sharpshooting has been identified as a viable tool for feral swine management in the U.S. (Campbell et al. 2010, West et al. 2009). Reported removal rates for aerial removal of feral swine range from 9-39 swine per hour (Campbell et al. 2010, Saunders and Bryant 1988, Hone 1983). Differences in swine density, climate, terrain and plant cover account for most of the variation in capture rates. Although aerial sharpshooting is an expensive method, WS' experience with feral swine removals indicates that the staff time, travel time and labor required to achieve similar results using ground-based methods will likely make aerial sharpshooting a cost-effective option. The comparatively high removal rates for aerial sharpshooting when compared to ground methods make it likely that the actual number of animals removed per year will be higher than for Alternative 2, although the maximum annual permitted take would be the same (2,000 animals) for each alternative.

IX. ENVIRONMENTAL IMPACTS

The following section provides a comparison of the anticipated environmental impacts resulting from each of the feral swine management alternatives.

EFFECTS ON TARGET SPECIES

Alternative 1: Integrated Mammal Damage Management Program (No Action)

The IDNR currently considers feral swine as an invasive species and does not track harvest or population densities of feral swine. However, the IDNR did fund a study that examined the distribution, habitat use, and morphotypes of feral swine in Illinois (McCann and Feldhammer 2002). McCann and Feldhammer (2002) found that feral swine were documented in 10 counties throughout Illinois. As of 2011, landowners in 26 counties (IDNR 2011) have reported the existence of feral swine on their property to Illinois WS and/or the IDNR. Biologists with WS and the IDNR are also receiving increased reports of feral swine sightings and activity. Feral swine are primarily found in the central and southern portions of the state (Appendix B).

Feral swine often have negative impacts on the environment. Therefore, these animals are considered by many wildlife biologists to be an undesirable component of North American wild and native ecosystems. Any reduction in feral swine populations could be considered a beneficial impact to the environment. Executive Order 13112 Invasive Species directs federal agencies to use their programs and authorities to prevent the spread of or to control populations of invasive species that cause economic or environmental harm, or harm to human health. To date, WS has only removed a maximum of 22 swine per year from Illinois (Table 1). These removals have been associated with disease surveillance and response to specific landowner requests for swine removal. They have not been intended to reduce the state feral swine population. Given the increase in counties where feral swine have been detected and increasing complaints regarding feral swine damage, the current level of removal has not adversely impacted the state feral swine population.

Alternative 2. Increase Annual Take of Feral Swine

Since the completion of the EA, Illinois WS has received increased requests for assistance with feral swine damage management, including damage to agriculture, damage to natural resources on private and public property, and threats of disease. Wildlife Services anticipates more requests for feral swine removal in future years. This alternative would increase the maximum number of swine which could be taken to 2,000 swine per year. As noted above, feral swine are a non-native invasive species which can cause substantial damage to agriculture and natural resources and pose a risk to human health, especially if the Illinois population continues to expand. For these reasons, the IDNR has requested WS assistance in removing feral swine from the state. Executive Order 13112 – Invasive Species directs federal agencies to use their programs and authorities to prevent the spread of or to control populations of invasive species that cause economic or environmental harm, or harm to human health.

Given the reproductive capacity of feral swine and the difficulty in removing swine from remote areas and areas with heavy vegetation, complete removal of all feral swine in the state will be difficult (West et al. 2009). The use of traps, snares and sharpshooting and shooting from the ground to remove feral swine is time and labor intensive. Consequently,

WS will probably be unable to remove 2,000 swine per year under current time and financial constraints. However, this alternative would be more likely to achieve Illinois WS goals than Alternative 1.

Alternative 3. Intensive Feral Swine Management (Preferred Alternative)

The maximum number of animals taken per year and associated impact on the swine population under this alternative is identical to Alternative 2. However, given the efficiency of aerial sharpshooting in removing swine, this alternative is likely to remove more swine with similar expenditures of fiscal resources than Alternative 2.

EFFECTS ON OTHER SPECIES, INCLUDING THREATENED AND ENDANGERED SPECIES

Alternative 1: Integrated Mammal Damage Management Program (No Action)

The EA concluded that the combined mammal damage management program, including feral swine removal, would not adversely impact non-target species populations. Wildlife Services did not take any non-target species, including T&E listed species, during the feral swine damage management activities conducted from FY 2009 through FY 2011. As noted in the EA and this supplement, feral swine adversely impact game and nongame species of native wildlife through predation, competition for resources, habitat damage, water contamination, and disease transmission (Table 2). Removal of feral swine will likely have beneficial impacts on native ecosystems. The conclusions in the EA regarding the impacts of feral swine removal on non-target species remain valid.

Table 2. State and federally listed threatened and endangered species which may be negatively impacted by feral hog activity in Illinois. (IDNR 2011).[1] Scientific names of species listed below are provided in Appendix A.

Allegheny Barberry	Eryngium Stem Borer	Prairie Rose Gentian
American Brooklime	Four-toed Salamander	Purple Wartyback
Arrowwood	Gravel Chub	Rice Rat
Barn Owl	Gray Bat	River Redhorse
Bewick's Wren	Gray/Timber Wolf	Royal Catchfly
Bigeye Chub	Greater Prairie Chicken	Shawnee Rocksnail
Bigeye Shiner	Greater Redhorse	Short-eared Owl
Black Rail	Heart-leaved Plantain	Slippershell
Black Tern	Indiana Bat	Snowberry
Black-crowned Night-heron	King Rail	Spike
Blanding's Turtle	Kirtland's Snake	Squirting Cucumber
Blazing Star	Lake Sturgeon	Timber Rattlesnake
Bloodleaf	Least Bittern	Upland Sandpiper
Bradley's Spleenwort	Little Spectaclecase	Upland Sandpiper
Buffalo Clover	Loggerhead Shrike	Western Sand Darter
Bunchflower	Narrow-leaved Green Milkweed	Wild Hyacinth

Common Moorhen	Northern Harrier	Willdenow's Sedge
Crested Coralroot Orchid	One-flowered Hydrea	Wolf's Bluegrass
Ear-leafed Foxglove	Ornate Box Turtle	Yellow Honeysuckle
Eastern Ribbon Snake	Osprey	Yellow-headed blackbirds
Eastern Sand Darter	Pale False Foxglove	Wild Blue Larkspur
Eastern Wood Rat		

[1] Table 2 provides a short representative list of species that may be negatively affected by feral swine, but is not considered exhaustive (J. Kath, IDNR Division of Natural Heritage, pers. comm.).

Alternative 2. Increase Annual Take of Feral Swine

Impact of this alternative would be similar to Alternative 1 except for the potential impacts from the use of dogs to hunt swine and aircraft for surveillance. Given the very low risk to non-target species from the methods described for Alternative 1, the increased use of the same methods under this alternative is not expected to result in a substantive increase in risk to non-target species. Increasing the number of feral swine which may be removed will also help reduce the adverse impacts of feral swine on native ecosystems.

Use of dogs is likely to be relatively infrequent. Wildlife Services would use specially trained tracking/trailing dogs to locate feral swine. The dogs are trained to only pursue the target species. Handlers with the dogs monitor the trail the animals are pursuing and will call back any dog that appears to be following the wrong species. Dogs are most likely to be used in areas with substantial vegetative cover which makes locating the swine difficult with other methods. The use of dogs will have negligible impact on non-target species because the dogs are not expected to cause the death of a non-target animal or substantively damage wildlife habitat. Dogs will not be used in areas near Least Terns, Piping Plovers and Whooping Cranes and are not expected to have any adverse impact on other federally-listed threatened and endangered species. Therefore, the proposed use of dogs should have no impact on federally-listed threatened and endangered species.

The only potential adverse impact on state-listed threatened or endangered species would be the risk of disturbance of ground-nesting birds (Short-eared Owls, Northern Harrier, and Greater Prairie Chicken). However, as noted above, the dogs are trained to focus on the target species and are only likely to pass briefly by these birds while in pursuit of swine. Given that WS use of dogs is likely to be infrequent, that WS is most likely to use dogs in area of dense vegetation which are not used by these species and the brief nature of any potential disturbance, we conclude that the proposed action will not adversely impact state-listed ground-nesting birds. The use of dogs is not expected to have any impact on state-listed threatened or endangered mammals, reptiles, amphibians, invertebrates, aquatic organisms and plants. Based on the above information, the proposed action is not expected to adversely affect non-target species. Removal of feral swine is likely to have beneficial impacts on non-target species including threatened and endangered species because it will reduce direct predation and habitat destruction by feral swine.

Under this alternative, WS would use helicopters to identify where feral swine exist There have been concerns that the use of aircraft might disturb other wildlife species populations to the point that their survival and reproduction might be adversely affected. White-tailed deer, wild turkey, and other wildlife may be seen during aerial surveillance. When used for surveillance, helicopters are likely to make a single pass through an area on a given day. The helicopters would not remain in one location for an extended period of time or make multiple repeated trips through and area.

A number of studies have looked at responses of various wildlife species to aircraft overflights. The National Park Service (1995) reviewed studies on the effects of aircraft overflights on wildlife. The report summarized a number of studies have documented responses by certain wildlife species that suggest adverse impacts might occur. Few, if any studies, have proven that aircraft overflights cause significant adverse impacts on populations, although the report stated it is possible to draw the conclusion that impacts to wildlife populations are occurring. It appears that some species will frequently or at least occasionally show adverse responses to even minor overflight occurrences. In general, it appears that the more serious potential impacts occur when overflights are frequent such as hourly and over long periods of time which represents "chronic exposure." Chronic exposure situations generally involve areas near commercial airports and military flight training facilities.

Several examples of wildlife species that have been studied with regard to low-level flights are available in the literature. Grubb et al. (2010) evaluated golden eagle response to civilian and military (Apache AH-64) helicopter flights in northern Utah. Study results indicated that golden eagles were not adversely affected when exposed to flights ranging from 100 to 800 meters along, towards and from behind occupied cliff nests. Eagle courtship, nesting and fledging were not adversely affected, indicating that no special management restrictions were required in the study location.

It was reported that low level overflights of 2-3 minutes in duration by a fixed-wing airplane and a helicopter produced no "drastic" disturbance of tree-nesting colonial waterbirds, and, in 90% of the observations, the individual birds either showed no reaction or merely looked up (Kushlan 1979). Conomy et al. (1998) quantified behavioral responses of wintering American black ducks (*Anas rubripes*), American wigeon (*A. americana*), gadwall (*A. strepera*), and American green-winged teal (*A. crecca carolinensis*) exposed to low-level flying military aircraft in North Carolina and found that only a small percentage (2%) of the birds reacted to the disturbance. They concluded that such disturbance was not adversely affecting the time-activity budgets of the species. Krausman et al. (1986) reported that only 3 of 70 observed responses of mule deer to small fixed-wing aircraft overflights at 150 to 500 feet above ground resulted in the deer changing habitats. These authors felt that the deer may have been accustomed to overflights because the study area was near an interstate highway which was followed frequently by aircraft.

Krausman et al. (1983) reported that, in 32 observations of the response of bighorn sheep to low-level flights by small fixed-wing aircraft, 60% resulted in no disturbance, 21% in

"slight" disturbance, and 19% in "great" disturbance. However, in this study, researchers made up to 10 passes directly above the surveyed animal which is a much higher level of impact than the limited flights that WS would make focusing on the swine. When Krausman et al. (1986) evaluated the effects of simulated low-altitude jet aircraft noise on desert mule deer (*Odocoileus hemionus crooki*) and mountain sheep (*Ovis canadensis mexicana*), they found that heart rates of the ungulates increased according to the dB levels, with lower noise levels prompting lesser increases. When they were elevated, heart rates rapidly returned to pre-disturbance levels suggesting that the animals did not perceive the noise as a threat. Responses to the simulated noise levels were found to decrease with increased exposure. Fancy (1982) reported that only 2 of 59 bison (*Bison bison*) groups showed any visible reaction to small fixed-wing aircraft flying at 200-500 feet above ground. The study indicated bison are relatively tolerant of aircraft overflights. Andersen et al. (1989) conducted low-level helicopter overflights directly at 35 red-tailed hawk (*Buteo jamaicensis*) nests and concluded their observations supported the hypothesis that red-tailed hawks habituate to low level flights during the nesting period. Their results also showed similar nesting success between hawks subjected to such overflights and those that were not. White and Thurow (1985) did not evaluate the effects of aircraft overflights, but showed that ferruginous hawks (*B. regalis*) are sensitive to certain types of ground-based human disturbance to the point that reproductive success may be adversely affected. However, military jets that flew low over the study area during training exercises did not appear to bother the hawks, and neither were they alarmed when the researchers flew within 100 feet in a small fixed-wing aircraft (White and Thurow 1985). White and Sherrod (1973) suggested that disturbance of raptors by aerial surveys with helicopters may be less than that caused by approaching nests on foot. Ellis (1981) reported that 5 species of hawks, 2 falcons, and golden eagles were "incredibly tolerant" of overflights by military fighter jets, and observed that, although birds frequently exhibited alarm, negative responses were brief and never limiting to productivity. Further reassuring, the considerable analyses of the Air National Guard (1997a, 1997b) show that, despite considerable research on numerous wildlife species, no scientific evidence exists that indicates any substantive adverse effects on wildlife populations will occur as a result of any of the types of low-level or other overflights that do or may occur.

Potential for Adverse Environmental Impacts from Aircraft Accidents

In other environmental analyses, WS has received questions about the potential for adverse environmental impacts resulting from an aircraft accident. Although risk of an aircraft accident is very low, accidents have occurred. The following information was collected to address this issue.

Aviation fuel is extremely volatile and will evaporate within a few hours or less to the point that even its odor cannot be detected. Thus, there should be no environmental hazard from unignited fuel spills. The quantities involved in WS aircraft accidents are small (10-30 gallons). In some cases, not all of the fuel is spilled.

Regarding oil and other fluid spills, the aircraft owner or his/her insurance company is responsible for cleanup of spilled oils and other fluids if required by the owner or manager

of the property on which the accident occurred. In the case of Bureau of Land Management, Forest Service, and National Park Service lands, the land managing agency generally requires that contaminated soil be removed and disposed of in accordance with state and federal regulations. In most accidents involving private property, the property owner is generally not concerned about the quantities of spilled oil involved in these types of accidents and has not requested or required clean-up. With the size of aircraft used by WS, the quantities of oil capable of being spilled in any accident are small and insignificant with respect to the potential for environmental damage from the 3-5 quarts of oil in turbine engines.

Petroleum products biodegrade through volatilization and bacterial action, particularly when exposed to oxygen (EPA 2000). Thus, small quantity oil spills on surface soils can be expected to biodegrade readily. Even in subsurface contamination situations involving underground storage facilities which would generally be expected to involve larger quantities than would ever be involved in a small aircraft accident, EPA guidelines provide for "natural attenuation" or volatilization and biodegradation in some situations to mitigate environmental hazards (EPA 2000). Thus, even where oil spills in small aircraft accidents are not cleaned up, the oil does not persist in the environment

For these reasons, the risk of ground fires or fuel/oil pollution from aviation accidents is considered to be low. Based on the history and experience of the program in aircraft accidents, it appears the risk of significant environmental damage from such accidents is exceedingly low.

Given the above information on aircraft use and risks to nontarget species, we conclude the proposed use of aircraft for surveillance will have no effect on federally-listed threatened and endangered species and will not adversely impact other native wildlife populations including state-listed threatened and endangered species.

In summary, the proposed increase in use of ground methods employed by the current feral swine management program, use of helicopters for feral swine surveillance, and the use of hunting dogs is not expected to adversely impact non-target species populations. This alternative is anticipated to have no effect on federally-listed threatned and endangered species and will not adversely impacts state populations of threatened or endangered species. The IDNR Division of Wildlife Resources has concurred with WS' determination regarding the impacts of the proposed action on state-listed species.

Alternative 3. Intensive Feral Swine Management (Preferred Alternative)

Impacts of Alternative 3 on non-target species will be identical to Alternative 2 for ground methods for managing damage by feral swine. This section focuses on the use of aerial sharpshooting.

Aerial sharpshooting would only be conducted on private and public lands where WS is requested to assist in feral swine removal and where permission from the landowners/ managers is attained prior to beginning work. Illinois WS would use aerial sharpshooting

to remove feral swine in accordance with applicable permits issued by state and/or federal agencies. Impacts of aerial sharpshooting are expected to be similar to potential impacts of aircraft use for surveillance. In areas with swine, aircraft would be in the area longer to remove feral swine than for surveillance but the time spent on any given property will be minimal and limited to several hours per year. Overall duration and frequency of flights in an area is not expected to be sufficient to constitute a "chronic" disturbance as discussed for Alternative 2. Wildlife Services would not conduct aerial sharpshooting in the vicinity of active Bald Eagle nests or eagle roosting and feeding congregations. Wildlife Services specialists must have a clear view of the animal before shooting, so the risk of shooting a non-target animal is negligible.

Given the above information on aerial sharpshooting and the analysis presented in Alternative 2, we conclude this alternative will have no effect on federally-listed threatened and endangered species and will not adversely impact other native wildlife populations including state-listed threatened and endangered species.

EFFECTS ON HUMAN HEALTH AND SAFETY

Alternative 1: Integrated Mammal Damage Management Program (No Action)

The EA concluded that risks to human health and safety from the proposed methods, including methods used for feral swine damage management would be low. In some situations where there is a risk of food contamination or disease transmission, removal of feral swine may have a beneficial impact on human health and safety. Wildlife Services' implementation of program activities in Illinois have not resulted in any significant adverse impacts to human health and safety. Program activities and methods and their potential impacts on human health and safety have not changed from those analyzed in the EA.

Alternative 2. Increase Annual Take of Feral Swine

All methods and their associated risks to human health and safety are identical to Alternative 1, except for the use of dogs to track/trail swine and aircraft for surveillance. Dogs would only be used in areas where WS has landowner permission to use the technique. The dogs are well trained and are not expected to pose a risk to human health and safety. Overall risks from ground methods proposed for this alternative would be low and similar to Alternative 1.

The low-level flights used for wildlife management including wildlife surveys like those conducted by the IDNR, county natural resource managers and village natural area managers are inherently higher risk than those for general aviation. Low-level flights introduce hazards such as power lines and trees, and the safety margin for error during maneuvers is diminished compared to high-level flights. Accidents have been associated with WS aerial operations and are a concern to WS. Some of WS's accidents have involved pilot error while others are directly related to mechanical failure. Wildlife Services developed the WS Aviation Training Center with the goal of reducing pilot error

accidents to zero. The WS Aviation Training Center provides safety training, individual instruction and aviation consultation to all aviation programs in WS. The center trains pilots to effectively respond to different types of mechanical failures and other safety concerns associated with low-level flight. Wildlife Services complies with all Federal Aviation Administration issued Service Bulletins, Airworthiness Directives, aircraft manufacturing recalls, and similar documents.

In 2007 and 2008, WS conducted a programmatic safety review to assess and improve employee safety (USDA 2008). The review covered nine WS program areas including the aviation program. The review of the aviation program was conducted by the Interagency Committee on Aviation Safety. The review team concluded that the WS aviation program is being operated in a safe, efficient and effective manner and that the program met the Interagency Committee on Aviation Safety requirements for the Gold Standard Certificate for Excellence. At this time, the WS program is the only USDA aviation program to be awarded this certification. Wildlife Services' program pilots and contractors are highly skilled with commercial pilot ratings and have passed proficiency tests in the flight environment encountered by WS. Wildlife Services' pilots are trained in hazard recognition and surveillance flights would only be conducted in safe environments. Federal aviation regulations require pilots to fly a minimum distance of 500 feet from structures and people, and all employees involved in these operations are mindful of this. Although the goal of the aviation program is to have no accidents, accidents may still occur. However, the protective measures implemented by WS keep the risk of aircraft accidents and injuries to the public and aircraft crew low.

Based on the above information, this alternative would have a low level of risk to human health and safety. The proposed increase in feral swine take would improve WS' ability to provide effective assistance in situations where feral swine pose a risk to human health and safety.

Alternative 3. Intensive Feral Swine Management (Preferred Alternative)

Impacts of this alternative on human health and safety would be identical to Alternative 2 except for the addition of aerial sharpshooting as a method. Wildlife Services' safety measures and training for aerial sharpshooting are the same as those for aircraft used in surveillance with the addition that the individuals conducting the shooting also have specialized training in the safe and effective use of sharpshooting from aircraft. Wildlife Services employees must have a clear view of the animal before shooting, so there is no risk of accidentally shooting a person. Overall risks to human health and safety are slightly higher to the flight crews than described for Alternative 2 because of the increased intensity and duration of the action but are still very low.

IMPACTS TO STAKEHOLDERS, INCLUDING AESTHETICS

Alternative 1: Integrated Mammal Damage Management Program (No Action)

Feral swine can cause substantial damage to native animals and ecosystems. They are generally secretive, largely nocturnal and avoid human activity which limits viewing opportunities. Consequently, those who routinely view or feed wildlife would not likely be disturbed by removal of feral swine under the current program. The primary aesthetic/recreational benefit from feral swine is to the individuals who enjoy the opportunity to hunt feral swine. Other hunters may be glad to have the swine removed because of their adverse impacts on native species and reports of adverse impacts on hunting opportunities noted in Section I. The IDNR is encouraging hunters to remove feral swine when they are pursuing other game and have landowner permission, and to report the take and locations to the IDNR or WS.

Alternative 2. Increase Annual Take of Feral Swine

Under this alternative, WS would work with landowners/managers and state and Federal agencies to achieve their goal of eliminating feral swine from their property. As with Alternative 1, swine removal by hunters would still be an important component of the overall swine removal effort. The elimination of feral swine from a majority of Illinois, if achieved, would eliminate hunting opportunities for those who enjoy hunting feral swine. However, given that swine are a non-native species with the potential for negative impacts on well-established hunting seasons and traditions involving native species, and that hunting swine is a recent development in the state, this alternative will not have a significant adverse impact on total opportunities for hunting in Illinois.

Some individuals may feel that their aesthetic enjoyment of an area would be adversely impacted by the sound of dogs used for hunting swine. Dogs will only be used in areas where WS has permission from the landowner/manager to use the technique. Wildlife Services does not expect to use the dogs frequently and use of dogs is not expected to occur over a period of several days in the same location. Furthermore, WS use of dogs to aide in the removal of feral swine would not affect the public any differently than hunter's use of dogs to pursue raccoons and coyotes. Use of dogs for hunting is currently legal in Illinois. Therefore, the impact of using dogs on individual enjoyment of sites is expected to be minimal.

Aircraft would be infrequently used at individual sites and would likely only consist of single pass of an aircraft over a location. Surveys would usually be conducted on weekdays within standard working hours which would also minimize the potential for adverse impacts on aesthetic enjoyment of properties. Overall impacts of this alternative on aesthetic enjoyment of sites would be low.

Alternative 3. Intensive Feral Swine Management (Preferred Alternative)

Impacts of this alternative are identical to Alternative 2 with the exception that WS may use helicopters to locate and remove feral swine. Wildlife Services may also be more likely to help landowners and state and Federal land managers achieve their goal of removing feral swine under this alternative.

Aircraft would only be used in properties where WS has landowner/manager permission. Aircraft would be infrequently used at individual sites. Sharpshooting from aircraft would usually be conducted on weekdays within standard working hours which would also minimize the potential for adverse impacts on aesthetic enjoyment of nearby properties. Given the above information, aesthetic impacts associated with the use of aircraft to remove swine are likely to be minimal.

HUMANENESS AND ANIMAL WELFARE CONCERNS OF METHODS USED

Alternative 1: Integrated Mammal Damage Management Program (No Action)

Some individuals will view the use of any lethal MDM method, or the use of specific method such as snares as inhumane. Individual perceptions regarding the humaneness of MDM methods were addressed in the EA. This alternative is a continuation of the program established in the EA. The EA's analysis of this issue remains valid.

Alternative 2. Increase Annual Take of Feral Swine

As noted in the EA, perceptions of humaneness vary depending on individual perspectives, experiences, and philosophies. Some individuals would consider the pursuit of wildlife with dogs inhumane to the wildlife chased and the dogs which may be harmed by the animals they are pursuing. Some people may consider the use of lethal methods, especially those which do not result in a fast and stress-free death to be a disproportionate response to the conflict. Others consider the careful and responsible use of well-trained hunting dogs to be a positive hunting experience. IDNR Administrative Code does allow hunters to pursue some species such as raccoons and coyotes with dogs. Conversely, there are also people who consider the removal of a non-native species with high reproductive capacity and the potential to have significant adverse impacts on game and nongame species of wildlife and natural ecosystems to be an ethical imperative which justifies the use of lethal methods.

Use of aircraft for feral swine surveillance is unlikely to be perceived as inhumane to the swine. This method of locating wildlife is commonly used by state, federal and local wildlife managers to assess various wildlife populations including breeding waterfowl and white-tailed deer.

Wildlife Services personnel are experienced, professional and humane in their use of management methods. Under each of the alternatives, feral swine would be killed by

experienced WS personnel using the best and most appropriate method(s) available. Wildlife Services is aware of the varying perceptions regarding the use of MDM methods and includes this information when developing site specific management plans using the WS Decision Model (Slate et al. 1992).

Alternative 3. Intensive Feral Swine Management (Preferred Alternative)

This alternative would add aerial sharpshooting to the methods which could be used under Alternative 2. As with hunting with dogs, some individuals will perceive sharpshooting from aircraft to be inhumane. The time from initial contact to death of the animal is usually shorter with aerial sharpshooting than with dogs, or capture in snares or live traps. However the relative impact of the experience on the animal in terms of stress and distress after initial contact likely varies among the methods. Aerial sharpshooting is 100% selective for feral swine and would pose lower risks to non-target species than snares.

Aerial sharpshooting is also likely to be the most efficient means of removing feral swine. Individuals who consider the removal of feral swine for the protection of native ecosystems to be an ethical imperative may feel that the use of the most efficient method of removing swine is justified in this circumstance.

As noted above, WS personnel are experienced, professional and humane in their use of management methods. Under each of the alternatives, feral swine would be killed by experienced WS personnel using the best and most appropriate method(s) available. Wildlife Services is aware of the varying perceptions regarding the use of MDM methods and includes this information when developing site specific management plans using the WS Decision Model (Slate et al. 1992).

EFFECTS ON WETLANDS

Alternative 1: Integrated Mammal Damage Management Program (No Action)

Feral swine removal will not have any adverse impacts on wetlands. However, as noted above, feral swine can cause substantial damage to wetland and riparian areas through rooting and water contamination. They are known to carry numerous diseases, such as leptospirosis, salmonellosis, and toxoplasmosis, and their rooting/feeding can degrade soil and water resources, lead to soil erosion, and destruction of natural areas and native species (West et al. 2009). Removal of feral swine would have beneficial impacts on wetland ecosystems.

Alternative 2. Increase Annual Take of Feral Swine

The increase in annual take of feral swine, the use of aircraft for swine surveillance, and the use of dogs to removal feral swine is not expected to have an adverse impact on wetlands. However the increase in the number of swine which may be taken and the use of

dogs is expected to improve WS' ability to reduce damage by feral swine, including damage to wetlands.

Alternative 3. Intensive Feral Swine Management (Preferred Alternative)

Use of aircraft is not expected to have adverse impacts on wetlands. Wildlife Services would use shotguns when sharpshooting swine from aircraft. Feral swine are often found in wetland, near ponds and in riparian areas, and the possibility exists that some shot could get into water in these areas. Lead shot in riparian areas can be consumed by and kill foraging waterfowl. Therefore, WS will use non-toxic shot instead of lead shot when conducting aerial sharpshooting in wetland areas. Additionally, similar to the affects evaluated with Alternative 2, the use of dogs is not expected to have an adverse impact on wetlands.

The increase in the number of swine which may be taken is expected to improve WS' ability to reduce feral swine damage, including damage to wetlands.

X. SUMMARY OF CUMULATIVE IMPACTS

No significant cumulative environmental impacts have resulted from implementation of the MDM program. Based on analysis in this supplement, future implementation of any of the feral swine management alternatives is not expected to have cumulative adverse impacts on the human environment. Wildlife Service's impacts on non-native feral swine are consistent with IDNR management objectives for the species and Executive Order 13112. Risks to non-target species from the proposed methods are very low and unlikely to contribute to existing impacts on non-target species populations. However, removal of feral swine will have beneficial impacts on native animals and ecosystems. Risks to public safety are very low. Alternatives 2 and 3 would impact feral swine hunting opportunities in the state, but would likely have beneficial impacts on hunting opportunities for native species of wildlife. Given that feral swine hunting is a recent development in the state and that many landowners/managers and state and Federal agencies want the animals removed from their premises, impacts of the proposed WS program are likely similar to those that would occur in the absence of WS involvement. Aesthetic impacts are expected to be low with the potential for positive impacts in natural areas which have been adversely impacted by feral swine. Feral swine damage management activities are anticipated to be beneficial to wetlands. Alternative 2 and 3 increase WS' capacity to address conflicts with feral swine, but Alternative 3 provides the greatest opportunity for assisting the landowners/managers and state and Federal agencies in achieving their feral swine management goals.

XII. LITERATURE CITED

Air National Guard. 1997a Air National Guard (ANG). 1997a. Final Environmental Impact Statement for the Colorado Airspace Initiative. Air National Guard, National Guard Bureau; 3500 Fletchet Avenue, Andrews AFB, MD 20762-5157. Vol. I, Vol. II.

Air National Guard. 1997b. Final Biological Assessment for the Colorado Airspace Initiative with emphasis on the American Peregrine Falcon; Air National Guard Readiness Center, Environmental Planning Branch; 3500 Fetchet Avenue; Andrews AFB, MD 20762-5157. 83 pp.

Andersen, D. E., O. J. Rongstad and W. R. Mytton. 1989. Response of nesting red-tailed hawks to helicopter overflights. Condor 91:296-299.

California Food Emergency Response Team. 2007. Investigation of an *Escherichia coli* O157:H7 outbreak associated with Dole pre-packaged spinach. California Department of Health Services, Food and Drug Branch, Sacramento, CA.

Campbell, T. A. and D. B. Long. 2009. Feral swine damage and damage management in forested ecosystems. Forest Ecology and Management 257:2319-2326.

Campbell, T. A., D. B. Long and B. R. Leland. 2010. Feral swine behavior relative to aerial gunning in southern Texas. Journal of Wildlife Management 74:337-341.

CEQ (Council for Environmental Quality). 1981. Forty most asked questions concerning CEQ's National Environmental Policy Act regulations. (40 CFR 1500-1508) Fed. Reg. 46:18026-18038.

Conomy, J. T., J. A. Collazo, J. A. Dubovsky, W. J. Fleming. 1998. Dabbling duck behavior and aircraft activity in coastal North Carolina. J. Wildl. Manage. 62(3):1127-1134.

Ellis, D. H. 1981. Responses of raptorial birds to low-level jet aircraft and sonic booms. Results of the 1980-81 joint U.S. Air Force-U.S. Fish and Wildl. Serv. Study. Institute for Raptor Studies, Oracle, AZ. 59 pp.

Environmental Protection Agency (EPA). 2000. How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites: A Guide for Corrective Action Plan Reviewers. Publication obtained online at http://www.epa.gov/cgi-bin/claritgw.

Fancy, S. G. 1982. Reaction of bison to aerial surveys in interior Alaska. Canadian Field Naturalist 96:91.

Grubb, T. G., Delaney, D. K., Bowerman, W. W. And Wierda, M. R. (2010), Golden Eagle Indifference to Heli-Skiing and Military Helicopters in Northern Utah. J. Wildl.Manage.74:1275–1285.

Hone, J. 1983. A short-term evaluation of feral pig eradication at Willandra in Western New South Wales. Australian Wildlife Research 10:269-275.

Hutton, T., T. DeLiberto, S. Owen, and B. Morrison. 2006. Disease Risks Associated with Increasing Feral Swine numbers and Distribution. Midwest Assoc. Fish & Wildl. Agencies, Wildl. & Fish Committee. 15 pp.

Illinois Department of Natural Resources, 2011. Natural Heritage Database. Springfield.

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

Krausman, P. R., and J. J. Hervert. 1983. Mountain sheep responses to aerial surveys. Wildl. Soc. Bull. 11:372-375.

Krausman, P. R., B. D. Leopold, and D. L. Scarbrough. 1986. Desert mule deer response to aircraft. Wildl. Soc. Bull. 14:68-70.

Kushlan, J.A. 1979. Effects of helicopter censuses on wading bird colonies. J. Wildl. Manage. 43:756-760Management Information Systems (MIS). 2011. Electronic Database. Illinois WS State Office. USDA/APHIS/WS, 2869 Via Verde Dr. Springfield, IL 62703.

McCann, B., Davie, D. K. , Feldhammer, G. A. 2002. Distribution, habitat use, and morphotypes of feral hogs (*Sus scrofa*) in Illinois. Illinois Department of Natural Resources Research Report. Contract Number: RES2001.

National Park Service. 1995. Report of effects of aircraft overflights on the National Park System. USDI-NPS D-1062, July, 1995.

Pimentel, D. 2007. Environmental and economic costs of vertebrate species invasions into the United States. Pages 2-8 in G. W. Witmer, W. C. Pitt, and K. A. Fagerstone, eds. Managing vertebrate invasive species: Proceedings of an international symposium. USDA, APHIS, WS National Wildlife Research Center, Ft. Collins, CO.

Saunders, G. and H. Bryant. 1988. The evaluation of a feral pig eradication program during a simulated exotic disease outbreak. Australian Wil. Research 15:73-81.

Schmidt, R.H. and M.W. Brunson. 1995. Assessing Public Attitudes toward Animal Damage Control Management Policies: Initial Findings. Utah State University. Logan, UT.

Slate, D. A., R. Owens, G. Connolly and G. Simmons. 1992. Decision making for wildlife damage management. Trans. North Am. Wildl. Nat. Res. Conf. 57:51-62.

The Wildlife Society. 1992. Conservation policies of The Wildlife Society. The Wildlife Society, Bethesda, Md. 24pp.

USDA (U.S. Department of Agriculture). 1997 (revised). Final Environmental Impact Statement – Animal Damage Control Program. USDA, Animal and Plant Health Inspection Service, Wildlife Services, Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737.

USDA (U.S. Department of Agriculture). 2005. Final Environmental Assessment (EA): Predator Damage Management in Colorado. USDA APHIS-WS, Denver, CO. http://www.aphis.usda.gov/regulations/ws/ws_environmental_colorado.shtml.

USDA (U.S. Department of Agriculture). 2008. Wildlife Services Program Safety Review. USDA, Animal and Plant Health Inspection Service, Wildlife Services, Washington, D.C. http://www.aphis.usda.gov/wildlife_damage/nwrc/Safety_Review/content/WS_Safety_Review08.pdf.

USDA (U.S. Department of Agriculture). 2009. Environmental Assessment (EA) Mammal Damage Management in Illinois. State Director, USDA/APHIS/WS, 2869 Via Verde Dr. Springfield, IL 62703. http://www.aphis.usda.gov/regulations/ws/ws_environmental_illinois.shtml

USFWS (U.S. Department of the Interior, Fish and Wildlife Service). 2011. Illinois Endangered, Threatened and Candidate Species. USFWS, Region 3. Updated March 9, 2011. http://www.fws.gov/midwest/Endangered/lists/state-il.html.

USFWS (U.S. Department of the Interior, Fish and Wildlife Service). 2011. Illinois Endangered, Threatened and Candidate Species. USFWS, Region 3. Updated March 9, 2011. http://www.fws.gov/midwest/Endangered/lists/state-il.html.

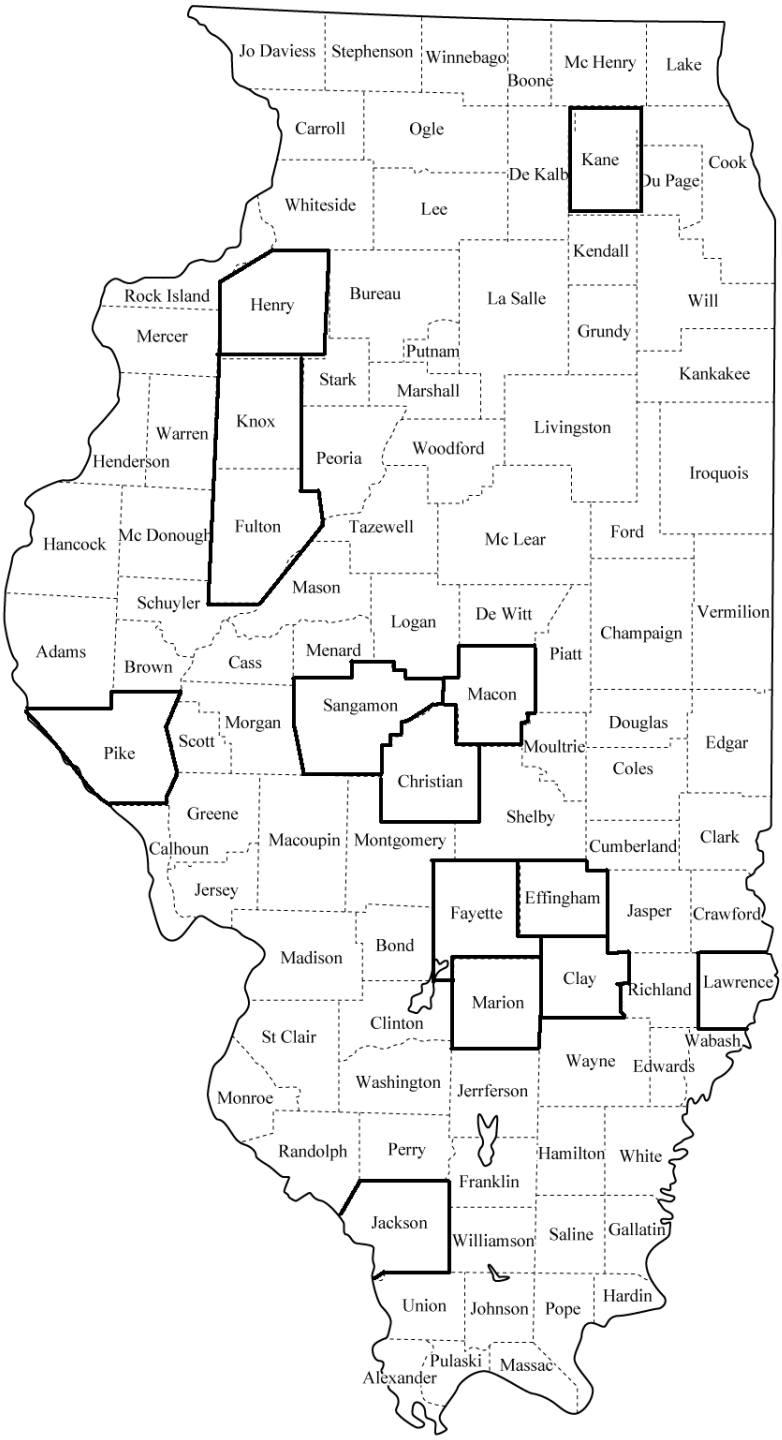
West, B. C., A. L. Cooper, and J. B. Armstrong. 2009. Managing wild pigs: A technical guide. Human-Wildlife Interactions Monograph 1:1-55.

White, C. M. and S. K. Sherrod. 1973. Advantages and disadvantages of the use of rotor-winged aircraft in raptor surveys. Raptor Research 7:97-104.

White, C. M. and T. L. Thurow. 1985. Reproduction of ferruginous hawks exposed to controlled disturbance. Condor 87:14-22.

Appendix A. Scientific Names of Listed Species Potentially Harmed by Feral Swine.

Common Name	Scientific Name
Allegheny Barberry	*Berberis canadensis*
American Brooklime	*Veronica Americana*
Arrowwood	*Viburnum molle*
Barn Owl	*Tyto alba*
Bewick's Wren	*Thryomanes bewickii*
Bigeye Chub	*Hybopsis amblops*
Bigeye Shiner	*Notropis boops*
Black Rail	*Laterallus jamaicensis*
Black Tern	*Chlidonias niger*
Black-crowned Night-heron	*Nycticorax nycticorax*
Blanding's Turtle	*Emydoidea blandiungii*
Blazing Star	*Liatris scarikosa var. nieuwlandii*
Bloodleaf	*Iresine rhizomatosa*
Bradley's Spleenwort	*Asplenium bradleyi*
Buffalo Clover	*Trifolium reflexum*
Bunchflower	*Melanthium virginicum*
Common Moorhen	*Gallinula chloropus*
Crested Coralroot Orchid	*Hexalectris spicata*
Ear-leafed Foxglove	*Thamnophis sauritus*
Eastern Ribbon Snake	*Thamnophis sauritus*
Eastern Sand Darter	*Ammocrypta pellucidum*
Eastern Wood Rat	*Neotoma floridana*
Eryngium Stem Borer	*Papaipema eryngii*
Four-toed Salamander	*Hemidactylium scutatum*
Gravel Chub	*Erimystax x-punctatus*
Gray Bat	*Myotis grisescens*
Gray/Timber Wolf	*Canis lupus*
Greater Prairie Chicken	*Tympanuchus cupido*
Greater Redhorse	*Moxostoma valenciennesi*
Heart-leaved Plantain	*Plantago cordata*
Indiana Bat	*Myotis sodalist*
King Rail	*Rallus elegans*
Kirtland's Snake	*Clonophis kirtlandi*
Lake Sturgeon	*Acipenser fulvescens*
Least Bittern	*Ixobrychus exilis*
Little Spectaclecase	*Villosa lienosa*
Loggerhead Shrike	*Lanius ludovicianus*
Narrow-leaved Green Milkweed	*Asclepias stenophylla*
Northern Harrier	*Circus cyaneus*
One-flowered Hydrolea	*Hydroleauniflora*
Ornate Box Turtle	*Terrepene ornate*
Osprey	*Pandion haliaetus*
Pale False Foxglove	*Agalinus skinneriana*
Prairie Rose Gentian	*Sabatia australis*
Purple Wartyback	*Cyclonaias tuberculata*
Rice Rat	*Oryzomys palustris*

River Redhorse	*Moxostoma carinatum*
Royal Catchfly	*Silene regia*
Shawnee Rocksnail	*Lithasia obovata*
Short-eared Owl	*Asio flammeus*
Slippershell	*Alasmidonta viridis*
Snowberry	*Symphoricarpos albus var. albus*
Spike	*Elliptio dilatata*
Squirting Cucumber	*Melothria pendula*
Timber Rattlesnake	*Crotalus horridus*
Upland Sandpiper	*Bartramia longicauda*
Western Sand Darter	*Ammocrypta clarum*
Wild Hyacinth	*Camassia angusta*
Willdenow's Sedge	*Carex willdenowii*
Wolf's Bluegrass	*Poa wolfii*
Yellow Honeysuckle	*Lonicera flava*
Yellow-headed blackbirds	*Xanthocephalus xanthos cephalus*
Wild Blue Larkspur	*Delphinium carolinianum*

Appendix B. Map of Counties Where Feral Swine have been Identified