SUPPLEMENT TO THE ENVIRONMENTAL ASSESSMENT:

REDUCING MAMMAL DAMAGE IN MISSOURI

March 2013

I. INTRODUCTION

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program completed an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) on alternatives for the protection of agricultural resources, natural resources, property, livestock, and public health and safety from damage and risks associated with mammals in Missouri in November 2006. The EA evaluated the need for WS activities, the relative effectiveness of four alternatives to meet the proposed need, and the potential environmental effects of each alternative. The management alternative selected was, "*Alternative 2 - Integrated Mammal Damage Management Program (Proposed Action/No Action)*" in which WS uses and recommends practical and effective nonlethal and lethal methods to alleviate mammal damage to agricultural and natural resources, property, and human health and safety. This report has been prepared to update information in the EA, review data on the program implemented since the completion of the EA, consider impacts of adding new methods for mammal damage management (MDM), and to provide the public the opportunity to review and comment on WS' MDM activities.

Wildlife Services is the Federal program authorized by law to aid agencies, organizations and individuals in reducing damage caused by wildlife (Act of March 2, 1931 [46 Stat. 1468; 7 U.S.C. 426-426b] as amended, and the Act of December 22, 1987 [101 Stat. 1329-331, 7 U.S.C. 426c]). 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). Wildlife Services uses an Integrated Wildlife Damage Management (IWDM) approach, commonly known as Integrated Pest Management (WS Directive 2.105) in which a combination of methods may be used or recommended concurrently or sequentially to reduce damage. Wildlife Services damage management actions are not based on punishing offending animals, but are one component of strategies to reduce damage developed in accordance with the WS Decision Model (Slate et al. 1992, WS Directive 2.201). All WS wildlife damage management activities are in compliance with applicable state, federal and local laws and regulations. This analysis is in addition to that in the 2006 EA and FONSI and all information and analyses in the 2006 EA remain valid unless otherwise updated below.

II. SUMMARY OF WILDLIFE SERVICES' MAMMAL DAMAGE MANAGEMENT ACTIVITIES

The scope of action and the need for WS assistance remain as described in the EA. Table 1 summarizes requests for technical assistance (advice) with mammal damage management received by the Missouri WS program. The table only lists requests received by WS and is not a comprehensive review of all damage by and conflicts with mammals in Missouri. Requests for information and assistance with wildlife damage management are also received and addressed by the MDC, USDA Agricultural Extension Service Offices, universities, private organizations and nuisance wildlife control operators. The following are examples of the types of MDM activities that have been conducted by WS since the completion of the EA.

- Wildlife Services coordinated with Veterinary Services, the Missouri Department of Agriculture (MDA), and the Missouri Department of Conservation (MDC) on the depopulation of a wildlife ranch in response to the detection of Chronic Wasting Disease (CWD). The MDA and MDC prefers to have WS' assistance because WS personnel are trained in the use of firearms and can target the animals in a safe, humane and professional manner. The ranch had a total of 11 captive cervids test positive for CWD which required 3,800 acres to be depopulated of white-tailed deer, red deer, and axis deer. Chronic Wasting Disease was found in 5 free-ranging deer outside the ranch property, which MDC is addressing with additional sampling and regulations changes. Wildlife Services removed 128 animals from the high-fenced facility.

- Mammals can venture onto airfields and become a direct threat to planes that are landing and taking off. Nationwide, 3,038 bat and terrestrial mammal strikes to civil aircraft were reported to the Federal Aviation Administration (FAA) during the period of 1990-2010 (Dolbeer et al. 2012). Aircraft damage was reported for 955 (31%) of the strikes and 628 (21%) strikes were reported to have a negative impact on flight (e.g., aborted takeoff, precautionary landing, engine shut down, etc.). Economic losses associated with the strikes cost approximately $44,320,306 and 275,394 hours of aircraft down time. Sixty two of the mammal strikes reported from 1990-2010 occurred in Missouri with 12 strikes resulting in substantial damage to the aircraft and two aircraft were destroyed (S. Wright, WS Airport Wildlife Hazards Program, pers. comm.). Costs associated with these strikes totaled $1,170,836 and there was approximately 19,000 hours of aircraft out of service time. Missouri WS advised airport managers on ways to exclude mammals from airports and, if needed, used nonlethal methods, and trapping and shooting on airport property and adjacent lands to reduce the occurrence of mammals on the airfield.

- Wildlife Services collected blood samples from captured feral swine to sample for swine brucellosis, pseudorabies, classical swine fever, swine influenza, tularemia, parasites and other diseases. From FY 07 through FY 11 over 3,100 individual samples were collected from feral swine in Missouri. In addition, Wildlife Services participated in the 10 member Feral Hog Task Force created in 2007 by the Governor. The Missouri Department of Conservation and the Missouri Department of Agriculture were appointed as co-chairs, and eight other members represent a variety of public and private groups in the state who all express concern about feral swine. Coordination with landowners by this group is key to eradication of feral swine in the state.

- Wildlife Services provided technical assistance on methods landowners and managers can use to reduce or prevent mammal damage and risks to human safety. From Fiscal Year (FY)[1] 2007-2011 the WS program conducted 321 technical assistance projects involving 755 people concerning MDM in Missouri. Technical assistance included personal consultations, written or telephone consultations, instructional sessions, exhibits, and site visits.

1 The federal Fiscal Year runs from 1 October to 30 September.

Table 1. Requests for technical assistance with damage management and risks to human health and safety from mammals in Missouri from October 1, 2006 – September 31, 2011.

Species	Agriculture	Health And Safety	Natural Resource	Property	Grand Total
Armadillos, nine-banded				3	3
Bats		1		1	2
Bears, black				1	1
Bobcats	1				1
Cats, feral/free ranging				1	1
Coyotes	3	3		40	46
Deer, white-tailed (wild)	1	23		13	37
Dogs, feral, free-ranging and hybrids	2				2
Foxes, red	1	2		2	6
Swine, feral	145	29	49	34	258
Woodchucks	1			5	6
Opossums, virginia		1		1	2
Otters, river	1				1
Rabbits, cottontail				3	3
Raccoons		3		6	9
Skunks, striped		4		4	8
Squirrels, eastern gray, fox				7	7
Squirrels, ground				1	1
Voles	2			2	4
Grand Total	**157**	**66**	**49**	**123**	**397**

III. PUBLIC INVOLVEMENT

As required by the Council in Environmental Quality (CEQ) and APHIS NEPA implementing regulations, an announcement of the availability of the pre-decisional EA for public review and comment was made through "Notices of Availability" (NOA) published in the two major newspapers in Missouri and through direct mailings to parties that have specifically requested to be notified. Twenty-six (26) letters were mailed to organizations, individuals, and public agencies announcing that the EA was available. Three copies of the pre-decisional EA were mailed to interested parties for comment. Wildlife Services received one request for a copy of the EA for review. Wildlife Services did not receive any comments on the EA during the 35 day public comment period or during the interval between the end of the comment period and the selection of a management alternative. The Decision and FONSI were made available to the public using the same methods as for the pre-decisional EA.

The original EA and Decision/FONSI, and this Supplement are being made available for public review and comment through a legal notice of availability in the Jefferson City News Tribune, posting on the WS web site (http://www.aphis.usda.gov/wildlife_damage/nepa.shtml) and by direct mailing to agencies, organizations, and individuals with probable interest in the program. Issues and alternatives identified in the public comments will be fully considered to determine whether the EA and Supplement should be revisited and, if appropriate, revised. Public notification procedures are in compliance with WS' NEPA implementation procedures published in the Federal Register March 21, 2007 (Vol. 72, No. 54: 13237-13238).

IV. AFFECTED ENVIRONMENT

The proposed action could include areas in and around commercial, industrial, public, and private buildings, facilities and properties and at other sites where mammals burrow, feed, or otherwise occur. Examples of areas where MDM activities could be conducted include, but are not necessarily limited to: agricultural fields, orchards, farmyards, dairies, ranches, livestock operations, waste handling facilities, industrial sites, natural areas, government properties and facilities, private homes and properties, corporate properties, schools, hospitals, parks and recreation areas, swimming lakes, communally-owned homeowner/property owner association properties, natural areas, wildlife refuges, wildlife management areas, ponds, rivers, and inlets, airports and surrounding areas.

V. RELATED ENVIRNOMENTAL DOCUMENTS

ADC Programmatic Environmental Impact Statement (USDA 1997 Revised). Wildlife Services has determined that review of alternatives for managing mammal damage in Missouri is best addressed at the State level in an EA. Wildlife Services' decision and actions regarding MDM in Missouri rely solely and exclusively on the decision document and record on this EA. The 2006 EA on MDM in Missouri incorporated by reference, sections, discussions, appendices, or other portions thereof, of WS programmatic Environmental Impact Statement (EIS). This Supplemental EA does not incorporate by reference USDA 1997 Revised.

Management of Aquatic Rodent Damage in Missouri. In, 2005, the WS program issued a Finding of No Significant Impact and a Final Environmental Assessment entitled, "Management of Aquatic Rodent Damage in Missouri " (USDA 2005). The EA analyzed the potential environmental impacts of alternatives for managing damage caused by beaver, nutria and muskrats in Missouri. Management of damage by these species is not included in the scope of this EA on management of mammal damage in Missouri. A Supplement and associated FONSI to the aquatic rodent damage management EA was issued in 2011 (USDA 2011). Consequently, WS' activities to address aquatic rodent damage are not included in the 2006 EA on mammal damage management in Missouri or this supplement.

VI. LAWS AND REGULATIONS

Section 1.7.5 of the EA lists agency authorities and state and federal laws applicable to MDM in Missouri. The following additional regulations are also relevant to the current and proposed MDM program.

<u>Fish and Wildlife Act of 1956 (section 742j-1) Airborne Hunting</u>. 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 U.S. Department of the Interior, Fish and Wildlife Service (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.

<u>Federal Meat Inspection Act</u>. 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.

Missouri Department of Conservation. Title 3 Code of State Regulations Chapter 7 and the Missouri Revised Statutes Section 270.400 provide for the taking of feral swine. Feral swine are not native to Missouri, and can be killed in any numbers at any time. However, some restrictions do apply during deer and turkey seasons.

VII. MONITORING

The Missouri WS program monitors the impact of its MDM activities to ensure that current and anticipated future impacts remain within the parameters analyzed in the EA. Wildlife Services also checks for new methods, needs for action, and issues which might require revised analysis.

VIII. ISSUES ANALYZED IN DETAIL IN THE EA

The following issues were identified as important to the scope of the analysis in the original EA and were analyzed in detail for each of the proposed management alternatives.

- Effects on target mammal species
- Effects on other wildlife species, including T&E species
- Effects on human health and safety
- Impacts to stakeholders, including aesthetics
- Humaneness and animal welfare concerns of methods used

In addition to the major issues considered in detail, four other issues were considered but not analyzed in detail: 1) No wildlife damage management at taxpayer expense -wildlife damage management should be fee based; 2) Mammal damage should be managed by private nuisance wildlife control agents; 3) Appropriateness of preparing an EA (instead of an EIS) for such a large area; and 4) Effectiveness of MDM methods. Reasons for not analyzing these issues in detail remain as discussed in the EA.

IX. MANAGEMENT ALTERNATIVES

A. Alternatives Analyzed in Detail

Four potential alternatives were developed to address the issues identified for detailed analysis in the EA. Three additional alternatives were considered, but were not analyzed in detail. A detailed discussion of the anticipated effects of the alternatives on the issues is contained in the EA. The following summary provides a brief description of each alternative.

Alternative 1: Technical Assistance Only

This alternative would not allow for WS operational MDM in Missouri. Wildlife Services would only provide technical assistance and make recommendations when requested. Producers, property owners, agency personnel, corporations, or others could conduct MDM using any legal lethal or non-lethal method available to them.

Alternative 2: Integrated Mammal Damage Management Program (Proposed Action/No Action)

The No Action alternative is a procedural NEPA requirement (40 CFR 1502.14(d)) and is a viable and reasonable alternative that could be selected and serves as a baseline for comparison with the other alternatives. 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 damage management program that responds to mammal damage in Missouri. Wildlife Services' involvement in MDM in Missouri is closely coordinated with the MDC, and WS take of mammals is authorized through permits and/or other authorities granted by the MDC. An Integrated Wildlife Damage Management (IWDM) approach would be implemented to reduce mammal damage to property, agricultural resources, and natural resources, and to reduce mammal impacts on human/public health and safety. Damage management would be conducted on public and private property in Missouri when the resource owner (property owner) or manager requests assistance. The IWDM strategy would encompass the use and recommendation of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and non-target species, and the environment. Under this action, WS could provide technical assistance and direct operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate non-lethal techniques like physical exclusion, habitat modification or harassment would be recommended and utilized to reduce damage. In other situations, mammals would be removed as humanely as possible using shooting, trapping, and registered pesticides and other products. Preference would be given to practical and effective non-lethal methods, but, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or could include instances where application of lethal methods alone would be the most appropriate strategy.

WS is proposing to add new methods to the list of techniques which may be used for MDM in Missouri: surveillance from aircraft, aerial sharpshooting, and use of tracking dogs. All three methods are primarily intended for use in location and removal of feral swine, although aerial surveillance may be used in limited applications to address disease concerns in deer.

Alternative 3: Non-lethal Mammal Damage Management Only by WS

This alternative would restrict WS to using and recommending non-lethal methods to resolve mammal damage problems. Information on lethal MDM methods would still be available to producers and property owners through other sources such as the MDC, USDA Agricultural Extension Service offices, universities, or pest control organizations. Requests for information regarding lethal management approaches would be referred to these entities. Individuals might choose to implement WS non-lethal recommendations, implement lethal methods or other methods not recommended by WS, arrange for WS direct assistance with non-lethal MDM, use contractual services of private businesses, or take no action. Persons receiving WS' non-lethal technical and direct control assistance could still resort to lethal methods that were available to them.

Alternative 4: No Federal WS Mammal Damage Management

This alternative would eliminate WS involvement in MDM in Missouri. Wildlife Services would not provide direct operational or technical assistance and entities which would otherwise have requested WS' assistance would have to conduct their own MDM without WS input. Information on MDM methods would still be available to producers and property owners through other sources such as the MDC, USDA Agricultural Extension Service offices, universities, or pest control organizations. Requests for information would be referred to these entities. Individuals might choose to conduct MDM themselves, use contractual services of private businesses, or take no action.

B. Alternatives Considered but not Analyzed in Detail

The EA considered three additional management methods as alternatives but did not address them in detail: 1) Lethal MDM only by WS; 2) Compensation for mammal damage losses; and 3) Reproductive control. We have reviewed the reasons for not considering these alternatives in detail and have determined that the reason remain as presented in the EA.

Since the EA was written, Gonacon™, a GnRH immunocontraceptive for use in white-tailed deer, has been approved by the EPA. The use of GnRH vaccine was discussed briefly in the EA (Section 3.4.3). However, it is not registered for use in the state of Missouri, and any immunocontraceptive must have written approval from the Director of the MDC. Wildlife Services does not anticipate having access to this method in the near future. Wildlife Services will update its analysis in accordance with the NEPA if Gonacon™ becomes available for use in Missouri.

C. Additional Methods

Three additional methods for mammal damage management were not addressed in the EA, aerial sharpshooting, aerial surveillance, and the use of tracking dogs. Wildlife Services proposes to add these methods to the list of methods which may be used under Alternative 2.

Aerial sharpshooting and surveillance are proposed for 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. This method may also be used for white-tailed deer in the case of extreme disease scenarios where the MDC has determined that removing a large portion of the population from a localized area is warranted to address/contain a disease outbreak. One example would be the recent detection of CWD in a captive hunting facility where the disease was also found in 5 free-ranging white-tailed deer outside the fenced area. If requested by the MDC, WS could use aerial surveillance and sharpshooting in both areas to efficiently remove deer and obtain disease samples.

Aerial surveillance and sharpshooting would be conducted using low level helicopter flight. Aerial surveillance and sharpshooting 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. All aerial sharpshooting would be conducted to remove feral swine and white-tailed deer in accordance with applicable permits issued by state and/or federal agencies. Aerial surveillance would involve use of aircraft to locate animals visually and through the use of telemetry devices. 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"[2] disturbance. Wildlife Services would not conduct aerial sharpshooting in the vicinity of active Bald Eagle nests or eagle roosting and feeding congregations. Wildlife Services personnel must have a clear view of the animal before shooting, so the risk of shooting a non-target animal is negligible.

Tracking and Trailing Dogs: Wildlife Services is proposing to use specially trained tracking/trailing dogs to locate feral swine. Dogs may also be used to aid in locating captive deer on large fenced properties during disease response projects such as the one described in Section II above, but would not be used to locate free-ranging deer. For a depopulation effort in an enclosed area, specially trained dogs are used to flush deer from the woods and underbrush so they can be quickly dispatched. 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 feral swine 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. Dogs are most likely to be used for feral swine in areas with substantial vegetative cover which makes location difficult with other methods.

X. ENVIRONMENTAL IMPACTS

This section updates the analysis in the EA and addresses the proposed addition of MDM methods where appropriate. The proposed additions in management methods would not change Alternatives 1, 3 and 4. Consequently, this section focuses on the impacts of implementation of Alternative 2 since the EA was completed and anticipated consequences of adding aerial sharpshooting, aerial surveillance and tracking dogs to the methods which may be used by WS.

The following resource values within the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, visual resources, air quality, prime and unique farmlands, timber, and range. These resources will not be analyzed further.

> **Cumulative Effects:** Cumulative effects are discussed in relationship to each of the alternatives analyzed, with emphasis on potential cumulative effects from methods employed, and including summary analyses of potential cumulative impacts to target and non-target species, including T&E species.
>
> **Irreversible and Irretrievable Commitments of Resources:** Other than minor uses of fuels for motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

[2] Frequent overflights such as hourly conducted over long periods of time represent "chronic exposure." Chronic exposure situations generally involve areas near commercial airports and military flight training facilities.

Effects on sites or resources protected under the National Historic Preservation Act: Wildlife Services MDM actions are not undertakings that could adversely affect historic resources.

A. Effects on Target Mammal Species Populations

The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1997 Revised, Pages 10-17). Magnitude is described in USDA (1997 Revised, Pages 11-15) as "*. . . a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. This section reviews and updates the target species population impact analysis in the EA. It analyzes the impacts of the proposed new management methods on feral swine and reviews the impacts of WS assistance in the management of disease concerns in captive wildlife.

The WS program gives preference to nonlethal methods where practical and effective. Nonlethal methods used and recommended by WS may include exclusion, harassment, live capture (padded foothold traps, cage traps, catch pole, nets, and hand capture) and relocation, capture and release on site (usually for disease surveillance), and sanitary measures like feeding pets indoors and keeping household refuse in a secure container.. Table 2 lists the mammals dispersed with nonlethal harassment methods and animals live-captured and either freed or relocated during FY 2007-FY2011.

Table 2. Wildlife freed, relocated (F/R) or dispersed (D) by Missouri WS during damage management projects from October 1, 2006 – September 31, 2011. The number of animals dispersed represents the number of animals impacted by dispersal programs and may include multiple incidents of dispersing a single individual.

	FY 07		**FY 08**		**FY 09**		**FY 10**		**FY 11**	
Species	**F/R**	**D**	**F/R**	**D**	**F/R**	**D**	**F/R**	**D**	**F/R**	**D**
Badgers								1		
Bats (all)[1]	1		2		1				2	
Bobcats	1					2				3
Cats, Feral/Free Ranging	19	4	4	1	4	2			2	2
Coyotes		16		17		59		85		120
Deer, White-tailed (wild)	1	24		11		67		85		56
Dogs, Feral, Free Ranging and Hybrid		2	1	2	1	3			2	2
Foxes, Red		3				1		6		1
Woodchucks (all)	2	4	1	1	4	5	1			2
Mice, Deer (all)	1								3	
Opossums, Virginia	8	1	1		6		4	3	2	1
Rabbits, Cottontail		2	1		2		1		2	
Raccoons		1	9		3	1	4		1	
Shrews (all)	1									
Skunks, Striped						1		1		2
Squirrels, Eastern Gray	1									

Species	FY 07		FY 08		FY 09		FY 10		FY 11	
	F/R	D	F/R	D	F/R	D	F/R	D	F/R	D
Voles (all)	19				23		18		56	
Woodrat, Eastern					1					

The EA concluded that the proposed WS MDM program would not have a significant impact on target mammal populations. Table 3 summarizes WS lethal mammal take from FY 2007-FY 2011 and maximum annual lethal take anticipated and analyzed in the EA. Table 4, contains information on animals taken by licensed hunters and trappers in Missouri for comparison to WS take. For all species, WS take was below the maximum anticipated annual take analyzed in the EA. For hunted species, WS take was also only a small portion of the total number of animals taken by licensed hunters.

MDC population indices indicate stable or increasing population trends for the state raccoon, coyote, bobcat, striped skunk, and Virginia opossum populations (MDC 2011). This information and the fact that WS take is a relatively low proportion of total take indicates that the WS program is not having a cumulative adverse impact on populations of these species.

MDC population index data indicate populations of red and gray fox are decreasing in the state. The MDC hypothesizes that these trends may be related to competition with bobcat and coyote. The increasing raccoon population and associated distemper virus may also be adversely impacting fox populations, particularly gray fox which appear to be especially vulnerable to the virus (MDC 2011). However, despite recent declines, the MDC still allows licensed harvest of red and gray fox (Table 4). Wildlife Services take is only 0.01% of licensed gray fox harvest and 0.37% of licensed red fox harvest. This level of take is not of sufficient magnitude to contribute substantively to existing population trends for these species.

The MDC has been working to stabilize or reduce the white-tailed deer population in many areas of the state (MDC 2012). These efforts have proven successful and the statewide deer population has been stable to slightly decreasing over the period of approximately 2003-2011. All WS take is conducted in accordance with authorizations from the MDC and is less than 0.01% of authorized take by licensed hunters.

Table 3. Number of animals intentionally killed by the Missouri WS program MDM activities during FY 07-FY 11.

SPECIES	FY 07	FY 08	FY 09	FY 10	FY 11	Maximum Predicted WS Take
Armadillos, Nine-banded	0	1	0	0	0	100
Badgers	2	1	1	0	1	12
Bats (All)	4	1	1	1	1	[1]
Bobcats	7	1	1	2	1	50
Cats, Feral/Free Ranging	2	4	3	2	4	150
Coyotes	12	30	36	36	67	100
Deer, Axis	0	0	0	0	1	[2]
Deer, Red	0	0	0	0	5	[2]
Deer, White-tailed (Captive)	0	0	0	0	93	[2]

SPECIES	FY 07	FY 08	FY 09	FY 10	FY 11	Maximum Predicted WS Take
Deer, White-tailed (Wild)	2	2	13	16	1	1,000
Foxes, Gray	0	1	0	0	0	20
Foxes, Red	8	4	9	2	3	50
Gophers, Pocket	0	0	0	1	0	[3]
Swine, Feral	7	24	19	12	32	1,000
Marmots/Woodchucks	11	6	12	5	8	100
Mice, Deer	20	23	45	12	4	[3]
Mice, House	1	0	0	0	0	[3]
Moles	0	0	1	0	12	[3]
Opossums, Virginia	92	60	57	42	66	200
Rabbits, Cottontail	246	83	283	129	111	1,000
Raccoons	161	100	51	36	126	500
Rats, Norway	0	1	0	0	0	[3]
Skunks, Striped	28	15	29	31	30	100
Squirrels, Fox and Gray	0	1	0	0	0	100
Voles (All)	12	0	85	41	4	[3]

1. 1-2 individuals per species including eastern pipistrelle, big brown, and hoary bats. No state or federally-listed threatened or endangered species were taken.
2. Removals of captive wildlife will not adversely impact native wildlife populations.
3. Analysis of impacts on small rodent populations are based on the scope of the area treated and not number of animals taken.

Table 4. Wildlife Services take relative to harvest by licensed hunters and trappers in Missouri- Oct 1, 2007 to Sept 30, 2011.

Species	Average Take by Hunters and Trappers FY2007-11	WS Average Take FY2007-11 as a % of Average Take by Hunters and Trappers	WS Maximum Predicted Take as a % of Average Take by Hunters and Trappers
Badger	48[1]	2.08	25
Bobcat	3,122	0.08	1.6
Cottontail rabbit	381,819	0.04	0.26
Coyote	16,680	0.22	0.6
Feral Swine	2,920[2]	0.64	34.25
Gray fox	1,474	0.01	1.36
Red fox	1,410	0.37	3.55
Raccoon	113,464	0.08	0.44
Squirrel, Fox and Gray	823,338	0.00*	0.01
Striped skunk	509	5.23	19.65
Virginia opossum	14,452	0.44	1.38
White-tailed deer (wild)	298,570	0.00*	0.33
Woodchuck	10,347[3]	0.08	0.97

[1] Average of four years, no take data available for FY 11.
[2] Best estimate of total take by hunters, private landowners, MDC and the U.S. Army Corps of Engineers obtained from T. Hutton and Dan McMurtry, Missouri WS.
[3] Harvest and sales data were not available for this species until FY11.
* Average WS take was less than 1/100 of 1% of licensed harvest.

Feral Swine: There are no estimates of the size of the state feral swine population. However, the MDC and MDA goal is to eliminate feral swine from the state. The EA estimated that annual take of feral swine would not exceed 1,000 animals per year. This number was established to accommodate current requests for management and the possibility that additional swine may be found or increase in areas of the state where WS is not currently working. To date, WS annual take of feral swine has been well below the estimated annual maximum (Table 2). 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). Addition of aerial sharpshooting and use of dogs will increase the number of feral swine removed per year, but annual take is not expected to exceed the level analyzed in the EA. Feral swine are a non-native invasive species which prey on native wildlife, compete with native species for food and other resources, damage native ecosystems and carry diseases transmissible to wildlife, humans and wildlife. Consequently, any level of removal, including complete eradication from the state would have a beneficial environmental impact and would be consistent with state agency goals.

Captive Wildlife: The Missouri WS program occasionally receives requests from state and federal regulatory agencies to assist in the removal of captive wildlife for the management of disease and disease transmission risks. Although these agencies can conduct the removals on their own, they may prefer to seek the assistance of WS because of staff training in safe and effective use of sharpshooting and because WS has access to suppressed firearms and other methods, such as infra-red and night visions equipment that are not readily available to the state or federal animal health agency(ies). Use of these methods by the WS program can often result in faster, less stressful, and more humane death of the animals than the

methods required for capture and handling of animals which may not be accustomed to human contact. The proposed use of dogs to locate deer would be rare, and is expected to only occur in situations where animals are located in very large enclosures with heavy vegetation which precludes effective removal using other methods, the regulatory agencies identified prompt removal of animals as a priority, and the regulatory agencies need to be certain that all animals in the pen have been located and removed.

Removal of captive cervids will not adversely impact native wildlife. However, some of the diseases in captive cervids which may warrant herd depopulation such as Chronic Wasting Disease are transmissible to native wildlife. Removal of these animals will reduce risks to native wildlife populations. All carcass disposal would be conducted by the state and federal animal health agencies and would be conducted in accordance with state regulations and agency guidelines for the protections of the environment and public and animal health.

Based on the information above and analysis in the EA, we conclude the proposed action has not had a significant impact on target mammal populations. Impacts on target mammal populations are expected to remain insignificant.

B. Effects on Other Wildlife Species, Including T&E Species

Species not State or Federally-listed as Threatened or Endangered: The EA concluded that WS MDM activities would not adversely affect any non-target wildlife species. Program activities and their potential impacts on non-target species have not changed from those analyzed in the EA. Table 5 below contains information on all non-target animals captured and released or killed by MO WS while conducting MDM.

Table 5. Non-target animals freed (F) or killed (K) during Missouri WS mammal damage management projects conducted from October 1, 2006 – September 31, 2011.

	FY 07		**FY 08**		**FY 09**		**FY 10**		**FY 11**	
Species	**F**	**K**	**F**	**K**	**F**	**K**	**F**	**K**	**F**	**K**
Chipmunk, Eastern	11									
Cats, Feral/Free Ranging					2				2	
Dogs, Feral, Free Ranging and Hybrid	2									
Foxes, Red									1	
Mink								1		
Raccoons	15	8	2	3	2	5	3	2		1
Squirrels, Eastern Gray and Fox			5							

The EA concluded that risks to non-target species from WS use of MDM methods would be very low, and that take of non-target species would be rare and should not affect the overall populations of any species. Given that WS actions resulted in the death of a small number of non-target animals annually (8 or fewer animal per year), we conclude that the overall non-target take was insignificant and will not have a negative impact on those species. Risks to non-target species are expected to remain insignificant.

The use of dogs is likely to be relatively infrequent, less than five projects per year. 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.

Under this alternative, WS would use helicopters to identify where feral swine exist and for aerial sharpshooting to remove feral swine. 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. 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. 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. Missouri WS would use aerial sharpshooting to remove feral swine in accordance with applicable permits issued by state and/or federal agencies. 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 (see below). 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.

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 which include studies documenting 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.

Threatened and Endangered Species: A review of the USFWS T&E species, and candidate species lists (USFWS 2013) indicated there have been several changes since the EA was completed in 2006. The Eastern prairie fringed orchid *(Platanthera leucophaea)* was previously listed as endangered but was not known to occur in the state at that time. In 2009 Eastern prairie fringed orchid was discovery in Grundy County, Missouri. The status of the Ozark hellbender, spectaclecase mussel, snuffbox mussel, and sheepnose mussel has changed to endangered. In an informal Section 7 consultation with the USFWS on the EA, WS determined that the proposed action would have no adverse impact on vascular plants, mollusks, or the Ozark hellbender and may have beneficial impacts in situations where feral swine are damaging prairies and riparian areas. The change in status for the snuffbox, spectaclecase, sheepnose and Ozark hellbender does not change the impact determination for these species. The determination regarding mussels and plants made in the Section 7 consultation is also valid for the Eastern prairie fringed orchid and the snuffbox.

The bald eagle (*Haliaeetus leucocephalus*) has been removed from the state and federal lists of threatened and endangered species, but still retains special protections under the federal Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act. Wildlife Services will continue to implement the protective measures for eagles listed in the 1992 national Section 7 consultation on the WS program to avoid risks to eagles.

A review of the MDC T&E species and species of concern lists (MDC 2013) indicated that bald eagles (discussed above), barn owls (*Tyto alba*), Western fox snakes (*Elaphe vulpine vulpine*) and Illinois mud turtles (*Kinosternon flavescens spooneri*) have been removed from the state list of endangered species. The MDC used genetic data to separate the state population of Eastern massassauga rattlesnakes into two subspecies *Sistrurus catenatus catenatus* (Eastern massasauga) and *Sistrurus catenatus tergeminus* (Western massasauga). All remaining populations of massauga in the central and western part of their range in Missouri are now classified as Western massasauga. There have been no sightings of Eastern massauga since 1941, and this species is considered extirpated from the state. The Western massasauga has been added to the state list of endangered species. The 2006 EA assessed the impact of MDM activities on Eastern massasauga (combined Eastern and Western subspecies) and determined that the proposed action would have no effect on massassauga with the possible exception of positive impacts in areas where feral swine are removed because they are damaging native habitat. WS continues to work with the MDC on projects for the protection of state-listed T&E species (e.g., feral swine removal projects) as discussed in the EA.

The proposed use of dogs and aerial sharpshooting to manage feral swine will have no adverse effect on federally-listed species. Dogs and aircraft will not be used in areas near least terns and piping plovers, which should prevent any possibility of negative impacts. The proposed methods for managing feral swine will not result in the direct take of any other federally-listed threatened and endangered species or damage to their habitats. However, improved success in removing feral swine does have the potential for positive impacts on native species and ecosystems.

The only potential adverse impact on state-listed threatened or endangered species from the proposed use of dogs and aircraft would be the risk of disturbance of black-tailed jackrabbits (*Lepus californicus*), plains spotted skunk (*Spilogale putorius*), and ground-nesting birds including Northern harrier (*Circus cyaneus*), and Greater prairie-chicken (*Tympanuchus cupido*) by dogs. Swainson's warblers breed in stands of giant cane (*Arundinaria gigantea*) within extensively forested landscapes along stream and river flood plains with high canopy cover and dense vegetation where dogs may also be used. 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. However, WS will work to avoid using dogs during periods when Northern harrier, Greater prairie-chicken, and Swainson's warblers are nesting to further reduce risks. Given that WS use of dogs is likely to be infrequent, and the brief nature of any potential disturbance, we conclude that the proposed action will not adversely impact state-listed species. The use of dogs is not expected to have an adverse impact on any other state-listed threatened or endangered mammals, reptiles, amphibians, invertebrates, aquatic organisms and plants. 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.

Wildlife Services has not taken, or captured any state or federally-listed T&E species during MDM activities. Wildlife Services' determinations of no effect or "not likely to adversely affect" are still valid for the proposed action. The effects of damage management activities on State and Federally-listed non-target species is expected to remain insignificant.

C. Effects on Human Health and Safety

The EA concluded that WS' MDM activities would not adversely affect public health and safety. No WS staff or members of the public were injured during WS implementation of the MDM program developed in the EA.

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.

The low-level flights used for wildlife management including wildlife surveys like those conducted by the MDC, 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.

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.

Based on the above information, this alternative would have a low level of risk to human health and safety. The associated 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.

D. Impacts to Stakeholders, Including Aesthetics

The EA concluded that effects on this issue would be insignificant. Program activities and methods and their potential impacts on aesthetics have not changed from those analyzed in the EA with the exception of the proposal to use dogs and aircraft for MDM. 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. 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 Missouri, 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, this alternative will not have a significant adverse impact on total opportunities for hunting in Missouri.

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 or rabbits as permitted by the MDC. 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 surveys would likely only consist of single pass of an aircraft over a location. Surveys and sharpshooting would usually be conducted on weekdays within standard working hours which would also minimize the potential for adverse impacts on aesthetic enjoyment of properties. Aerial sharpshooting would only be used at properties where WS has landowner/manager permission. Use of aircraft to locate and removal feral swine could improve the likelihood that WS will be able to help landowners and state and Federal land managers achieve their goal of removing feral swine under this alternative. Given the above information, aesthetic impacts associated with the use of aircraft to remove swine are likely to be minimal.

E. Humaneness and Animal Welfare Concerns of Methods Used

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. Missouri Code of State Regulations does allow hunters to pursue some species such as raccoons, squirrels, and rabbits with hunting dogs during the prescribed season. 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. 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. 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.

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).

XI. SUMMARY

No significant cumulative environmental impacts have resulted from implementation of the MDM program. Program activities and impacts have been within the parameters predicted and analyzed in the EA. Based on analysis in this supplement, adding use of dogs, aerial surveys and aerial sharpshooting to the preferred alternative is not expected to have significant cumulative adverse impacts on the human environment. Wildlife Service's impacts on non-native feral swine are consistent with MDC management objectives for the species and Executive Order 13112. Risks to non-target species from the current program and proposed new methods are very low and unlikely to contribute substantively 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. Reductions in the state feral swine population would impact feral swine hunting opportunities in the state, but would likely have beneficial impacts on hunting opportunities for native wildlife species. Many landowners/managers and state and Federal agencies want the animals removed from their premises, so 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. Adding use of dogs, aerial surveys and aerial sharpshooting would increase WS' capacity to address conflicts and provides the greatest opportunity for assisting the landowners/managers and state and Federal agencies in achieving their management goals.

APPENDIX A

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APPENDIX B: LIST OF FEDERAL CANDIDATE, THREATENED, ENDANGERED AND STATE ENDANGERED SPECIES IN MISSOURI

SCIENTIFIC NAME	COMMON NAME	STATE STATUS	FEDERAL STATUS
Plants			
Asclepias meadii	Mead's Milkweed	Endangered	Threatened
Boltonia decurrens	Decurrent False Aster	Endangered	Threatened
Geocarpon minimum	Geocarpon	Endangered	Threatened
Helenium virginicum	Virginia Sneezeweed	Endangered	Threatened
Isotria medeoloides	Small Whorled Pogonia	Endangered[3]	Threatened
Lindera melissifolia	Pondberry	Endangered	Endangered
Physaria filiformis	Missouri Bladder-pod	Endangered	Threatened
Platanthera leucophaea	E. Prairie Fringed Orchid[3]	Endangered	Threatened
Platanthera praeclara	W. Prairie Fringed Orchid	Endangered	Threatened
Trifolium stoloniferum	Running Buffalo Clover	Endangered	Endangered
Mollusks			
Antrobia culveri	Tumbling Creek Cavesnail	Endangered	Endangered
Cumberlandia monodonta	Spectaclecase		Endangered
Elliptio crassidens	Elephantear	Endangered	
Epioblasma florentina curtisii	Curtis Pearlymussel	Endangered	Endangered
Epioblasma triquetra	Snuffbox	Endangered	Endangered
Fusconaia ebena	Ebonyshell	Endangered	
Lampsilis abrupta	Pink Mucket	Endangered	Endangered
Lampsilis higginsii	Higgins Eye	Endangered	Endangered
Lampsilis rafinesqueana	Neosho Mucket		Proposed Endangered
Leptodea leptodon	Scaleshell	Endangered	Endangered
Plethobasus cyphyus	Sheepnose	Endangered	Endangered
Potamilus capax	Fat Pocketbook	Endangered	Endangered
Quadrula fragosa	Winged Mapleleaf	Endangered	Endangered
Quadrula cylindrica cylindrica	Rabbitsfoot		Proposed Threatened
Crustaceans			
Cambarus aculabrum	Cave Crayfish		Endangered
Insects			
Nicrophorus americanus	American Burying Beetle	Endangered[3]	Endangered[4]
Somatochlora hineana	Hine's Emerald Dragonfly	Endangered	Endangered
Fish			
Acipenser fulvescens	Lake Sturgeon	Endangered	
Amblyopsis rosae	Ozark Cavefish	Endangered	Threatened
Cottus sp. cf. *carolinae*	Grotto Sculpin		Candidate
Crystallaria asprella	Crystal Darter	Endangered	
Etheostoma cragini	Arkansas Darter		Candidate
Etheostoma fusiforme	Swamp Darter	Endangered	
Etheostoma histrio	Harlequin Darter	Endangered	
Etheostoma nianguae	Niangua Darter	Endangered	Threatened
Etheostoma parvipinne	Goldstripe Darter	Endangered	

Etheostoma whipplei	Redfin Darter	Endangered	
Forbesichthys agassizi	Spring Cavefish	Endangered	
Hybognathus hayi	Cypress Minnow	Endangered	
Notropis maculatus	Taillight Shiner	Endangered	
Notropis sabinae	Sabine Shiner	Endangered	
Notropis topeka	Topeka Shiner	Endangered	Endangered
Noturus eleutherus	Mountain Madtom	Endangered	
Noturus placidus	Neosho Madtom	Endangered	Threatened
Percina nasuta	Longnose Darter	Endangered	
Platygobio gracilis	Flathead Chub	Endangered	
Scaphirhynchus albus	Pallid Sturgeon	Endangered	Endangered
Scaphirhynchus platorynchus	Shovelnose Sturgeon		Threatened/SA
Umbra limi	Central Mudminnow	Endangered	
AMPHIBIANS			
Cryptobranchus a. alleganiensis	Eastern Hellbender	Endangered	
Cryptobranchus a. bishopi	Ozark Hellbender	Endangered	Endangered
REPTILES			
Deirochelys reticularia miaria	Western Chicken Turtle	Endangered	
Emydoidea blandingii	Blanding's Turtle	Endangered	
Kinosternon flavescens	Yellow Mud Turtle	Endangered	
Nerodia cyclopion	Mississippi Green Water Snake	Endangered[3]	
Sistrurus c. catenatus	Eastern Massasauga	Endangered[3]	Candidate
Sistrurus c. tergeminus	Western Massasauga	Endangered	
BIRDS			
Botaurus lentiginosus	American Bittern	Endangered	
Charadrius melodus	Piping Plover		Threatened
Circus cyaneus	Northern Harrier	Endangered	
Egretta thula	Snowy Egret	Endangered	
Falco peregrinus	Peregrine Falcon	Endangered	
Limnothlypis swainsonii	Swainson's Warbler	Endangered	
Peacaea aestivalis	Bachman's Sparrow	Endangered	
Rallus elegans	King Rail	Endangered	
Sterna antillarum athalassos	Interior Least Tern	Endangered	Endangered
Tympanuchus cupido	Greater Prairie-chicken	Endangered	
MAMMALS			
Canus lupus Gray	Gray Wolf		Endangered[4]
Corynorhinus townsendii ingens	Ozark Big-eared Bat	Endangered[3]	Endangered
Lepus californicus	Black-tailed Jackrabbit	Endangered	
Myotis grisescens	Gray Bat	Endangered	Endangered
Myotis sodalis	Indiana Bat	Endangered	Endangered
Spilogale putorius interrupta	Plains Spotted Skunk	Endangered	

1 Listed in the Wildlife Code of Missouri, Rule 3 CSR10-4, 111 Endangered Species.
2 Federally Listed Species under the Endangered Species Act (ESA) of 1973 as amended:
3 MDC considers species extirpated, historical or accidental occurrence in Missouri.
4 Species federally-listed in state but not currently known to occur in Missouri (USFWS 2013)