SUPPLEMENT TO THE ENVIRONMENTAL ASSESSMENT:
REDUCING MAMMAL DAMAGE THROUGH AN INTEGRATED WILDLIFE DAMAGE MANAGEMENT PROGRAM IN THE STATE OF NEW HAMPSHIRE

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

April 2013

I. INTRODUCTION

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program prepared an environmental assessment (EA) to evaluate potential impacts to the quality of the human environment from the implementation of a management program to address damage to property, agricultural resources, natural resources, and threats to human safety caused by white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), woodchuck (*Marmota monax*), raccoon (*Procyon lotor*), muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), gray fox (*Urocyon cinereoargenteus*), and coyote (*Canis latrans*) in New Hampshire (USDA 2005*a*).

The EA evaluates the need for damage management and the relative effectiveness of four alternatives to meet that need, while accounting for the potential environmental effects of those activities that could be conducted under the alternatives. The proposed action alternative in the EA evaluates an integrated methods approach to address the need for resolving damage caused by mammals. The need for action arises from requests for assistance[1] received by WS to reduce and prevent damage to agricultural resources, natural resources, property, and threats to human safety associated with mammals in New Hampshire (see Chapter 1 of the EA). Chapter 2 of the EA contains a discussion of the issues, including issues that received detailed environmental impact analysis in Chapter 4 (Environmental Consequences) of the EA, issues that drove the development of Standard Operating Procedures (SOPs), and issues that were identified but were not considered in detail.

Chapter 3 of the EA contains a discussion of the alternatives that were developed to meet the need for action discussed in Chapter 1 and to address the identified issues discussed in Chapter 2. Alternatives were developed for consideration based on the need for action and issues using the WS Decision model (Slate et al. 1992, USDA 2005*a*). Chapter 3 of the EA also discusses alternatives that were considered but were not analyzed in detail. SOPs for mammal damage management in New Hampshire were also discussed in Chapter 3 of the EA. Chapter 4 of the EA provides information needed for making informed decisions in selecting the appropriate alternative to address the need for action described in Chapter 1 and the issues described in Chapter 2. Chapter 4 analyzed the environmental consequences of each alternative in comparison to determine the extent of actual or potential impacts on the issues.

To assist with the identification of additional issues and alternatives to managing damage associated with mammals in New Hampshire, the EA was made available to the public for review and comment prior to the issuance of a Decision[2]. The EA was made available to the public during a 46-day comment period

[1]WS would only conduct mammal damage management after receiving a request for assistance. Before initiating mammal damage activities, a Memorandum of Understanding, cooperative service agreement, or other comparable document would be signed between WS and the cooperating entity, which would list all the methods the property owner or manager would allow to be used on property they own and/or manage.

[2]After the development of an EA and after public involvement, WS issues a Decision. Based on the analyses after public involvement, a decision would be made to publish a Notice of Intent to prepare an Environmental Impact Statement or a Finding of No Significant Impact would be noticed to the public in accordance to NEPA and the Council of Environmental Quality regulations.

by a legal notice published in *The New Hampshire Union Leader* on July 8 and July 9, 2005. A letter of availability for the EA was also mailed directly to agencies, organizations, and individuals with probable interest in the proposed program. No comments were received from the public during the public involvement process. Based on the analyses in the EA, the decision-maker determined the proposed action alternative would best meet the need for action and the issues identified during the development of the EA. The proposed action alternative implemented an integrated damage management program in New Hampshire using multiple methods to address the need to manage damage caused by mammals. After consideration of the analysis contained in the EA and public involvement, a Decision and Finding of No Significant Impact (FONSI) for the proposed action alternative was issued on August 30, 2005.

The WS program in New Hampshire continues to receive requests for assistance to resolve or prevent damage occurring to agricultural resources, natural resources, and property, including threats to human safety, associated with those mammal species addressed in the EA (USDA 2005*a*). In addition to those species, WS has received increasing requests for assistance associated with additional mammal species to include requests associated with damage and threats of damage caused by feral swine (*Sus scrofa*), Virginia opossum (*Didelphus marsupialis*), porcupines (*Erethizon dorsatum*), gray squirrels (*Sciurus carolinensis*), red squirrels (*Tamiasciurus hudsonicus*), Northern flying squirrels (*Glaucomys sabrinus*), Southern flying squirrels (*Glaucomys volans*), feral cats (*Felis* spp.), deer mice (*Peromyscus maniculatus*), white-footed mice (*Peromyscus leucopus*), house mice (*Mus musculus*), meadow jumping mice (*Zapus hudsonius*), woodland jumping mice (*Napaeozapus insignis*), Northern short-tailed shrews (*Blarina brevicauda*), masked shrews (*Sorex cinereus*), water shrews (*Sorex palustris*), smoky shrews (*Sorex fumeus*), long-tailed shrews (*Sorex dispar*), pygmy shrews (*Sorex hoyi*), least shrews (*Crytotis parva*), hairy-tailed moles (*Parascalops breweri*), Eastern moles (*Scalopus aquaticus*), star-nosed moles (*Condylura cristata*), Southern red-backed voles (*Clethrionomys gapperi*), meadow voles (*Microtus pennsylvanicus*), rock voles (*Microtus chrotorrhinus*), woodland voles (*Microtus pinetorum*), and Norway rats (*Rattus norvegicus*), which were not addressed in the EA.

II. AUTHORITY AND COMPLIANCE

WS' activities to reduce damage and threats associated with wildlife are regulated by federal, state, and local laws and regulations. The authority of WS and other agencies along with the compliance with relevant laws and regulations are discussed in detail in Section 1.1 of the EA (USDA 2005*a*). WS' activities are also conducted consistent with relevant Executive Orders, which were also discussed in Section 1.1 of the EA (USDA 2005*a*). Compliance with laws and regulations not directly addressed in the EA will be discussed in this supplement.

Coastal Zone Management Act of 1972, as amended (16 USC 1451-1464, Chapter 33; PL 92-583, October 27, 1972; 86 Stat. 1280).

This law established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans. Funds were authorized for cost-sharing grants to States to develop their programs. Subsequent to federal approval of their plans, grants would be awarded for implementation purposes. In order to be eligible for federal approval, each state's plan was required to define boundaries of the coastal zone, identify uses of the area to be regulated by the state, determine the mechanism (criteria, standards or regulations) for controlling such uses, and develop broad guidelines for priorities of uses within the coastal zone. In addition, this law established a system of criteria and standards for requiring that federal actions be conducted in a manner consistent with the federally approved plan. The standard for determining consistency varied depending on whether the federal action involved a permit, license, financial assistance, or a federally authorized activity.

Food Security Act

The Wetland Conservation provision (Swampbuster) of the 1985 (16 USC 3801-3862), 1990 (as amended by PL 101-624), and 1996 (as amended by Public Law 104-127) farm bills require all agricultural producers to protect wetlands on the farms they own. Wetlands converted to farmland prior to December 23, 1985 are not subject to wetland compliance provisions even if wetland conditions return because of lack of maintenance or management. If prior converted cropland is not planted to an agricultural commodity (crops, native and improved pastures, rangeland, tree farms, and livestock production) for more than 5 consecutive years and wetland characteristics return, the cropland is considered abandoned and then becomes a wetland subject to regulations under Swampbuster and Section 404 of the Clean Water Act. The Natural Resource Conservation Service is responsible for certifying wetland determinations according to this Act.

Invasive Species (Executive Order 13112)

Executive Order 13112 establishes guidance to federal agencies to prevent the introduction of invasive species, provide for the control of invasive species, and to minimize the economic, ecological, and human health impacts that invasive species cause. The Order states that each federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law: 1) reduce invasion of exotic species and the associated damages, 2) monitor invasive species populations and provide for restoration of native species and habitats, 3) conduct research on invasive species and develop technologies to prevent introduction, and 4) provide for environmentally sound control and promote public education of invasive species.

New Hampshire Revised Statutes Annotated Wetland Definition

Under Title L, Chapter 482-A:2(X) of the New Hampshire Revised Statutes Annotated, a wetland has been defined as "*...an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal conditions does support, a prevalence of vegetation typically adapted for life in saturated soil conditions*."

Water Management and Protection, Fill and Dredge in Wetlands (Title L, New Hampshire Revised Statutes Annotated, Chapter 482-A)

This law (1989, 339:1, eff. Jan. 1, 1990) is to protect and preserve submerged lands under tidal and fresh waters and its wetlands, (both salt water and fresh-water) in New Hampshire, as herein defined, from despoliation and unregulated alteration, because such despoliation or unregulated alteration will adversely affect the value of such areas as sources of nutrients for finfish, crustacea, shellfish and wildlife of significant value, will damage or destroy habitats and reproduction areas for plants, fish and wildlife of importance, will eliminate, depreciate or obstruct the commerce, recreation and aesthetic enjoyment of the public, will be detrimental to adequate groundwater levels, will adversely affect stream channels and their ability to handle the runoff of waters, will disturb and reduce the natural ability of wetlands to absorb flood waters and silt, thus increasing general flood damage and the silting of open water channels, and will otherwise adversely affect the interests of the general public. Under RSA 482-A the New Hampshire Department of Environmental Services (NHDES) requires the applicant to obtain a permit to fill or dredge jurisdictional wetland habitats, including the banks of rivers and streams.

New Hampshire Endangered Species Conservation Act (RSA 212-A) - state endangered.

The New Hampshire Endangered Species Conservation Act protects rare species and their habitats which are determined to be threatened or endangered elsewhere pursuant to the endangered species act by prohibiting the taking, possession, transportation or sale of endangered species and by carefully regulating such activities with regard to threatened species. Exceptions to such prohibitions, for the purpose of enhancing the conservation of such species, may be permitted as set forth elsewhere in RSA 212-A.

Rivers Management and Protection Program; NHDES (RSA 483)

This state policy ensures the continued viability of New Hampshire rivers as valued ecologic, economic, public health and safety, and social assets for the benefit of present and future generations. The state shall encourage and assist in the development of river corridor management plans and regulate the quantity and quality of instream flow along certain protected rivers or segments of rivers to conserve and protect outstanding characteristics including recreational, fisheries, wildlife, environmental, hydropower, cultural, historical, archaeological, scientific, ecological, aesthetic, community significance, agricultural, and public water supply so that these valued characteristics shall endure as part of the river uses to be enjoyed by New Hampshire people. As specified, if conflicts arise in the attempt to protect all valued characteristics within a river or stream, priority shall be given to those characteristics that are necessary to meet state water quality standards.

The Shoreland Protection Act (NHDES, RSA 483-B)

Under current law the potential exists for uncoordinated, unplanned and piecemeal development along the state's shorelines, which could result in significant negative impacts on the public waters of New Hampshire. No person shall commence construction, excavation, or filling activities within the protected shoreland without obtaining a permit from the department to ensure compliance with this policy. Projects which have no impact on water quality and which follow department rules shall qualify for a permit by notification. The owner may proceed with the proposed project immediately upon receipt of written notice from the department that a complete and accepted notification has been received by the NHDES. A notification shall be complete and accepted provided it meets or exceeds all of the minimum standards under RSA 483-B:9, includes a notification form signed by the owner of property, the name and address of the property owner, the address of the site on which the work will occur, the name of the jurisdictional water body, the tax map and lot number on which the proposed work will occur, plans clearly and accurately depicting the work to be completed relative to the reference line of the jurisdictional water body, photographs of the area to be impacted, and identification of detailed project criteria would qualify the project for a permit by notification.

III. SCOPE AND PURPOSE

The EA evaluated the issues and alternatives associated with WS' potential participation in managing damage and threats caused by mammals in the State. The EA was prepared by WS to determine if the alternatives could have a significant impact on the quality of the human environment. Specifically, the EA was prepared to: 1) facilitate planning, 2) promote interagency coordination, 3) streamline program management, 4) clearly communicate to the public the analysis of individual and cumulative impacts of the alternative approaches to meeting the need for action; and 5) evaluate and determine if there could be any potentially significant or cumulative effects from those alternative approaches. The analyses contained in the EA were based on information derived from WS' Management Information System, published documents (see Appendix A of the EA), interagency consultations, and public involvement.

The EA analyzes the potential effects of conducting alternative approaches to addressing mammal damage, as coordinated with the New Hampshire Fish and Game Department (NHFG), along with other governmental agencies and private entities, as appropriate, in the State under Memorandum of Understanding (MOU), Cooperative Service Agreement, or other comparable document. The EA also addresses the potential effects of managing mammal damage in areas where additional agreements may be signed in the future. Because the objective would be to conduct a coordinated program to alleviate or prevent damage associated with mammals, in accordance with plans, goals, and objectives developed to reduce damage, and because the program's goals and directives would be to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional damage management efforts could occur. Thus, the EA anticipates those additional efforts and the analyses are intended to apply to actions that may occur in any locale and at any time within New Hampshire as part of a coordinated program.

The purpose of the EA will remain as addressed in section 1.2 of the EA (USDA 2005*a*). This supplement to the EA examines potential environmental impacts of WS' program as it relates to: 1) conducting disease surveillance and monitoring in mammal populations, particularly monitoring for the presence of feral swine diseases (*e.g*., swine brucellosis, pseudorabies, classical swine fever), plague, tularemia, raccoon roundworm, and tick-borne diseases (*e.g*., Lyme disease, babisiosis), 2) an increase in the number of requests for assistance to manage mammal damage and threats in New Hampshire, 3) requests for assistance associated with additional mammal species, 4) any new information and data that have become available from research findings and data gathering since the issuance of the Decision in 2005, and 5) analyses of WS' mammal damage management activities in New Hampshire since the 2005 Decision was issued to ensure program activities remained within the impact parameters analyzed in the EA.

IV. NEED FOR ACTION

Some species of wildlife adapt and thrive in human altered habitats. Those species, in particular, are often responsible for the majority of conflicts between humans and wildlife that lead to requests for assistance to reduce damage to resources and to reduce threats to human safety. Section 1.3 of the EA discusses the need for action associated with those species addressed in the EA and remains applicable to the continued need for action addressed in this supplement to the EA.

Both sociological and biological carrying capacities must be applied to resolve wildlife damage problems. The wildlife acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations. Biological carrying capacity is the land or habitat's ability to support healthy populations of wildlife without degradation to the species' health or their environment during an extended period of time (Decker and Purdy 1988). These phenomena are especially important because they define the sensitivity of a person or community to a wildlife species. For any given damage situation, there are varying thresholds of tolerance exhibited by those people directly and indirectly affected by the species and any associated damage. This damage threshold determines the wildlife acceptance capacity. While the habitat may have a biological carrying capacity to support higher populations of wildlife, in many cases the wildlife acceptance capacity is lower or has been met. Once the wildlife acceptance capacity has been met or exceeded, people begin to implement management activities to alleviate damage or address threats to human health and safety.

The alleviation of damage or other problems caused by or related to the behavior of wildlife is termed wildlife damage management and is recognized as an integral component of wildlife management (The Wildlife Society 1990). The imminent threat of damage or loss of resources is often sufficient for

individual actions to be initiated and the need for damage management is derived from the specific threats to resources. Those species have no intent to do harm. They utilize habitats (*e.g.*, reproduce, walk, forage) where they can find a niche. If their activities result in lost economic value of resources or threaten human safety, people characterize this as damage. When damage exceeds or threatens to exceed an economic threshold and/or pose a threat to human safety, people seek assistance with resolving damage or reducing threats to human safety. The threshold triggering a request for assistance is often unique to the individual person requesting assistance and can be based on many factors (*e.g.*, economic, social, aesthetics). Therefore, how damage is defined is often unique to the individual person and damage occurring to one individual may not be considered damage by another individual. However, the use of the term "*damage*" is consistently used to describe situations where the individual person has determined the losses associated with wildlife is actual damage requiring assistance (*i.e.*, has reached an individual threshold). The term "*damage*" is most often defined as economic losses to resources or threats to human safety. However, damage could also include lost aesthetic value of property and other situations where the actions of wildlife are no longer tolerable to an individual person.

WS has identified those mammal species most likely to be responsible for causing damage in the State based on previous requests for assistance. Table 1 lists WS' technical assistance projects involving mammal damage or threats of mammal damage in New Hampshire from the federal fiscal year[3] (FY) 2005 through FY 2011. Technical assistance is provided by WS to those persons requesting assistance with resolving damage or the threat of damage by providing information and recommendations on activities to alleviate mammal damage that can be conducted by the requestor without WS' direct involvement in managing or preventing the damage. WS' technical assistance activities are discussed further in Chapter 3 of the EA (USDA 2005*a*).

Table 1 - Technical assistance requests received by WS in New Hampshire involving mammal species, FY 2005 – FY 2011.[†]

	Fiscal Year							
Resource Type	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**Total**
Property	594	578	731	685	626	890	611	**4,715**
Agriculture	262	222	216	309	296	372	370	**2,047**
Natural Resources	23	43	88	133	125	157	4	**5,73**
Human Safety	412	493	560	582	694	585	583	**3,909**
No Reference	2	2	5	5	3	6	93	**116**
TOTAL	**1,293**	**1,338**	**1,600**	**1,714**	**1,744**	**2,010**	**1,681**	**11,360**

[†]Data presented in the table represent the number of technical assistance projects conducted by the WS program in New Hampshire. Data does not represent operational assistance projects conducted during the time period covered.

WS has conducted 11,360 technical assistance projects involving mammal damage to agricultural resources, natural resources, property, and human safety since FY 2005 in New Hampshire. In addition to technical assistance, WS also provided direct operational assistance in which WS was directly involved with managing damage associated with mammals. Activities associated with WS providing direct operational assistance are also discussed in Chapter 3 of the EA (USDA 2005*a*). Table 1 does not reflect direct operational assistance projects conducted by WS between FY 2005 and FY 2011.

A description of the need for action to address damage and threats associated with mammals in New Hampshire is provided in section 1.3 of the EA (USDA 2005*a*). The need for action addressed in the EA remains applicable to this supplement to the EA. This supplement to the EA will evaluate an increase in

[3] The federal fiscal year begins on October 1 and ends on September 30 the following year.

the number of requests for assistance received by WS. In addition, this supplement will address requests for assistance associated with additional mammal species that were not originally addressed in the EA.

Nearly 42% of the technical assistance projects involving mammals from FY 2005 through FY 2011 involved damage or the threat of damage to property. Damage to property associated with mammals can occur in a variety of ways and is often dependent on the behavior of the particular species involved. Property damage included damage to structures (*e.g.*, homes, garages, sheds) and general property damage to trees, shrubs, turf, and home gardens. Mammals involved in damage complaints included raccoons, skunks, multiple squirrel species, woodchucks, feral swine, and black bears. Threats to human health and safety including complaints about animals being a "*nuisance*" accounted for nearly 35% of the technical assistance requests received by WS from FY 2005 through FY 2011. Human health and safety threats occur primarily from concerns of possible injuries associated from conflicts with wildlife, or the threat of disease transmission associated with mammals.

Requests for assistance received by WS are reported by cooperators and damage complaints may be verified by WS through site visits. Since FY 2005, $334,733 in damages caused by mammals has been reported and/or verified by WS and have primarily been associated with property and agricultural resources (see Table 2). Approximately $123,674 and $207,984 in damages have been reported to or verified by WS since FY 2005 to property and agricultural resources, respectively. Whereas, monetary damages reported to WS associated with mammal damage to natural resources and to human safety were substantially less totaling $485 and $2,590, respectively.

Table 2 - Monetary damage by resource caused by mammals in New Hampshire, FY 2005 – FY 2011

	Fiscal Year							
Resource Type	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**Total**
Property	$3,393	$1	$28,265	$58,196	$9,230	$5,275	$19,314	**$123,674**
Agriculture	$3,381	$3,058	$21,032	$82,203	$9,047	$23,009	$66,254	**$207,984**
Natural Resources	0	0	0	$100	0	0	$385	**$485**
Human Safety	$2	0	$313	$2,175	0	0	$100	**$2,590**
TOTAL	**$6,776**	**$3,059**	**$49,610**	**$142,674**	**$18,277**	**$28,284**	**$86,053**	**$334,733**

Table 2 only reflects damage that has been reported to or verified by WS based on requests received for assistance. Assigning a monetary damage to natural resources can be challenging especially when taking in to account lost aesthetic because of mammals causing damage to natural resources. Similarly, placing a monetary value on threats to human safety is equally as difficult. The monetary damage reported in Table 2 reflects damage that has occurred and that has been reported to or verified by WS, but is not reflective of all mammal damage occurring in the State since not all mammal damage or threats are reported to WS.

Mammals such as, raccoon, beaver, deer, and feral swine can cause substantial economic damage to agricultural crops and resources as result of their feeding and other behaviors. According to the National Agricultural Statistics Service, wildlife damage to agricultural resources was estimated at $944 million in 2001 (USDA 2002). Some examples of agricultural damage include black bears foraging on honey from beekeepers, deer browsing in apple orchards, feral swine feeding in cornfields, and coyote predation of livestock. Property or non-agricultural resources may consist of business and residential buildings and structures, equipment, vehicles, machinery, and pets. Damage can include beaver flooding roadways and property, raccoons constructing a den within a building, and skunks digging for insects on a golf course.

Mammals at airports present both threats of property damage and human safety hazards. The civil and military aviation communities have acknowledged that the threat to human health and safety from aircraft collisions with wildlife is increasing (Dolbeer 2000, MacKinnon et al. 2001). Collisions between aircraft and wildlife are a concern throughout the world because wildlife strikes threaten passenger safety (Thorpe 1996), result in lost revenue, and repairs to aircraft can be costly (Linnell et al. 1996, Robinson 1996). Aircraft collisions with wildlife can also erode public confidence in the air transport industry as a whole (Conover et al. 1995).

Mammal species can pose direct threats to aircraft from aircraft striking mammals or act as attractants for other wildlife species that pose a threat to aviation safety (*e.g.*, mice, shrews, voles, rats). From 1990 through 2010, there were 997 reported deer-aircraft strikes to civil aircraft in the United States resulting in 233,950 hours in aircraft down time and nearly $32 million in reported repair costs (Dolbeer et al. 2012). Of reported strikes, coyotes were involved with 13% of the strikes involving terrestrial mammals, which are the second highest percentage for mammals behind only deer. A total of 36 species of terrestrial mammals have been identified in the aircraft strike record in the United States along with at least 13 species of bats (Dolbeer et al. 2012). Most requests for assistance received by WS to manage damage associated with wildlife at airports involves threats to human health and safety, and property since wildlife strikes can cause damage to aircraft. Between carnivore species and species of Artiodactyls (*i.e.*, hooved, even-toed mammals), over $41 million in damages to aircraft have occurred from 1990 through 2010 in the United States (Dolbeer et al. 2012).

Need for Action associated with the Proposed Supplement to the EA

Several aspects of WS' mammal damage management activities have experienced an increase in the number of requests for assistance received. Areas experiencing an increase in requests for assistance include disease surveillance and monitoring, along with increases in requests to reduce risks to human safety, protection of property, and reducing or preventing agricultural damage. The increase in activities to manage damage and threats analyzed in this supplement to the EA would allow WS to adequately address requests as needs are identified, as requested by cooperators experiencing threats to human safety and/or damage due to mammals arise, and as funding permits. In addition, new methods to manage damage have become available since the EA was developed, which will be analyzed in the supplement to the EA.

As part of the increase in requests for assistance, WS reasonably anticipates an increase in the number of requests for direct operational assistance where WS would be requested to employ lethal and non-lethal methods. If additional requests for assistance were received, the number of individual mammals and the number of mammals species addressed by WS would also likely increase, which could lead to an increase in the number of mammals lethally taken annually by WS and addressed using non-lethal methods.

Those mammal species addressed in the EA were identified based on requests for assistance received by WS prior to the development of the EA. WS continues to receive requests for assistance to manage damage and threats of damage caused by mammals in New Hampshire. WS is also being requested to participate in disease surveillance and monitoring programs to detect and evaluate risks associated with mammalian diseases. This supplement to the EA will evaluate the issues associated with an increase in the number of requests for assistance received by WS in New Hampshire to address damage and threats associated with raccoons and beaver. In addition, this supplement will evaluate the increasing requests for assistance associated with feral swine, opossum, porcupine, gray squirrel, red squirrel, Northern flying squirrel, Southern flying squirrel, feral cat, deer mice, white-footed mice, house mice, meadow jumping mice, woodland jumping mice, Northern short-tailed shrews, masked shrews, water shrews, smoky shrews, long-tailed shrews, pygmy shrews, least shrews, hairy-tailed moles, Eastern moles, star-nosed

moles, Southern red-backed voles, meadow voles, rock voles, woodland voles, and Norway rats, which were not addressed in the EA.

Table 3 lists those mammal species and the resource types that those mammal species can cause damage to in New Hampshire, including those mammal species that were not addressed in the EA. Many of the mammal species can cause damage to or pose threats to a variety of resources. Most requests for assistance received by WS are associated with those mammal species causing damage or threats of damage to property and posing a threat to human safety.

Table 3 – Mammal species addressed in the EA and supplement and the resources damaged

Species	Resource[a]				Species	Resource			
	A	N	P	H		A	N	P	H
white-tailed deer	X	X	X	X	**white-footed mouse**	X		X	X
black bear	X		X	X	**house mouse**	X	X	X	X
woodchuck	X	X	X	X	**meadow jumping mouse**			X	X
raccoon	X	X	X	X	**woodland jumping mouse**			X	X
muskrat	X	X	X	X	**Northern short-tailed shrew**			X	X
beaver	X	X	X	X	**masked shrew**			X	X
red fox	X	X	X	X	**water shrew**			X	X
striped skunk	X	X	X	X	**smoky shrew**			X	X
gray fox	X	X	X	X	**long-tailed shrew**			X	X
coyote	X	X	X	X	**pygmy shrew**			X	X
feral swine	X	X	X	X	**least shrew**			X	X
Virginia opossum	X	X	X	X	**hairy-tailed mole**			X	X
porcupine	X	X	X	X	**Eastern mole**			X	X
gray squirrel			X	X	**star-nosed mole**			X	X
red squirrel			X	X	**Southern red-backed vole**			X	X
Northern flying squirrels			X	X	**meadow vole**			X	X
Southern flying squirrels			X	X	**rock vole**			X	X
feral cats	X	X	X	X	**woodland vole**			X	X
deer mouse	X		X	X	**Norway rat**	X	X	X	X

[a]A=Agriculture, N =Natural Resources, P=Property, H=Human Safety

Disease Surveillance and Monitoring

Public awareness and health risks associated with zoonoses (*i.e.*, diseases of animals that can be transmitted to humans) have increased in recent years. Concerns for zoonotic diseases were addressed in section 1.3.1 of the EA and many continue to pose threats to human safety where people encounter mammals (USDA 2005*a*). As part of the activities conducted to alleviate damage or threats of damage associated with those mammal species, WS also receives requests for assistance with conducting disease monitoring and surveillance activities as part of those activities. Most disease sampling occurs ancillary to other wildlife damage management activities (*i.e.*, disease sampling occurs after wildlife have been captured or lethally taken for other purposes). For example, WS may sample deer that were harvested during the annual hunting season for Chronic Wasting Disease (CWD). WS could also be requested to collect ticks from moose that were harvested during the regulated hunting season. Although CWD has not been identified in cervid populations in New Hampshire, WS could be requested to conduct surveillance activities for CWD, such as taking lymph node samples from cervids culled from captive herds when requested by the NHFG. WS has also assisted the New Hampshire Department of Health and

Human Services (NHDHHS) with the collection of giardiasis samples from beaver harvested during the annual trapping season.

WS could be requested to conduct disease surveillance activities involving those mammal species addressed in the EA. In addition, WS could receive requests for assistance to conduct disease sampling and surveillance in populations of those mammals that were not addressed in the EA but are being addressed in this supplement to the EA, primarily feral swine.

Feral swine are potential reservoirs for at least 30 viral and bacterial diseases (Davidson and Nettles 1997, Samuel et al. 2001, Williams and Barker 2001) and 37 parasites (Forrester 1991) that are transmissible to humans. In addition, feral swine can pose risks to domestic livestock through the potential transmission of diseases between feral swine populations and domestic livestock where interactions may occur.

In addition to activities being requested to monitor diseases in feral swine populations, the WS program is increasingly being requested to sample for diseases in other mammalian species (see Table 4). WS has been requested to conduct disease surveillance and monitoring activities for plague, tularemia, and raccoon roundworms in raccoons and other mammals. Ticks have also been collected from mammals addressed during damage management activities and at big game check stations for tick-borne disease testing, such as Lyme disease, anaplasmosis, and babesiosis. In those cases, sampling occurred opportunistically (*i.e.*, disease sampling was not the reason those animals were addressed).

Table 4 -Wildlife diseases of mammals that pose a human health and safety risk in the United Sates (modified from Davidson and Nettles 1997).

Disease	Causative Agent	Hosts
Anthrax	bacterium (*Bacillus antracis*)	Livestock, deer, dogs, cats
Demodectic mange	mange mite (*Demodex odocoilei*)	Deer
Sarcoptic mange	mite (*Sarcoptes scabiei*)	Red fox, coyotes, dogs
Swine brucellosis	bacterium (*Brucella suis)*	Swine
Trichinosis	nematode *(Trichinella spiralis)*	Swine, bears, raccoons, foxes, rats
Rabies	virus (Rhabidovirus)	All mammals
Visceral larval migrans	nematode (*Baylisascaris procyonis)*	Raccoons, skunks
Leptospirosis	bacteria (*Leptospira interrogans*)	All mammals
Echinococcus infection	tapeworm (*Echinococcus multilocularis*)	Fox, coyotes
Bovine Brucellosis	bacterium (*Brucela abortus*)	Cattle
Toxoplasmosis	protozoan parasite (*Toxoplasma ondii)*	Cats, other mammals, birds
Spirometra infection	tapeworm, (*Spirometra mansonoides)*	Bobcats, raccoons, fox, dogs, cats
Murine typhus	bacteria (*Rickettsia mooseri = R. typhi*)	Rats, mice
Giardiasis	protozoan parasite (*Giardia lamblia*)	beaver, coyotes, dogs, cats
Hantavirus Pulmonary Syndrome	Hantavirus	Rodents
Histoplasmosis	*Histoplasma capsulatum*	Fungus in bat guano
Lyme Disease	*Borelia burgdorferi* (spirocheate)	Rodents
Plague	*Yersinia pestis*	Rodents
Tularemia	Bacterium (*Francisella tularensis*)	Rodents, rabbits, and hares
Tuberculosis	*Mycobacterium bovis*	Cervids

Addressing Increasing Requests for Assistance Received by WS in New Hampshire

Since the EA was developed and the Decision was issued in 2005, the number of requests for assistance received by WS associated with damage or threats of damage caused by beaver, raccoons, and skunks have increased. As part of the requests for assistance, WS reasonably anticipates an increase in the number of mammals that may be addressed using lethal methods when those methods are requested by a cooperator. WS also anticipates an increase in non-lethal harassment and dispersal of those mammal species addressed in this supplement as part of the increasing requests for assistance.

To assist with communicating to the public the individual and cumulative impacts associated with managing increasing damage and threats in New Hampshire, those activities are being further analyzed and addressed in this supplement to the EA. Information regarding the need for action to manage damage associated with those species will be further evaluated by species.

In addition to those species addressed in the EA, the WS program has received requests for assistance to manage damage and threats of damage associated with feral swine, opossum, porcupine, squirrels, feral cats, mice, shrews, voles, moles, and rats which were not specifically addressed in the EA.

Agricultural damage and threats caused by feral swine in New Hampshire occurs to crops, livestock, and other agricultural resources. Damage occurs from direct consumption of agricultural crops and from trampling, rooting, and/or wallowing that are common activities of feral swine. Rooting is a common activity of feral swine during their search for food where they overturn sod and soil (Stevens 1996). Feral swine also wallow in water and mud to regulate body temperature and to ward off skin parasites.

Feral swine can cause damage to a variety of agricultural crops through direct consumption of the crop but also from trampling, rooting, and wallowing (Beach 1993). Damage and threats to livestock associated with feral swine result from predation on livestock and the risks associated with disease transfer from feral swine to domestic livestock. Feral swine can also cause damage to other agricultural resources. For example, feral swine can cause damage to pastures and land used for hay by rooting and wallowing, can cause damage to ponds and water sources for livestock, and can cause damage from the consumption of livestock feed. Feral swine feeding activities in agricultural crops can also lead to increased erosion from the removal of vegetation that leaves the soil bare along with the overturning of soil caused by rooting.

In addition to crop damage, feral swine damage pastures, land used for hay, and sod farms from rooting and wallowing activities (Beach 1993). Rooting activities can also lead to increased erosion and soil loss. Wallowing and rooting activities in livestock watering areas can lead to a degradation in water quality, by increasing turbidity, by causing algal blooms, by depleting dissolved oxygen, and increasing erosion (Beach 1993). Since feral swine often travel in family groups, damages from rooting and wallowing can be extensive often encompassing several acres.

Additional risks associated with feral swine include the potential for disease transmission from feral swine to domestic livestock, especially to domestic swine. Feral swine are potential reservoirs for several diseases that are known to be transmissible between feral swine and domestic livestock (Wood and Barrett 1979, Corn et al. 1986, Beach 1993). Corn et al. (1986) found feral swine tested in Texas were positive for pseudorabies, brucellosis, and leptospirosis. A study in Oklahoma found samples from feral swine tested positive for antibodies of porcine parvovirus, swine influenza, and porcine reproductive and respiratory syndrome virus (Saliki et al. 1998). Cholera, trichinosis, and African swine fever are additional diseases that can be transmitted between livestock and feral swine. Disease transmission is likely to occur where domestic livestock and feral swine have a common interface, such as at water sources and livestock feeding areas.

Although several diseases known to be carried by swine are also transmissible to other livestock, the primary concern is the potential transmission of diseases from feral swine to domestic swine. Pseudorabies is a viral disease associated with an extremely contagious herpes virus that can have negative impacts on reproduction in domestic swine. Brucellosis is a bacterial disease that can also have negative impacts on reproduction of swine. Many of the other diseases associated with feral swine also negatively affect the health and marketability of domestic swine that can lead to economic losses to the livestock producer.

The United States is one of the world's largest producers of pork and is the second largest exporter of pork. Pork production in the United States accounts for about 10% of the total world supply. The retail value of pork sold to consumers exceeds $30 billion annually. In addition, the pork industry supports more than 600,000 jobs. An economic analysis estimated that the annual cost of pseudorabies to pork producers in the United States at more than $30 million annually in lost production as well as testing and vaccination costs (USDA 2008). The WS program in New Hampshire conducts disease surveillance in the feral swine population as part of the National Wildlife Disease Surveillance Program. Since the testing of feral swine began, no feral swine in New Hampshire have tested positive for swine brucellosis or pseudorabies, which are the two diseases of primary concern.

Although the source of livestock disease outbreaks can be difficult to identify, a risk of transmission and the spreading of diseases to domestic swine and other livestock exists wherever feral swine and domestic livestock interact. A disease outbreak not only has negative economic implications to the individual livestock producer, but also can cause economic losses that can negatively affect the statewide swine industry.

In addition to the potential for disease transmission, feral swine are known to predate on livestock. Feral swine are known to kill calves, kids, lambs, and poultry (Stevens 1996). Predation occurs primarily on young livestock, but feral swine can also kill weakened or injured livestock. Predation of livestock likely does not occur with regular frequency. However, if feral swine populations continue to increase, WS could be requested to address localized predation associated with feral swine.

Overall, feral swine damages to agricultural resources in New Hampshire are not well documented. Since feral swine are documented to cause damage and pose threats to agricultural resources where they occur, an increase in the statewide population of feral swine could lead to an increase in the number of requests for assistance received by WS to manage damage and threats.

Natural resources may be described as those assets belonging to the public and often managed and held in trust by government agencies for citizens. Such resources may be plants or animals, including threatened and endangered (T&E) species, historic properties, or habitats in general. Examples of natural resources are historic structures and places; parks and recreation areas; natural areas, including unique habitats or topographic features; threatened and endangered plants or animals; and any plant or animal populations which have been identified by the public as a natural resource.

Feral swine compete with over 100 species of native wildlife for important and limited natural food supplies. Native animals in direct competition with feral swine for quality food include high profile species such as deer, wild turkey, quail, and black bear. Some species including quail, turkey, endangered sea turtles, and shorebirds are at risk of predation by nest destruction and the consuming of eggs. Feral swine cause damage to natural flora and fauna on private lands along with designated natural areas such as parks and wildlife management areas. Those sites suffer erosion and local loss of critical ground plants and roots as well as destruction of seedlings because of their feeding and other activity (Barrett and Birmingham 1994). Many state and federal natural resource managers are now in the process of

controlling swine numbers because of their known impact to endangered plants and animals (Thompson 1977).

Feral swine are known to feed on many smaller animals (some threatened or endangered), disrupt ecosystems via rooting, and feeding on rare and endangered plants. Many experts in the fields of botany and herpetology have observed declines in some rare species of plants, reptiles, amphibians, and soil invertebrates (Singer et al. 1982) in areas inhabited by feral swine. It has been well documented that feral swine disturb large areas of vegetation and soils through rooting, and it is documented that swine inhabiting coastal, upland, and wetland ecosystems are uprooting, damaging, and feeding on rare native species of plants and animals (Means 1999). It has been documented that swine can disrupt natural vegetative communities, eliminate rare plants and animals, and alter species composition within a forest including both canopy and low growing species (Lipscomb 1989, Frost 1993). Feral swine rooting and wallowing can also increase water turbidity in streams and wetlands (reducing water quality and affecting native fishes), increase soil erosion, and alter nutrient cycling (Singer et al. 1982, DeBenedetti 1986). For example, Kaller and Kelso (2003) found that feral and free-ranging swine were linked to increased levels of fecal coliform and other potentially pathogenic bacteria in several Louisiana watersheds. Additionally, some species of freshwater mussels and aquatic insects have been negatively impacted by feral swine (Kaller and Kelso 2006).

Feral swine can damage landscaping, golf courses, roads, drainage ditches and cause erosion by feeding in these areas. Feral swine dig or root in the ground with their nose in search of desired roots, grubs, earthworms, and other food sources. Feral swine can damage landscaping, golf courses, roads, drainage ditches and cause erosion by feeding in these areas. The rooting and digging activity of feral swine turns sod and grass over which often leaves the area bare of vegetation and susceptible to erosion. Feral swine also pose a threat to property from being struck by motor vehicles and aircraft.

Feral swine can pose a threat to human safety from disease transmission, from aggressive behavior, and from being struck by vehicles and aircraft. Feral swine are potential reservoirs for at least 30 viral and bacterial diseases (Davidson and Nettles 1997, Samuel et al. 2001, Williams and Barker 2001) and 37 parasites (Forrester 1991) that are transmissible to humans. Brucellosis, salmonellosis, toxoplasmosis, trichinosis, tuberculosis, and tularemia are some of the common diseases that can be carried by feral swine that are also known to infect humans (Stevens 1996, Hubalek 2002, Seward et al. 2004). Actual transmission of diseases from feral swine to humans is rare (Amass 1998).

In addition to threats from disease transmission, feral swine can pose risks from aggressive behavior and from being struck by motor vehicles and aircraft. Feral swine can be very aggressive toward people, especially when threatened. Collisions with motor vehicles and aircraft can also threaten human safety if the operator loses control of the vehicle or if the damage to aircraft is severe.

In many circumstances, assistance with a wildlife conflict is requested because of a perceived risk to human health or safety associated with wild animals living near humans or acting abnormally in human-inhabited areas. Under the alternatives, WS could assist in resolving those types of requests. In the majority of cases in which human health concerns are a major reason for requesting assistance with feral swine damage, there may have been no actual cases of transmission of disease to humans to prompt the request. Therefore, the potential for disease transmission would be the primary reason for requesting WS' assistance. Situations where the threat of disease associated with feral swine populations might occur include, but are not limited to:

- Exposure to the threat of disease transmission due to high populations of feral swine near agricultural facilities or from companion animals encountering infected swine or other wild, feral or domestic animals contracting diseases (*e.g.*, pets, farm animals, feral cats, skunks, fox). Some

diseases such as the West Nile virus may be transmitted by biting flies or mosquitoes and are typically more of a threat during the time of year that those insects are more prevalent. It should be noted that West Nile virus antibodies have been found in feral swine but it is not known if the virus can be transmitted from feral swine blood.

- Exposure to the bacterium, *Brucella suis*, which causes swine brucellosis. Swine are considered the natural host for *B. suis* which can be harbored without signs of illness. Humans may contract the disease by handling, dressing, or eating undercooked meat.

Feral swine commonly feed in roadside ditches and may cross streets and highways. With some animals weighing as much as five hundred or more pounds, physical injuries to humans can occur when vehicles collide with, or try to avoid hitting these animals. Feral swine may pose an aviation threat (to aircraft and human safety) when they are found in aircraft operating areas on airports. At least one crash in Florida was caused by feral swine on a runway. In Louisiana, at least four civilian and military airports have reported problems with free-ranging feral swine and have taken action to remove them.

Beaver activity in certain situations can become a threat to public health and safety (*i.e*., burrowing into or flooding of roadways and railroad beds can result in serious accidents) (Miller 1983, Woodward 1983). Increased water levels in urban areas resulting from beaver activity can lead to unsanitary conditions and potential health problems by flooding septic systems and sewage treatment facilities (De Almeida 1987, Loeb 1994). Beaver damming activity also creates conditions favorable to mosquitoes and can hinder mosquito control efforts or result in population increases (Wade and Ramsey 1986). While the presence of those insects is largely a nuisance, mosquitoes can transmit diseases, such as encephalitis (Mallis 1982) and West Nile Virus (CDC 2000). In addition, beaver are carriers of the intestinal parasite *Giardia lamblia*, which can contaminate human water supplies and cause outbreaks of the disease Giardiasis in humans (Woodward 1983, Beach and McCulloch 1985, Wade and Ramsey 1986, Miller and Yarrow 1994). The CDC has recorded at least 41 outbreaks of waterborne Giardiasis, affecting more than 15,000 people. Beaver are also known carriers of tularemia, a bacterial disease that is transmittable to humans through bites by insect vectors or infected animals or by handling animals or carcasses, which are infected (Wade and Ramsey 1986). Skinner et al. (1984) found that in cattle-ranching sections of Wyoming, the fecal bacteria count was much higher in beaver ponds than in other ponds, something that can be a concern to ranchers and recreationists. On rare occasions, beaver may contract the rabies virus and attack humans.

Large rodents cause damage to a variety of property types in New Hampshire on an annual basis. Most damage caused by beaver is a result of dam building, bank burrowing, tree cutting, obstructing culverts, overflow structures and spillways, or flooding. Some cases of beaver damage include roads being flooded, reservoir dams being destroyed by bank den burrows, and train derailments being caused by continued flooding and burrowing (Miller and Yarrow 1994). Housing developments have been threatened by beaver dam flooding. Some small bridges also have been destroyed because of beaver dam-building activity. Miller (1983) estimated that the annual damage by beaver in the United States was $75 to $100 million. The estimated value of beaver damage is perhaps greater than that of any other single wildlife species in the United States, with economic damage estimated to have exceeded $4 billion in the southeastern United States over a 40-year period (Arner and Dubose 1982). In certain southeastern states, losses from beaver damage have been estimated at $3 million to $5 million dollars annually (Miller and Yarrow 1994), with timber losses as the most common type of damage (Hill 1982). Tracts of bottomland hardwood timber up to several thousand acres in size may be lost to beaver activity (Miller and Yarrow 1994). Surveys in North Carolina and Alabama indicated that the majority of landowners with beaver damage on their property desire damage management via beaver removal (Hill 1976, Lewis 1979, Woodward et al. 1985).

Loker et al. (1999) found that suburban residents also might desire lethal management methods to resolve beaver damage conflicts. Such conflicts, which are viewed as damage, result in adverse impacts that often outweigh benefits (Miller and Yarrow 1994). Beaver often inhabit sites in or adjacent to urban/suburban areas and cut or girdle trees and shrubs in yards, undermine yards and walkways by burrowing, flood homes and other structures, destroy pond and reservoir dams by burrowing into levees, gnaw on boat houses and docks, and cause other damage to private and public property (Wade and Ramsey 1986). Additionally, roads and railroads may be damaged by saturation of the roadbed from beaver flooding or by beaver burrowing into the banks that comprise roadbeds and railroad beds.

Large rodents, such as beaver, are often attracted to airports and landfills. Drainage ditches, settling and retention ponds, natural and man-made wetlands and other surface water on or adjacent to airports and landfills provide beaver habitat. Beaver damming can create flooding near or along aircraft runways and taxiways, which poses a safety concern on airports. Damage to berms and dams used to create settling or retention ponds used to remove sediments from water or contain contaminated surface water originating from a landfill. Failure of these dams or berms could result in flooding that could threaten human safety, damage property and result in sedimentation of streams or contamination soil and wetlands. Beaver damming activity can flood settling and retention ponds. Dams may also inhibit access to non-potable water sources used by landfills to control dust.

Farmers in New Hampshire produce a wide variety of cash crops including but not limited to corn, hay, blueberries, apples, vegetables (cucumbers, beans, peas, tomatoes, pumpkins, squash, and other greens), turf nursery crops, Christmas trees, and ornamental horticulture. Beaver may cause damage to a variety of agricultural crops in New Hampshire. Beaver have been observed damaging field and sweet corn by local farmers and WS' personnel in New Hampshire and reports of feeding and damage on other field crops as well as commercially grown standing timber and seedling trees. Populations of beaver are abundant throughout New Hampshire. Beaver activities cause flooding of prime bottomland crop fields, causing severe economic losses to agricultural producers. Similar flooding and subsequent killing of trees occurs in some commercial forest tracts, killing harvestable trees or seedlings.

Most property damage caused by beaver in New Hampshire is a result of dam building, bank burrowing, tree cutting, obstructing culverts, overflow structures and spillways, or flooding. Some cases of beaver damage include roads being flooded, reservoir dams being destroyed by bank den burrows, and train derailments being caused by continued flooding and burrowing (Miller and Yarrow 1994). Housing developments have been threatened by beaver dam flooding. Some small bridges also have been destroyed because of beaver dam-building activity. Miller (1983) estimated that the annual damage by beaver in the United States was $75 to $100 million. The estimated value of beaver damage is perhaps greater than that of any other single wildlife species in the United States, with economic damage estimated to have exceeded $4 billion in the southeastern United States over a 40-year period (Arner and Dubose 1982). In certain southeastern states, losses from beaver damage have been estimated at $3 million to $5 million dollars annually (Miller and Yarrow 1994), with timber losses as the most common type of damage (Hill 1982). Tracts of bottomland hardwood timber up to several thousand acres in size may be lost to beaver activity (Miller and Yarrow 1994). Surveys in North Carolina and Alabama indicated that the majority of landowners with beaver damage on their property desire damage management via beaver removal (Hill 1976, Lewis 1979, Woodward et al. 1985).

Sometimes the activities of beaver inflict damage to natural resources. This most frequently occurs in relation to plants or other animals, including but not limited to, trees, natural vegetation of other types, other mammals, birds, reptiles, amphibians, and fish. Beaver can cause extensive damage to timber, seedling trees, Christmas trees, and other vegetation in natural areas, park, and recreation areas, and wetland mitigation sites in New Hampshire. Beaver activities also destroy critical habitat types (*e.g.* free-flowing water, riparian areas, and bird roosting and nesting areas) which are important to many wildlife

species, including certain species of fish and mussels. Patterson (1951) and Avery (1992) reported the presence of beaver dams could negatively affect fisheries. Beaver dams may adversely affect stream ecosystems by increasing sedimentation in streams, and thereby negatively affecting wildlife that depend on low turbidity. Beaver activity has been suggested to cause serious degradation to riparian habitat, which might otherwise support populations of endangered mussel species in New Hampshire.

In the majority of cases in which human health concerns are a major reason for requesting WS' assistance, there may have been no actual cases of transmission of disease to humans by mammals to prompt the request. Thus, the risk of disease transmission would be the primary reason for requesting assistance. Situations in New Hampshire where the threat of disease associated with beaver populations might occur could be:

- Exposure by residents to the threat of rabies due to populations of large rodents in urban or suburban settings or from companion animals encountering infected beaver in any environment.

- Accumulated droppings from denning or foraging large rodents and subsequent exposure to disease organisms in fecal deposits in an urban or suburban community or at an industrial site where humans must live or work in areas of accumulation. Threats of parasitic infections to humans from *Giardia* spp. resulting from high beaver populations in a park or recreation area where swimming was allowed. In 2007, a New Hampshire community experienced a localized giardiasis outbreak that was traced back to beaver contaminating a well water source. A cooperative effort to collect and test beaver included WS, the NHFG, and the NHDHHS.

- Threats of *Escherichia coli* (*E. coli*), salmonella, and other disease-causing organisms contaminating drinking water supplies or field crops after flooding of sewer/septic systems due to beaver activity.

Shrews, voles, moles, mice, and Norway rats can cause damage, primarily associated with consumption of landscaping vegetation, garden plants, gnawing on trees, burrowing activities, and infesting homes or buildings. However, most requests for assistance received by WS are associated with those species at airports where they act as attractants for other wildlife species that can pose a threat to aviation safety. Raptors and other carnivores can be attracted to airports with high densities of small mammals and rodents, which pose a strike risk on airports.

WS often is requested to conduct small mammal trapping projects at airports to determine rodent species and densities or rodents using the airfield as part of wildlife hazard assessments. The wildlife hazard assessments are often used by airports to develop wildlife hazard management plans, which outline strategies and goals for reducing aircraft strike risks associated with wildlife.

In addition to rodents, there has been an increase in the need to address complaints relevant to raccoons, skunks, and opossums. In New Hampshire, raccoons cause damage to gardens, residential and non-residential buildings, fish, domestic fowl, and pets, as well as general property damage. Results of their feeding may be economic losses of cash crops, such as corn. Damage to buildings generally occurs when they seek to gain entry or begin denning in those structures. Raccoons may den in uncapped chimneys, or may tear off shingles or fascia boards to gain access to attics or wall spaces. They may also damage or destroy sod by rolling it up in search of earthworms and other invertebrates (Boggess 1994).

The public is also concerned about health and safety issues associated with raccoons, primarily from disease transmission. These diseases include, but are not limited to, canine distemper and rabies, and the roundworm *Baylisascaris procyonis*, the eggs of which survive for extremely long periods in raccoon

feces and soil contaminated by them. Ingestion of these eggs can result in serious or fatal infections in other animals as well as humans (Davidson and Nettles 1997; see Table 4).

Skunks can become a nuisance in a variety of ways due to their distinctive odor, burrowing and feeding habits. They may burrow to create a den under home porches or buildings by entering foundation openings. Skunks will forage and feed in garbage bins or refuse, beehives, birdfeeders, pet and livestock food, and on corn and other agricultural crops. They dig in gardens, lawns, golf courses, and fields in search of insects. Skunks will occasionally kill domestic fowl and consume eggs. Similar to skunks, opossums may be considered a nuisance animal due to their frequency around both residential and non-residential buildings. Opossums will get into garbage, bird feeders or pet and livestock food. They can also destroy domestic fowl or wild birds and their nests. Both skunks and opossums are also known carriers and vectors of the rabies virus.

Porcupines cause damage to property primarily through feeding and chewing. They can cause extensive damage to timber, seedling trees, forest plantings, ornamentals, orchards, nurseries, and other vegetation in natural areas and park and recreation areas (Schemnitz 1994). In some instances, economic losses can be considerable. They may chew on any item that has been exposed to salt, particularly items such as hand tools that have been exposed to human sweat. Porcupine quills may also cause injury to pets and domestic stock, particularly dogs that attempt to bite them or interact with them. Quills cause pain and can even be fatal to dogs and other animals if not property treated.

Eastern gray squirrels, red squirrels, and both the Northern and Southern flying squirrel are the species of tree squirrels encountered in New Hampshire. Squirrels may occasionally damage trees by chewing bark and nipping branches interfering with commercial production, natural reseeding, and ornamentals. Squirrels can also cause damage and negatively affect production in nut and fruit orchards. In residential areas, squirrels will travel power lines and can short out transformers. They will gnaw on wires creating a fire hazard and on buildings to gain access for shelter and nesting. Once in a structure, they can cause damage to insulation, wiring, chimneys, and other property (Jackson 1994*a*). In New England, squirrels cause considerable damage to maple sugaring operations by gnawing tubing line systems used to collect sap with estimated damages of $300,000 annually for Vermont (Howard and Pelsue, Jr. 1987). Squirrels will also damage lawns and gardens by digging and feeding and often take food at feeders intended for birds. Flying squirrels have been documented eating bird nestlings.

Feral cats feed extensively on native animals including songbirds, game birds, rodents, rabbits, amphibians, and other wildlife. Some of the species they prey on are protected, such as, the piping plover which is an endangered species in New Hampshire. Their impact on wildlife populations in suburban and rural areas not only occurs through predation but competition for food resources with native predators like fox, raccoons, coyotes, and weasels (Coleman and Temple 1989). Feral cats will also cause property damage by foraging in garbage and seeking refuge in residential buildings. They will occasionally kill poultry, injure house cats, and are an important vector for disease.

Feral cats have been found to transmit *Toxoplasma gondii* to both domestic and wild animal species. Dubey et al. (1995) found cats to be 68.3% positive for seroprevalence of *T. gondii* on swine farms in Illinois and the major reservoir for this disease. Cats have been found to be important reservoirs and the only species known to allow for the completion of the life cycle for the protozoan parasite, *T. gondii* (Dubey 1973, Teutsch et al. 1979). Both stray and domiciled cats may be infected by this protozoan, but this infection is more common in stray cats. Diseases that may be communicable from free- ranging or feral cats to house cats include feline panleukopenia (FPL) infection, feline calicivirus (FCV) infection, feline reovirus (FRV) infection, and feline syncytium-forming virus (FSV) infection (Gillespie and Scott 1973). Feral cats serve as major reservoirs for the bacterium *Bartonella* spp., which can cause cat scratch disease in humans. In areas where dog rabies has been eliminated, but rabies in wildlife has not, cats

often are the most significant animal transmitting rabies to humans (Vaughn 1976, Eng and Fishbein 1990, Krebs et al. 1996).

V. RELATIONSHIP TO OTHER ENVIRONMENTAL DOCUMENTS

The relationship of this supplement to the EA and other environmental documents, including those discussed in Section 1.4 of the EA, are discussed below.

USDA 1994/97 FEIS: Animal Damage Control Programmatic Environmental Impact Statement
WS has determined that this matter is best assessed at the State level in an EA. WS' decision and actions regarding mammal damage management in New Hampshire rely solely and exclusively on the decision document and record on this supplement. The 2005 EA on mammal damage management in New Hampshire incorporated by reference, sections, discussions, appendices, or other portions thereof, of USDA 1994/97. This Supplemental EA does not incorporate by reference to USDA 1994/97.

Environmental Assessment and Finding of No Significant Impact – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Fox, and Coyotes in the United States: An EA was developed to analyze the potential for environmental effects of WS' involvement in the funding of and participation in Oral Rabies Vaccination programs to eliminate or stop the spread of raccoon rabies in a number of eastern states (including New Hampshire) and gray fox and coyote rabies in Texas (USDA 2001). The EA has been supplemented with additional information and analyses. Pertinent information from the EA and supplements has been incorporated by reference into this document.

Environmental Assessment and Finding of No Significant Impact – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons on National Forest System Lands in the United States: An EA was developed to analyze the environmental effects of WS' involvement in the funding of and participation in Oral Rabies Vaccination programs to eliminate or stop the spread of raccoon rabies on Forest Service lands in a number of eastern states (including New Hampshire) (USDA 2005*b*). Pertinent information from the EA and supplements has been incorporated by reference into this document.

VI. WS' RECORD KEEPING REGARDING REQUESTS FOR MAMMAL DAMAGE MANAGEMENT ASSISTANCE

WS continues to maintain a Management Information System (MIS) as described in Section 1.5 of the EA. Information from requests for assistance received by WS can be entered into the database, including the number of individuals involved in a damage situation; tools and methods used or recommended to alleviate the conflict; and the resource that is in need of protection. WS continued to assist those cooperators requesting assistance with damage caused by mammals in New Hampshire from federal fiscal year (FY)[4] 2005 through FY 2011. Those persons requesting assistance reported damages to timber, roads, crops, pasture, and drainage control devices, primarily from beaver burrowing into embankments, beaver gnawing on and felling trees, and from flooding caused by beaver impounding water through dam building.

WS provided both technical assistance and direct operational assistance as described in the EA from FY 2005 through FY 2011. Technical assistance provides those persons interested with information and recommendations on preventing wildlife damage and effective methods for resolving damage that are legally available for use. This information can then be employed by those persons experiencing wildlife damage to effectively resolve damage without WS' direct involvement.

[4]The federal fiscal year begins on October 1 and ends on September 30 the following year.

Direct operational assistance occurs when WS is directly involved with employing methods to resolve, alleviate, or reduce threats. As directed by the selected alternative, WS applies multiple methods as part of an integrated damage management program to resolve requests for assistance. WS' technical assistance and direct operational programs are discussed in detail in the EA (USDA 2005*a*). WS' activities conducted from FY 2005 through FY 2011 are summarized below and are based on information available from the MIS.

Mammal Damage Management Conducted in New Hampshire by WS during FY 2005

WS continued to implement and employ an integrated damage management approach to reducing threats and damage caused by mammals in FY 2005 through the recommendation and use of multiple methods. WS received 1,293 requests for technical assistance with mammal species in FY 2005. Technical assistance was provided to those interested through the dissemination of handouts and information regarding damage management techniques, species identification, methods demonstrations, and site visits. Requests for assistance involved damage and threats to property, human health and safety, natural resources, and agriculture. Technical assistance projects involved damage or threats of damage caused primarily by black bear, beaver, striped skunk, white-tailed deer, and red fox (see Table 5).

Table 5 - Technical assistance requests received by WS by species during FY 2005

	Resource[1]							Resource					
Species	**A**	**N**	**P**	**H**	**X**	**Total**	**Species**	**A**	**N**	**P**	**H**	**X**	**Total**
Bats (all)	0	0	22	29	0	**51**	**Mink**	4	1	0	0	0	**5**
Beaver	30	1	89	2	0	**122**	**Moles (all)**	0	0	3	0	0	**3**
Black Bear	81	6	120	94	0	**301**	**Moose**	6	0	2	1	0	**9**
Bobcat	1	0	4	0	0	**5**	**Muskrat**	0	0	4	0	0	**4**
Chipmunk	0	1	6	1	1	**9**	**Virginia Opossum**	1	0	6	7	0	**14**
Coyote	12	1	31	34	0	**78**	**River Otter**	1	0	0	0	0	**1**
White-tailed Deer	77	1	56	1	0	**135**	**Porcupine**	16	1	33	9	0	**59**
Feral dog	0	0	0	1	0	**1**	**Rabbits (all)**	1	0	0	1	0	**2**
Fisher	6	2	21	17	0	**46**	**Raccoon**	6	2	31	28	0	**67**
Gray Fox	1	0	5	3	1	**10**	**Striped Skunk**	0	0	33	101	0	**134**
Red Fox	13	1	43	50	0	**107**	**Squirrels (all)**	0	1	39	16	0	**56**
Woodchuck	4	0	43	11	0	**58**	**Weasel (all)**	2	1	1	2	0	**6**
Mice/Rats	0	4	2	4	0	**10**	**TOTAL**	**262**	**23**	**594**	**412**	**2**	**1,293**

[1]A=Agricultural Resources, N=Natural Resources, P=Property, H=Human Safety, X=No Resource identified (general information provided)

In addition to technical assistance, WS conducted direct operational assistance in New Hampshire in which WS was directly involved with resolving damage associated with mammal species. During FY 2005, WS provided direct operational assistance during two projects involving mammals. Those projects were conducted to reduce threats of damage associated with woodchucks. Damage reported by cooperators and verified by WS occurred from the burrowing, digging, and feeding behaviors of woodchucks. Burrowing and digging activities can lead to the weakening and failure of earthen dams used to retain water as well as lead to damage to foundations and walls when burrowing occurs against buildings. Damage can also occur from burrowing in gardens and from feeding on vegetables and other landscaping plants, since woodchucks feed primarily on vegetative matter. Woodchucks are known to feed on wild lupine (*Lupinus* spp.) which is a perennial legume that is essential for the completion of the life cycle of the federally endangered Karner blue butterfly (*Lycaeides melissa samuelis*). Karner blue butterflies lay their eggs on or near wild lupine with the hatching caterpillar feeding exclusively on wild lupine.

To alleviate damage associated with woodchucks at the request of cooperators, WS used 184 gas cartridges (EPA Reg. No. 56228-2) to fumigate woodchuck burrows to alleviate damage. During the use of fumigants, three woodchucks are known by WS to have been killed. The total number of woodchucks killed in treated burrows is unknown because some burrows were treated a number of times based on recent woodchuck activities at those locations. The number of entrances to burrow systems used by woodchucks varies. Twichell (1939) found the number of entrances to burrow systems used by woodchucks ranged from two to six entrances in Missouri with the average number being 2.8 entrances. Other studies note the number of entrances per burrow system ranged from one to five entrances (Grizzell, Jr. 1955) to high of 11 entrances per system (Merriam 1971). Merriam (1971) found the mean number of entrances per burrow system was 2.98 entrances. The use of burrow systems is usually restricted to a male and a reproductive female (Swihart 1992, Armitage 2003). Since woodchucks can be taken at any time without a limit on the number of individuals that can be taken and no requirements to report take, take information is currently not available for woodchucks in New Hampshire.

Mammal Damage Management Conducted in New Hampshire by WS during FY 2006

WS continued to implement and employ an integrated damage management approach to reducing threats and damage caused by mammals in FY 2006 through the recommendation and use of multiple methods. WS received 1,338 requests for technical assistance associated with mammal species. Technical assistance was provided through the recommendation of methods to resolve damage and threats without WS' direct involvement. Technical assistance was provided to those persons interested through the dissemination of handouts and information regarding damage management techniques, species identification, methods demonstrations, and site visits. Requests for assistance involved damage and threats to property, human health and safety, natural resources, and agriculture. The primary species involved during technical assistance requests were black bear, beaver, striped skunk, and red fox (see Table 6).

Table 6 - Technical assistance requests received by WS by species during FY 2006

	Resource[1]							Resource					
Species	**A**	**N**	**P**	**H**	**X**	**Total**	**Species**	**A**	**N**	**P**	**H**	**X**	**Total**
Bats (all)	0	3	23	48	0	**74**	**Mink**	0	0	1	1	0	**2**
Beaver	16	3	128	12	1	**160**	**Moles (all)**	0	0	2	0	0	**2**
Black Bear	98	5	69	99	0	**271**	**Moose**	1	0	11	3	0	**15**
Bobcat	3	2	1	3	0	**9**	**Muskrat**	0	0	2	2	0	**4**
Feral Cat	0	1	0	2	0	**3**	**Virginia Opossum**	1	1	8	5	0	**15**
Chipmunk	0	0	1	3	0	**4**	**River Otter**	0	0	0	0	1	**1**
Coyote	13	3	29	43	0	**88**	**Porcupine**	2	0	18	5	0	**25**
White-tailed Deer	55	4	34	3	0	**96**	**Rabbits (all)**	0	1	0	1	0	**2**
Fisher	7	1	31	14	0	**53**	**Raccoon**	7	1	24	41	0	**73**
Gray Fox	2	1	3	6	0	**12**	**Shrews (all)**	0	0	0	1	0	**1**
Red Fox	11	7	43	51	0	**112**	**Striped Skunk**	2	3	56	112	0	**173**
Mountain Lion	0	1	0	0	0	**1**	**Squirrels (all)**	0	4	27	21	0	**52**
Woodchuck	2	1	62	11	0	**76**	**Weasel (all)**	2	1	1	2	0	**6**
Mice/Rats	0	0	4	4	0	**8**	**TOTAL**	**222**	**43**	**578**	**493**	**2**	**1,338**

[1]A=Agricultural Resources, N=Natural Resources, P=Property, H=Human Safety, X=No Resource

Similar to those operational assistance projects conducted in FY 2005, requests for direct operational assistance in FY 2006 involved mainly threats related to woodchucks. WS employed gas cartridges to treat 190 woodchuck burrows. WS provided assistance associated with woodchucks to the NHFG and the USFWS to protect foraging habitat for the endangered Karner blue butterfly. In addition, WS treated

burrows of woodchucks to alleviate burrowing damage into earthen dams at the request of a cooperator. During the use of gas cartridges, WS confirmed the lethal take of two woodchucks. However, the total number of woodchucks killed from the use of gas cartridges is unknown. In addition, WS employed cage traps to live-capture seven raccoons during FY 2006 as part of the National Rabies Management Program's ORV density study in northern New Hampshire (USDA 2001). After sampling, raccoons were then released on site unharmed.

Mammal Damage Management Conducted in New Hampshire by WS during FY 2007

WS' activities continued in FY 2007 with the recommendation and use of an integrated approach to managing mammal damage and threats. WS received 1,600 requests for assistance with mammal species through the recommendation of methods to resolve damage and threats. Requests for assistance involved damage and threats to property, human health and safety, natural resources, and agriculture. The primary species involved were black bear, raccoon, white-tailed deer, striped skunk, and red fox (see Table 7).

WS provided technical assistance involving at least 30 species of mammals. Similar to previous years, requests for assistance were primarily received to alleviate damage or threats of damage occurring to property. Nearly 46% of the technical assistance projects conducted by WS were associated with mammal damage to property. The number of mammal species addressed and technical assistance requests received by WS in FY 2007 increased compared to FY 2005 and FY 2006.

Table 7 - Technical assistance requests received by WS by species during FY 2007

	Resource[1]							Resource					
Species	**A**	**N**	**P**	**H**	**X**	**Total**	**Species**	**A**	**N**	**P**	**H**	**X**	**Total**
Bats (all)	0	2	15	47	0	**64**	**Mice/Rats**	0	1	3	9	0	**13**
Beaver	4	0	71	1	0	**76**	**Mink**	1	0	0	1	0	**2**
Black Bear	81	26	169	140	0	**416**	**Moles (all)**	0	0	3	0	0	**3**
Bobcat	1	1	5	3	1	**11**	**Moose**	5	2	6	0	0	**13**
Feral Cat	1	1	0	2	2	**6**	**Muskrat**	0	0	5	1	0	**6**
Chipmunk	0	0	8	6	0	**14**	**Virginia Opossum**	0	2	7	8	0	**17**
Coyote	13	8	32	28	0	**81**	**River Otter**	0	0	0	0	2	**2**
White-tailed Deer	76	2	47	2	0	**127**	**Porcupine**	5	4	34	12	0	**55**
Feral Dog	0	0	0	2	0	**2**	**Rabbits/Hare**	0	1	4	0	0	**5**
Ferret (domestic)	0	0	1	0	0	**1**	**Raccoon**	5	4	48	56	0	**113**
Fisher	5	5	16	11	0	**37**	**Shrews (all)**	0	0	1	0	0	**1**
Gray Fox	3	3	11	8	0	**25**	**Striped Skunk**	1	9	84	137	0	**231**
Red Fox	6	9	30	66	0	**111**	**Squirrels (all)**	0	6	66	16	0	**88**
Mountain Lion	0	1	0	0	0	**1**	**Voles (all)**	0	0	2	0	0	**2**
Woodchuck	4	1	61	4	0	**70**	**Weasel**	5	0	2	0	0	**7**
							TOTAL	**216**	**88**	**731**	**560**	**5**	**1,600**

[1]A=Agricultural Resources, N=Natural Resources, P=Property, H=Human Safety, X=No Resource

WS continued to provide operational assistance in FY 2007 to cooperators with managing damage and threats associated with woodchucks due to their negative impact on earthen dams, airport property and the federally endangered Karner blue butterfly. A total of two woodchucks were known to have been lethally taken by WS during the use of gas cartridges; however, a total of 175 burrow entrances were treated so the total number of woodchucks lethally removed is unknown. WS lethally removed muskrats and Norway rats through trapping. Muskrat burrowing and foraging activity were causing structural damage to property (buildings) and lawn erosion. Norway rats were damaging buildings, eating and

contaminating food, and polluting rainwater cisterns. Human health and safety concerns were associated with accumulations of droppings and aggressive behavior.

WS also assisted with a project to protect the endangered piping plover at a traditional nesting site. WS live-captured feral cats and other mammal predator species using cage traps. Feral cats were subsequently released to a local animal shelter to care for the cats and determine the adoptability of the cats. After release of the feral cats to the animal shelter, the care and disposition of the feral cats were the responsibility of the shelter.

WS used cage traps to live-capture raccoons as part of the National Rabies Management Program's ORV density study in Northern New Hampshire again in FY 2007. The methods employed by WS to take mammals to alleviate damage or threats of damage are shown in Table 8. Those methods employed by WS to alleviate damage or threats of damage were addressed in the EA in Appendix B (USDA 2005*a*). Mammals lethally taken in cage traps were live-captured and subsequently euthanized in accordance with WS Directive 2.505. Carcasses of target wildlife lethally removed by WS were disposed of in accordance with WS Directive 2.515.

Table 8 - WS' take of mammal species in New Hampshire during FY 2007 by method

Species	Method				TOTAL
	Cage Trap (lethal)[a]	Cage Trap (non-lethal)	Body Gripping Trap	Gas Cartridge[b]	
Woodchuck	0	0	0	175	**175[b]**
Muskrat	0	0	24	0	**24**
Opossum	1	0	0	0	**1**
Norway Rat	0	0	11	0	**11**
Striped Skunk	1	0	0	0	**1**
Raccoon	0	17[c]	0	0	**17**
Feral Cat	0	8[d]	0	0	**8**

[a]Mammals were live-captured using the described methods and subsequently euthanized in accordance with WS Directive 2.505.
[b]Represents the number of gas cartridges discharged not necessarily the number of woodchucks killed since actual take is unknown.
[c]Mammals were live-captured using the described methods and subsequently released on site as part of ORV Project.
[d]Mammals were live-captured using the described methods and subsequently released to a local animal shelter.

Mammal Damage Management Conducted in New Hampshire by WS during FY 2008

During FY 2008, WS continued to provide technical assistance and direct operational damage management to those persons requesting assistance with managing damage caused by mammals. WS received requests for technical assistance involving at least 27 mammal species while requests for direct operational assistance by WS involved four species. Requests for technical assistance received by WS during FY 2008 are shown in Table 9 by resource category.

A total of 1,714 technical assistance requests were received by WS. Most requests for assistance involved damage or threats of damage associated with black bear, beaver, white-tailed deer, red fox, and striped skunk. Overall, most requests for assistance were associated with threats to human safety representing over 52% of the requests received by WS during FY 2008. Of the requests received, 40% involved damage or threats of damage to property and 34% involved threats to human safety. Those persons requesting assistance reported to WS or WS verified damage associated with mammals totaling $142,674 in FY 2008 compared to $49,610 the previous fiscal year.

Table 9 - Technical assistance requests received by WS by species during FY 2008

Species	Resource[1]					Total	Species	Resource					Total
	A	N	P	H	X			A	N	P	H	X	
Bats (all)	0	3	18	36	0	**57**	**Woodchuck**	2	1	59	12	0	**74**
Beaver	20	3	83	1	2	**109**	**Mice/Rats**	0	0	0	3	0	**3**
Black Bear	99	31	194	168	0	**492**	**Mink**	3	0	1	1	0	**5**
Bobcat	5	3	4	2	0	**14**	**Moles (all)**	0	0	3	0	0	**3**
Feral Cat	0	0	0	2	0	**2**	**Moose**	5	1	6	1	0	**13**
Chipmunk	0	1	3	0	0	**4**	**Muskrat**	0	0	2	1	0	**3**
Coyote	15	12	18	30	1	**76**	**Virginia Opossum**	0	1	4	10	0	**15**
White-tailed Deer	106	5	68	6	1	**186**	**River Otter**	2	0	0	1	1	**4**
Elk (captive)	0	1	0	0	0	**1**	**Porcupine**	10	6	22	10	0	**48**
Fisher	10	9	15	15	0	**49**	**Rabbits/Hare**	0	2	1	1	0	**4**
Gray Fox	1	3	10	12	0	**26**	**Raccoon**	3	12	43	37	0	**95**
Red Fox	15	22	39	82	0	**158**	**Striped Skunk**	0	2	49	131	0	**182**
Mountain Lion	0	2	0	0	0	**2**	**Squirrels (all)**	0	10	35	11	0	**56**
Mammal (unidentified)	0	1	0	0	0	**1**	**Weasel (all)**	13	2	8	9	0	**32**
							TOTAL	**309**	**133**	**685**	**582**	**5**	**1,714**

[1]A=Agricultural Resources, N=Natural Resources, P=Property, H=Human Safety, X=No Resource

WS also employed lethal methods to take mammals at the request of cooperators to reduce damage or threats of damage. The methods employed by WS to take mammals to alleviate damage or threats of damage are shown in Table 10. Mammals lethally taken were live-captured in cage traps and subsequently euthanized in accordance with WS Directive 2.505 or were lethally taken in body-gripping traps. Similar to previous years, most requests for direct operational assistance were associated with woodchucks and threats to endangered species.

Table 10 - WS' take of mammal species in New Hampshire during FY 2008 by method

Species	Method				TOTAL
	Cage Trap (lethal)[a]	Cage Trap (non-lethal)[b]	Body-gripping Trap	Gas Cartridge[c]	
Woodchuck	0	0	10	221	**231[c]**
Opossum	1	0	0	0	**1**
Striped Skunk	1	0	0	0	**1**
Feral Cat	0	3	0	0	**3**

aMammals were live-captured using the described methods and subsequently euthanized in accordance with WS Directive 2.505.
[b]Mammals were live-captured using the described methods and subsequently released to a local animal shelter.
[c]Includes the number of gas cartridges discharged not necessarily the number of woodchucks killed since actual take is unknown.

Mammal Damage Management Conducted in New Hampshire by WS during FY 2009

During FY 2009, WS continued to receive and respond to requests for assistance to manage damage associated with mammals. To address those requests for assistance, WS continued to provide both technical assistance and operational assistance. Those persons requesting assistance reported to WS or WS verified damage associated with mammals totaling $18,277 in FY 2009. Similar to previous years, monetary damages associated with mammals that were reported to WS or were verified by WS occurred primarily to property and agriculture.

WS received 1,744 requests for assistance with mammal species through the recommendation of methods to resolve damage and threats. WS made recommendations on methods and techniques for reducing or alleviating damage caused by at least 29 species of mammals. Requests for assistance involved damage and threats to property, human health and safety, natural resources, and agriculture. The primary species involved were black bear, red fox, white-tailed deer, and striped skunks (see Table 11).

Table 11 - Technical assistance requests received by WS by species during FY 2009

Species	Resource[1]					Total	Species	Resource					Total
	A	N	P	H	X			A	N	P	H	X	
Bats (all)	0	1	2	29	1	**33**	**Mice/Rats**	0	0	0	2	0	**2**
Beaver	11	1	57	1	0	**70**	**Mink**	1	0	1	0	0	**2**
Black Bear	140	38	235	273	1	**687**	**Moles (all)**	0	0	2	0	0	**2**
Bobcat	5	6	5	2	0	**18**	**Moose**	4	1	3	2	0	**10**
Feral Cat	0	0	2	0	0	**2**	**Muskrat**	0	0	2	0	0	**2**
Chipmunk	0	0	3	2	0	**5**	**Virginia Opossum**	0	2	2	10	0	**14**
Coyote	8	9	23	25	0	**65**	**River Otter**	1	0	0	0	0	**1**
White-tailed Deer	80	4	46	6	1	**137**	**Porcupine**	3	2	23	10	0	**38**
Feral Dog	1	0	0	0	0	**1**	**Rabbits/Hare**	1	0	0	0	0	**1**
Fisher	3	5	24	9	0	**41**	**Raccoon**	7	8	27	55	0	**97**
Gray Fox	4	2	3	7	0	**16**	**Striped Skunk**	0	7	48	135	0	**190**
Red Fox	24	27	37	104	0	**192**	**Squirrels (all)**	0	9	19	9	0	**37**
Feral Hog	0	1	2	0	0	**3**	**Voles (all)**	0	0	1	0	0	**1**
Mountain Lion	0	1	0	0	0	**1**	**Weasel (all)**	2	0	1	0	0	**3**
Woodchuck	1	1	58	13	0	**73**	**TOTAL**	**296**	**125**	**626**	**694**	**3**	**1,744**

[1]A=Agricultural Resources, N=Natural Resources, P=Property, H=Human Safety, X=No Resource

In addition to technical assistance, WS continued to employ direct damage management activities during FY 2009 when requested. The number of mammals addressed by WS during FY 2009 is shown in Table 12. WS conducted two direct operational assistance projects associated with damage to property caused by woodchucks. The projects involved the protection of earthen dams and protecting airport property. WS continued to assist the NHFG with protection of endangered piping plover nesting colonies from predation. All take by WS to alleviate damage or threats of damage occurred within those parameters evaluated within the EA (USDA 2005*a*). In addition, damage management activities were only conducted on those properties when requested by the appropriate property owner or manager.

Table 12 - WS' take of mammal species in New Hampshire during FY 2009 by method

Species	Method				TOTAL
	Cage Trap (lethal)[a]	Cage Trap (non-lethal)	Body Gripping Trap	Gas Cartridge[b]	
Woodchuck	0	0	12	150	**162[b]**
Striped Skunk	2	0	0	0	**2**

[b]Mammals were live-captured using the described methods and subsequently euthanized in accordance with WS Directive 2.505.

[a]Includes the number of gas cartridges discharged not necessarily the number of woodchucks killed since actual take is un-determinable.

Mammal Damage Management Conducted in New Hampshire by WS during FY 2010

During FY 2010, WS continued to receive and respond to requests for assistance to manage damage associated with mammals. The number of requests for technical assistance reached 2,010 in FY 2010, a

15% increase from FY 2009 (see Table 13). As in FY 2009, damage or threats of damage to property and human safety were the primary resource for requests for assistance with mammals. Damage or threats of damage to property and human safety comprised 44% and 29% of the technical assistance requests received by WS, respectively. WS made recommendations on methods and techniques for reducing or alleviating damage caused by more than 30 species of mammals. Those persons requesting assistance reported to WS or WS verified damage associated with mammals totaling $28,284.

In addition to technical assistance, WS continued to employ direct damage management activities when requested. The number of mammals addressed by WS during FY 2010 is shown in Table 14. WS addressed at least nine mammal species during direct operational assistance to alleviate damage or threats of damage. Two of those species addressed by WS are not native to the State. Feral swine and house mice are non-native species in New Hampshire that often compete with native wildlife species for food and habitat.

Table 13 - Technical assistance requests received by WS by species during FY 2010

	Resource[1]							Resource					
Species	**A**	**N**	**P**	**H**	**X**	**Total**	**Species**	**A**	**N**	**P**	**H**	**X**	**Total**
Bats (all)	0	5	5	10	1	**21**	**Mice/Rats**	0	0	0	2	0	**2**
Beaver	5	5	42	0	0	**52**	**Mink**	3	0	1	0	0	**4**
Black Bear	201	48	465	317	0	**1,031**	**Moles**	0	0	1	0	0	**1**
Bobcat	2	2	1	3	0	**8**	**Moose**	0	0	1	1	0	**2**
Feral Cat	0	0	0	1	1	**2**	**Muskrat**	0	0	2	1	0	**3**
Chipmunk	1	0	4	3	0	**8**	**Virginia Opossum**	1	4	4	5	0	**14**
Coyote	19	5	31	16	1	**72**	**River Otter**	1	2	2	0	0	**5**
White-tailed Deer	81	5	31	2	0	**119**	**Porcupine**	1	3	33	10	1	**48**
Feral Dog	1	1	0	1	0	**3**	**Rabbits/Hare**	0	3	0	0	0	**3**
Fisher	7	2	23	9	0	**41**	**Raccoon**	7	8	33	21	1	**70**
Gray Fox	9	3	10	14	0	**36**	**Striped Skunk**	0	9	59	75	0	**143**
Red Fox	18	38	56	77	1	**190**	**Squirrels (all)**	0	7	29	8	0	**44**
Feral Hog	8	5	13	3	0	**29**	**Voles**	0	0	1	0	0	**1**
Mountain Lion	0	1	0	0	0	**1**	**Weasel**	6	0	2	1	0	**9**
Woodchuck	1	1	41	5	0	**48**	**TOTAL**	**372**	**157**	**890**	**585**	**6**	**2,010**

[1]A=Agricultural Resources, N=Natural Resources, P=Property, H=Human Safety, X=No Resource

WS' direct assistance in FY 2010 involved continuing to provide direct management to prevent damage caused by woodchucks to earthen dams, human safety, and air traffic. In addition to the woodchucks lethally taken through trapping, WS employed gas cartridges to fumigate woodchuck burrows at the request of a cooperator to alleviate damage or threats of damage.

To alleviate damage or threats of damage at airports, WS provided trapping assistance for removal of such mammals as red fox, raccoon, and striped skunk. Also at airports, mice, voles, moles, and shrews were targeted by WS as part of wildlife hazard assessments being conducted to determine the densities of small rodents on airport properties. Although small rodents can cause direct damage to resources, at airports those rodents often act as attractants for other wildlife that pose a strike risk to aircraft using the airport, such as raptors and predatory mammals. As part of a comprehensive wildlife hazard assessment, WS samples rodent densities on airport properties to determine and identify potential risks to aircraft associated with wildlife that could be attracted to an airport due to high densities of rodents.

From FY 2009 to FY 2010, assistance requests with feral swine increased from three to 29. Requests were primarily related to damage to both agriculture and property because of their destructive nature (*i.e.*,

rooting, wallowing, crop damage). WS provided direct operational assistance to as many as 10 landowners experiencing feral swine damage. Through trapping and shooting efforts, 17 feral swine were lethally removed to protect property and to collect samples for disease surveillance (see Table 14). Also, WS assisted cooperators with damage and threats of damage from beaver due to flooding and feeding activities. Beaver build dams in waterways to flood an area so they have access to food and cover to hide from predators. Both flooding and feeding behaviors can cause damage to property, homes, water quality, timber, agricultural crops and ornamental plants, trees and gardens. WS used trapping and shooting methods to lethally remove 24 beaver.

Table 14 - WS' take of mammal species in New Hampshire during FY 2010 by method

Species	Method								Total
	Cage Trap[a]	Cage Trap[b]	Conibear	Foothold Trap	Snare	Firearm	Snap Trap	Gas Cartridge[c]	
Beaver	0	0	13	1	2	8	0	0	**24**
Red Fox	0	0	0	4	0	0	0	0	**4**
Feral Hog	14	0	0	0	0	3	0	0	**17**
Woodchuck	0	0	0	0	0	0	0	188	**188[c]**
Deer Mice	0	0	0	0	0	0	68	0	**68**
House Mice	0	0	0	0	0	0	5	0	**5**
Raccoon	0	19	0	2	0	0	0	0	**21**
Striped Skunk	3	0	0	1	0	0	0	0	**4**
Voles	0	0	0	0	0	0	2	0	**2**

[a]Mammals were live-captured using the described methods and subsequently euthanized in accordance with WS Directive 2.505.
[b]Mammals were live-captured using the described methods and subsequently released on site as part of ORV Project.
[c]Represents the number of gas cartridges discharged not necessarily the number of woodchucks killed since actual take is unknown.

Those methods employed by WS in FY 2010 to alleviate damage or threats of damage were addressed in the EA in Appendix B (USDA 2005*a*). All take occurred within the parameters evaluated within the EA. All carcasses of mammals lethally removed were disposed of in accordance with WS Directive 2.515.

Mammal Damage Management Conducted in New Hampshire by WS during FY 2011

During FY 2011, WS continued to receive and respond to requests for assistance to manage damage associated with mammals. The number of requests for technical assistance reached 1,681 in FY 2011 (see Table 15). As in most years, damage or threats of damage to property and human safety were the primary resource for the request for assistance with mammals. Damage or threats of damage to property and human safety comprised 71% of the technical assistance requests received by WS. WS made recommendations on methods and techniques for reducing or alleviating damage caused by more than 30 species of mammals. Those persons requesting assistance reported to WS or WS verified damage associated with mammals totaling $86,053.

In addition to technical assistance, WS continued to employ direct damage management activities when requested. The number of mammals addressed by WS during FY 2011 is shown in Table 16. WS addressed at least 10 mammal species during direct operational assistance to alleviate damage or threats of damage. This was the highest number of species addressed during direct operational assistance provided between FY 2005 through FY 2011. Two of those species addressed by WS are not native to the State.

Table 15 - Technical assistance requests received by WS by species during FY 2011

Species	Resource[1]					Total	Species	Resource					Total
	A	N	P	H	X			A	N	P	H	X	
Bats (all)	0	1	1	16	1	**19**	**Mice/Rats**	0	0	1	3	1	**5**
Beaver	6	0	51	4	0	**61**	**Mink**	0	0	1	1	0	**2**
Black Bear	165	3	237	215	33	**653**	**Moles (all)**	0	0	1	0	0	**1**
Bobcat	10	0	4	2	2	**18**	**Moose**	2	0	5	0	0	**7**
Feral Cat	0	0	0	2	0	**2**	**Muskrat**	0	0	0	1	0	**1**
Chipmunk	0	0	5	5	1	**11**	**Virginia Opossum**	2	0	3	16	1	**22**
Coyote	18	0	31	28	8	**85**	**River Otter**	0	0	1	0	0	**1**
White-tailed Deer	79	0	29	2	5	**115**	**Porcupine**	8	0	24	8	2	**42**
Feral Dog	1	0	0	0	0	**1**	**Rabbits/Hare**	0	0	0	1	0	**1**
Fisher	7	0	11	6	4	**28**	**Raccoon**	11	0	23	30	3	**67**
Gray Fox	3	0	11	23	4	**41**	**Striped Skunk**	5	0	40	87	3	**135**
Red Fox	26	0	40	102	17	**205**	**Squirrels (all)**	0	0	33	12	6	**51**
Feral Hog	3	0	5	1	1	**10**	**Voles (all)**	3	0	3	0	0	**6**
Mountain Lion	0	0	0	0	0	**0**	**Weasel (all)**	8	0	1	0	0	**9**
Woodchuck	13	0	50	18	1	**82**	**TOTAL**	**370**	**4**	**611**	**583**	**93**	**1,661**

[1] A=Agricultural Resources, N=Natural Resources, P=Property, H=Human Safety, X=No Resource

WS direct assistance in FY 2011 involved continuing to provide direct management to prevent damage caused by woodchucks to earthen dams, human safety, and air traffic. In addition to the woodchucks lethally taken through trapping, WS employed gas cartridges to fumigate woodchuck burrows at the request of a cooperator to alleviate damage or threats of damage.

To alleviate damage or threats of damage at airports, WS provided trapping assistance for removal of such mammals as raccoon. Also at airports, mice, voles, moles, and shrews were targeted by WS as part of wildlife hazard assessments being conducted to determine the densities of small rodents on airport properties.

Assistance requests with feral swine continued in FY 2011 and WS maintained agreements with landowners assisted in FY 2010. Requests were primarily related to damage to both agriculture and property because of their destructive nature (*i.e.*, rooting, wallowing, crop damage). WS provided direct operational assistance to as many as 10 landowners experiencing feral swine damage. Through trapping and shooting efforts, a total of 17 feral swine were lethally removed to protect property and to collect samples for disease surveillance (see Table 16). Also, WS assisted cooperators with damage and threats of damage from beaver and muskrats due to their flooding and feeding activities. Beaver build dams in waterways to flood an area so they have access to food and cover to hide from predators. Both flooding and feeding behaviors can cause damage to property, homes, water quality, timber, agricultural crops and ornamental plants, trees and gardens. WS used trapping and shooting methods to lethally remove three beaver and 22 muskrat.

Table 16 - WS' take of mammal species in New Hampshire during FY 2011 by method

Species	Method								TOTAL
	Cage Trap[a]	Cage Trap[b]	Conibear	Foothold Trap	Snare	Firearm	Snap Trap	Gas Cartridge[c]	
Beaver	0	0	2	0	0	1	0	0	**3**
Feral Hog	13	3	0	0	0	1	0	0	**17**
Woodchuck	0	0	0	0	0	0	0	183	**183[c]**
Deer Mice	0	0	0	0	0	0	40	0	**40**
House Mice	0	0	0	0	0	0	45	0	**45**
Raccoon	1	52	0	0	0	0	0	0	**53**
Striped Skunk	0	3	0	0	0	0	0	0	**3**
Shrews	0	0	0	0	0	0	12	0	**12**
Muskrat	0	0	22	0	0	0	0	0	**22**
Virginia Opossum	0	1	0	0	0	0	0	0	**1**

[a]Mammals were live-captured using the described methods and subsequently euthanized in accordance with WS Directive 2.505.

[b]Mammals were live-captured using the described methods and subsequently released.

[c]Includes the number of gas cartridges discharged not necessarily the number of woodchucks killed since actual take is unknown.

Those methods employed by WS in FY 2011 to alleviate damage or threats of damage were addressed in the EA in Appendix B (USDA 2005*a*). All take occurred within the parameters evaluated within the EA. All carcasses of mammals lethally removed were disposed of in accordance with WS Directive 2.515.

VII. PROPOSED ACTION

The proposed action alternative was briefly described in Section 1.6 of the EA and further described in Chapter 3 of the EA. The Decision and FONSI for the EA selected the proposed action alternative, which implemented an adaptive integrated approach to managing damage associated with mammals. The proposed action alternative continued the implementation of an adaptive integrated approach utilizing non-lethal and lethal techniques, as deemed appropriate using the WS Decision Model, to reduce damage and threats caused by mammals. A major goal of the program would be to continue to resolve and prevent damage and to reduce threats to human safety. To meet this goal, WS, in consultation the NHFG, continues to respond to requests for assistance with, at a minimum, technical assistance, or when funding is available, operational damage management assistance. Funding could occur through federal appropriations or from cooperative funding. The adaptive approach to managing damage associated with mammals would integrate the use of the most practical and effective methods to resolve a request for damage management as determined by site-specific evaluation to reduce damage or threats to human safety for each request.

Under the proposed action alternative, WS could respond to requests for assistance by: 1) taking no action, if warranted, 2) providing only technical assistance to property owners or managers on actions they could take to reduce damages caused by aquatic rodents, or 3) provide technical assistance and direct operational assistance to a property owner or manager experiencing damage.

Several aspects of WS' mammal damage management activities have experienced an increase in the number of requests for assistance received. Areas of WS' activities experiencing an increase in requests for assistance include disease surveillance and monitoring, along with increases in requests to reduce risks associated with human safety, protection of property, and reducing or preventing agricultural damage. The increase in program activities analyzed in this supplement to the EA would allow WS to adequately address requests as needs are identified, as requested by cooperators experiencing threats to human safety

and/or damage due to mammals, and as funding permits. In addition, new methods to manage damage have become available since the EA was developed which will be analyzed in this supplement to the EA, which could be employed under the proposed action alternative.

As part of the increase in requests for assistance, WS reasonably anticipates the number of animals addressed annually to increase. Those mammal species addressed in the EA were identified based on requests for assistance received by WS prior to the development of the EA. WS continues to receive requests for assistance to manage damage and threats of damage caused by those mammals in New Hampshire. Since FY 2005, WS has responded to requests for assistance to manage damage to property, agricultural resources, natural resources, and threats to human safety associated with mammals. WS is also being requested to participate in disease surveillance and monitoring programs to detect and evaluate risks associated with mammalian diseases. This supplement to the EA will evaluate the issues associated with an increase in the number of requests for assistance received by WS in New Hampshire to address damage and threats associated with an increasing number of mammals and mammal species.

Additional Methods Available to Manage Mammal Damage

This supplement to the EA evaluates additional methods to resolve mammal damage that have become available since the completion of the EA. Since the completion of the EA, Forward Looking Infrared (FLIR) devices, night vision equipment, and trap monitoring devices have become available and could be used or recommended as part of an integrated damage management strategy to alleviate mammal damage by WS. The use of those methods as part of an integrated approach to resolving damage and threats associated with mammals are also analyzed in this supplement to the EA. A description of the methods available during the development of the EA that could be used or recommended by WS is provided in Appendix B of the EA (USDA 2005*a*). Those methods that have become available since the EA was developed are addressed below.

Trap monitors are devices that send a radio signal to a receiver if a set trap is disturbed and alerts field personnel that an animal may be captured. Trap monitors can be attached directly to the trap or attached to a string or wire and then placed away from the trap in a tree or shrub. When the monitor is hung above the ground, it can be detected from several miles away, depending on the terrain in the area. There are many benefits to using trap monitors, such as saving considerable time when checking traps, decreasing fuel usage, prioritizing trap checks, and decreasing the need for human presence in the area.

Night vision and FLIR equipment aid in locating wildlife at night when wildlife may be more active. Night vision and FLIR equipment could be used during wildlife surveys and in combination with shooting to remove wildlife at night. WS' personnel most often use this technology to target mammals in the act of causing damage or likely responsible for causing damage. The use of those methods allows WS to conduct activities at night when human activities are minimal; thereby, reducing risks to human safety.

Additional methods could be available to WS under the alternatives when addressing requests for assistance to manipulate water levels associated with impounded water caused by beaver dams. Manipulation of water levels associated with water impoundments caused by beaver dams could be addressed by WS using either dam breaching, dam removal, or the installation of water flow devices, including exclusion devices. Those methods allow dams to be breached or removed to maintain the normal flow of water. Heavy equipment, such as backhoes or bulldozers, would not be used by WS to breach, remove, or install water flow devices; although, heavy machinery could be utilized by a cooperator or their agents. WS may utilize small all-terrain or amphibious vehicles and/or watercraft for transporting personnel, equipment, and supplies to worksites.

The breaching or removal of dams could be conducted by hand. Breaching is normally conducted through incremental stages of debris removal from the dam that allows water levels to be gradually lowered. Breaching of dams would normally occur to limit the potential for flooding downstream by gradually allowing water levels to lower as more of the dam was breached over time. Breaching also minimizes the release of debris and sediment downstream by allowing water to move slowly over or through the dam. Depending on the size of the impoundment, water levels could be slowly lowered over several hours or days when breaching dams. When breaching dams, only that portion of the dam blocking the stream or ditch channel would be altered or breached, with the intent of returning water levels and flow rates to historical levels or to a level that eliminates damage threats or habitat alteration that would be acceptable to the property owner or resource manager. Similar to breaching dams, the removal of the dam removes the debris impounding water and restores the normal flow of water.

Beaver dams would generally be breached or removed by hand with a rake or power tools (*e.g.*, a winch). However, explosives would also be available to remove beaver dams. Explosives are not currently used for removing beaver dams in New Hampshire, but could potentially be utilized by WS' personnel specially trained and certified to conduct such activities. Explosives are defined as any chemical mixture or device that serves as a blasting agent or detonator. Explosives would generally be used to remove beaver dams that were too large to remove by hand. Explosives would only be used after beaver were removed from the site.

If explosives were used, WS' personnel would only utilize binary explosives (*i.e.*, explosives comprised of two parts that must be mixed at the site before they can be detonated as an explosive material) for beaver dam removal, when requested. Binary explosives consist of ammonium nitrate and nitro-methane; however, those two components separated are not classified as explosives until mixed. Therefore, binary explosives would be subject to fewer regulations and controls. However, once mixed, binary explosives would be considered high explosives and subject to all applicable federal and state regulations. Detonating cord and detonators would also be considered explosives and WS would adhere to all applicable State and federal regulations for storage, transportation, and handling. All WS' explosive specialists would be required to attend 30 hours of extensive explosive safety training and spend time with a certified explosive specialist in the field prior to obtaining certification. All blasting activities would be conducted by well-trained, certified explosive specialists and closely supervised by professional wildlife biologists. Explosive handling and use procedures follow the rules and guidelines set forth by the Institute of Makers of Explosives, which is the safety arm of the commercial explosive industry in the United States and Canada.

In addition to dam breaching and removal, water flow devices and exclusion methods would also be available for WS to employ during direct operational assistance or to recommend during technical assistance. Several different designs of water flow devices and exclusion methods would be available; however, the intent of all those methods would be to lower water levels by allowing water to flow through the beaver dam using pipes and wire mesh. After installation, beaver dams would be left intact with water levels maintained at desired levels by adjusting the water flow device. Water flow devices and exclusion methods allow beaver to remain at the site and maintain the beaver dam.

Although dams could be breached/removed manually or with binary explosives, those methods are usually ineffective because beaver can quickly repair or replace the dam if the beaver were not removed prior to breaching or removing the dam (McNeely 1995). Damage may be effectively reduced in some situations by installing exclusion and water control devices. Exclusion and water control devices can be designed so that the level of the beaver-created water impoundment can be managed to eliminate or minimize damage from flooding while retaining the ecological and recreational benefits derived from beaver impounding water over time. For example, WS may recommend modifications to site and culvert design (Jensen et al. 1999) as a non-lethal way of reducing problems with beaver dams at culverts.

Beaver exclusion generally involves the placement of fencing to prevent beaver access to water intake areas such as culverts. A variety of exclusion systems have been used including the Clemson beaver pond leveler, Beaver Deceiver™, Beaver Bafflers™, and pre-dams (Wood and Woodward 1992, Lisle 1996, Brown and Brown 1999, Lisle 1999, Brown et al. 2001, Partington 2002, Lisle 2003). The Beaver Deceiver™ is a fencing system that is installed to prevent beaver blockage of culverts by minimizing environmental cues that stimulate dam construction in beaver, and by making culverts less attractive as dam construction sites (Lisle 1996, Lisle 1999, Lisle 2003). Beaver can be deterred from blocking culverts by the installation of a fence on the upstream end of the culvert. Installation of a fence increases the length of the area, which must be dammed, and if beaver build along the fence, may increase the distance between the beaver and the source of the cues, which stimulate damming behavior (*e.g*., water moving through culvert) (Lisle 1996, Lisle 1999, Lisle 2003, Callahan 2005). Beaver prefer to build dams perpendicular to water flow, so fences should be oriented at odd angles to water flow and should be set so that they do not block the stream channel. Usually, fencing is also used to cover the up and downstream ends of the culverts to prevent beaver from entering the deceiver from the downstream side of the culvert and to prevent any beaver that might make it past the outer fence from plugging the interior of the culvert. Efforts would be made to reduce the sound of water flowing through the culvert by raising the water level on the down-stream side of the culvert with dam boards or beaver-made dams; by constructing flumes to replace waterfalls, or, in extreme cases, by resetting the culvert (Lisle 1996). In situations where extra care is needed to ensure sufficient water flow through the culvert, Beaver Deceivers™ may be used in combination with water control devices.

Cylindrical exclusion devices, like the Beaver Bafflers™, would be attached to a culvert opening, which reduces the likelihood that beaver would plug a culvert by spreading the water intake over a larger area (Brown et al. 2001). While cylindrical shapes can be effective in some situations (Partington 2002), in a study of beaver exclusion and water control devices, cylindrical shapes attached in-line with the culvert had a higher failure rate (40%) than trapezoidal shapes (*e.g*., Beaver Deceivers™; 3% failure rate) and use of the cylindrical devices was discontinued in favor of trapezoidal fences (Callahan 2005).

Unlike Beaver Deceivers™ and cylindrical fences, pre-dam fences (*e.g*., deep water fences, diversion dams) (Brown and Brown 1999) have been designed with the specific intention that the beaver build the dam along the fence. Pre-dam fences consist of short semicircular or circular fences that are built in an arc around a water inlet. The fence serves as a dam construction platform, which allows beaver to build a dam and impound water at the site, but prevents beaver from plugging the water intake. If the size of the upstream water impoundment were not an issue, no further modifications of the pre-dam would be needed. However, in most cases, pre-dams would be used in combination with water control devices to manage the depth and extent of the upstream water impoundment.

The mesh size of the fencing used during construction of the devices should be selected to minimize risks to beaver and non-target species. Brown et al. (2001) noted that beaver occasionally became stuck in 6-inch mesh and that the risk of beaver entrapment was lower with 5-inch mesh. Lisle (1999) noted that the size of the mesh on the fence of the Beaver Deceivers™ (6-inch mesh) was such that it allowed most species to pass through the fence except beaver and big turtles. In remote areas where there is little vehicular traffic, it may be acceptable for animals that cannot pass through the deceiver to travel across the road. However, for culverts under busy roads, it could be necessary to design special "*doors*" which can allow the passage of beaver and large turtles through the device. For example, 30 cm-diameter T-joints have been used to allow access through Beaver Deceiver™ fences. The T-shape reduces the likelihood that beaver can haul woody debris for dam construction inside the device (Lisle 2003). Fence caps would not be attached to the up and downstream ends of the culvert when it is necessary to allow passage of species like large turtles and beaver through a culvert.

Water control devices (*e.g.*, pond levelers) are systems used to allow the passage of water through a beaver dam. The devices would be used in situations where the presence of a impound water by beaver was desired but it may be necessary to manage the level of water in the impoundment area. Various types of water control devices have been described (Arner 1964, Roblee 1984, Laramie and Knowles 1985, Miller and Yarrow 1994, Wood et al. 1994, Lisle 1996, Organ et al. 1996, Brown and Brown 1999, Lisle 1999, Brown et al. 2001, Close 2003, Lisle 2003, Clemson University 2006, Simon 2006, Spock 2006, Perry 2007). The devices generally involve the use of one or more pipes installed through the dam to increase the flow of water through the dam. Height and placement of pipes can be adjusted to achieve the desired water level in the water impoundment created by beaver. Beaver generally only check the dam for leaks, so, when site conditions permit, the inlet of the pipe can be placed away from the dam to make the source of the water flow more difficult to detect and decrease the likelihood that beaver would attempt to plug the device. To minimize the sound/sensation of water movement and associated beaver damming behavior, the end of the pipe may be capped and water allowed to flow into the pipe through series of holes or notches cut through the pipe. Holes and notches may be placed on the underside of the pipe to further reduce signs of water movement. Alternatively, ninety-degree elbow joints could be placed facing downward on the upstream end of the pipes to prevent the noise of running water from escaping and attracting beaver. A protective cage would be placed around the upstream end of the inlet pipe to prevent beaver from blocking the pipe and to reduce problems with debris blocking the pipe. As noted above, water control systems can be combined with exclusion devices to prevent beaver from blocking culverts while still maintaining impounded water at an acceptable level.

Exclusion devices and water control systems have been used for many years with varying degrees of success (United States General Accounting Office 2001). Landowner management objectives play a role in how the efficacy of a level system is perceived (Nolte et al. 2001). Survey respondents classified pond levelers installed to manage wetlands for waterfowl habitat more successful than levelers installed to provide relief from flooding (Nolte et al. 2001). Success rates as low as 4.5% and 3% have been reported by the Massachusetts Division of Fisheries and Wildlife and the New York Department of Natural Resources (Langlois and Decker 1997). Nolte et al. (2001) reported only 50% of the installed pond levelers in Mississippi met landowner objectives and found that pond levelers placed in sites with high beaver activity more frequently failed if installed without implementing population control measures. Higher success rates have been reported for newer exclusion and water control systems ranging from 87% - 93% (Callahan 2005, Boyles 2006, Simon 2006, Boyles and Savitzky 2007). Lisle (2003) reported that use of the devices or a combination of a Beaver Deceiver™ and flow management device virtually eliminated the need for maintenance and beaver removal at 20 sites where clogged culverts and flooded roads had previously been a routine issue.

Exclusion and water control systems must be specifically designed to meet the needs of each site. Consequently, devices installed by inexperienced individuals may have a higher failure rate than those installed by a professional (Lisle 1996, Callahan 2003, Boyles 2006, Simon 2006, Spock 2006). Higher success rates reported for newer exclusion and water control devices may be indicative of increased understanding of the kinds of situations where these devices work best. For example, Callahan (2005) noted that exclusion and water control systems installed at culvert sites were more successful than similar systems installed at freestanding dams. Callahan (2003) and Callahan (2005) also provide a list of sites that were not well suited to the use of exclusion or water control devices. Boyles (2006) and Boyles and Savitzky (2007) reported some of the highest success rates for new exclusion and water control systems, but only tested the devices at culvert sites.

Beaver build dams to raise water levels to meet their needs for security and access to forage. While pond levelers allow for the retention of some water, if the water level does not meet the needs of the beaver, they may move a downstream and build a new dam (Callahan 2003, Clemson University 2006). This may merely result in moving the problem to a new landowner or, depending upon site characteristics, the

impounded water may result in new or increased damage problems for the original landowner. McNeely (1995) reported the most common reasons cited for the lack of success methods were blocking caused by debris or silt and beaver construction of additional dams upstream or downstream of the management device. In the study by Callahan (2005), construction of a new dam upstream or downstream of the device was the most common cause of failure for free-standing dams (*e.g.*, dams not associated with a culvert or other similar constriction in water flow), but insufficient pipe capacity and lack of maintenance were also problems. Nolte et al. (2001) also reported the need to address problems with dams upstream or downstream of a device once installed. At culvert sites, lack of maintenance was the primary cause of device failure. There were also problems with vandalism at one of the culvert sites. At two culvert sites and two freestanding dams, the beaver appeared to be able to thwart the exclusion devices and water control systems and build dams that reduced or completely impeded the operation of the devices (Callahan 2005).

Most pond levelers and water control devices require maintenance. The amount of maintenance required can vary considerably among sites, depending on site conditions and the type of water control device (Nolte et al. 2001, Callahan 2005, Boyles 2006, Spock 2006). Stream flow, leaf fall, floods, and beaver activity would continuously bring debris to the intake of the water control device. Ice damage and damage from debris washed downstream during high water events may also trigger the need for maintenance (*e.g.*, cleaning out the intake pipe). Although most exclusion and water control devices generally require some level of maintenance, there are reports of devices that have remained effective for a period of years with no maintenance (Nolte et al. 2001). Nolte et al. (2001) reported that post installation maintenance had been performed on 70% of the 20 successfully operating Clemson pond levelers installed by WS. The most common action was to adjust the riser on the pipe to manipulate water levels. Other maintenance included removal of vegetation and secondary dams built after the installation of the devices. In a survey of individuals who had received assistance with exclusion and water control devices, Simon (2006) found 18 of 36 survey respondents reported maintaining their devices, while installation program staff monitored an additional 10 devices. Of those survey respondents, Simon (2006) found that 61% reported that routine maintenance took 15 minutes or less while 93% reported that maintenance took a half hour or less. Boyles (2006) reported that time spent in device maintenance ranged from one to 4.75 hours per year.

Installation and upkeep of water control devices vary from site to site. Callahan (2005) reported that the average cost for an exclusion fence at a culvert was $750 with average annual maintenance cost of approximately $200. Flexible leveler pipe systems cost an average of $1,000 to install and $100 per year in maintenance. Average cost to install a combination fence and leveler was $1,400 with approximately $150 per year in maintenance. Properly maintained, a fence or pipe system may be expected to last approximately 10 years. Annualizing the costs of maintenance and levelers ranged from $200 to $275/year (Callahan 2005). The cost of a Beaver Deceiver™ may range from $150 - $1,500, and an additional cost would be applied if pipes were needed at the site (S. Lisle, Penobscot Nation, letter to J. Cromwell, WS, September 7, 2000). Spock (2006) reported that exclusion and/or water control device installation costs ranged from < $600 to over $3,000 dollars. Slightly more than half the systems (58.2%) cost between $600 and $1,000 to install. In many cases, the cost included the first year of maintenance. Maintenance costs, when available, ranged from $50 - $600 per year with 49.9% of maintenance agreements costing from $100 - $200. The more expensive installations tended to be extensive fence and leveler systems or systems with numerous leveler pipes. Boyles (2006) reported that device installation cost an average of $1,349 per device and $3,180 per site with subsequent annual maintenance cost averaging $19.75 per site per year (Boyles 2006). However, unlike the study by Callahan (2005), the devices evaluated by Boyles (2006) had only been in place for a relatively short time (average time in place 15 months, range 6 to 22 months versus average time in place 36.6 months, range 3 to 75 months). The cost of maintenance may vary over time as site conditions change.

Threatened and Endangered Species Consideration

Since the completion of the EA, additional species have been listed as threatened or endangered in the State. As part of the supplement to the EA, WS will evaluate mammal damage management activities under the proposed action alternative as described in the EA and as proposed in this supplement to the EA to ensure activities are not likely to jeopardize the continued existence of any T&E species listed by the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), and the NHFG. Further evaluation of T&E species will occur under Section XIV below.

VIII. DECISIONS TO BE MADE

Based on agency relationships, Memorandums of Understanding (MOUs), and legislative authorities, WS was the lead agency for the EA, and therefore, responsible for the scope, content, and decisions made. The NHFG is responsible for managing wildlife in the State of New Hampshire, including the establishment and enforcement of regulated hunting and trapping seasons. WS' activities to reduce and/or prevent mammal damage would be coordinated with the NHFG, which ensures WS' actions are incorporated into population objectives established for wildlife populations in the State.

Based on the scope of the EA and this supplement to the EA, the decisions to be made are: 1) should WS continue to conduct wildlife damage management to alleviate damage and threats to property and human safety in the State, 2) should WS conduct disease surveillance and monitoring in the wildlife population when requested by the NHFG and other agencies, 3) should WS continue to implement an integrated wildlife damage management strategy, including technical assistance and direct operational assistance, to meet the need for mammal damage management in the State, 4) if not, should WS attempt to implement one of the alternatives to an integrated damage management strategy as described in the EA, and 5) would continuing the proposed action alternative under this supplement result in adverse impacts to the environment requiring the preparation of an Environmental Impact Statement (EIS) based on activities conducted since the completion of the EA and/or based on new information available.

IX. SCOPE OF ANALYSIS

The EA and this supplement to the EA evaluate activities in New Hampshire to reduce damage and threats to human safety in the State. The scope of analysis remains valid as addressed in the EA unless otherwise discussed in this supplement.

Actions Analyzed

The EA and this supplement evaluate the need for mammal damage management to reduce damage to agricultural resources, natural resources, property, and threats to human safety within the State of New Hampshire wherever such management is requested by a cooperator. The EA and this supplement discuss the issues associated with conducting mammal damage management to meet the need for action and evaluate different alternatives to meet that need while addressing those issues.

WS uses a decision model based on a publication by Slate et al. (1992) which involves evaluating each request for assistance, taking action, evaluating the action, and monitoring results of the actions taken. Slate et al. (1992) provides more detail on the processes used in WS' Decision Model. WS' personnel use the Decision Model to develop the most appropriate strategy to reduce damage and to determine potential environmental effects from damage management actions (Slate et al. 1992, USDA 2005*a*).

The methods available for use or recommendation under each of the alternatives evaluated are provided in Appendix B[5] in the EA, while new methods available are discussed in this supplement. The alternatives and Appendix B in the EA also discuss how methods would be employed to manage damage and threats associated with mammals. Therefore, the actions evaluated in the EA and this supplement are the use of those methods available under the alternatives and the employment of those methods by WS to manage or prevent damage and threats associated with mammals from occurring when requested by the appropriate resource owner or manager and when permitted by the NHFG, as required. The NHFG has jurisdiction over the management of wildlife in the State and has specialized expertise in identifying and quantifying potential adverse effects to the human environment from activities conducted to alleviate mammal damage.

Native American Lands and Tribes

The WS program in New Hampshire would only conduct damage management activities on tribal lands when requested by a Native American Tribe. Therefore, the Tribe would determine when WS' assistance was required and what activities would be allowed. Because Tribal officials would be responsible for requesting assistance from WS and determining what methods would be available to alleviate damage, no conflict with traditional cultural properties or beliefs would be anticipated. Those methods available to alleviate damage associated with mammals on federal, State, county, municipal, and private properties under the alternatives analyzed in the EA would also be available for use to alleviate damage on Tribal properties when the use of those methods have been approved for use by the Tribe requesting WS' assistance. Therefore, the activities and methods addressed under the alternatives would include those activities that could be employed on Native American lands, when requested and agreed upon between WS and the Tribe.

Period for which the EA is Valid

If the analyses in this supplement indicate an EIS is not warranted, the EA, as supplemented, would remain valid until WS, in consultation with the NHFG, determines that new needs for action, changed conditions, new issues, or new alternatives having different environmental impacts must be analyzed. At that time, the analysis in the EA and this supplement would be reviewed and further supplemented pursuant to the NEPA. Review of the EA and this supplement would be conducted to ensure that the EA is sufficient. This process ensures the EA is complete and still appropriate to the scope of activities conducted by WS in New Hampshire.

Site Specificity

Actions could be taken to protect human health and safety, reduce damage to agricultural resources, alleviate property damage, and protect natural resources, including T&E species, when requested. As mentioned previously, WS would only conduct damage management activities when requested by the appropriate property owner or manager. In addition, WS' activities that could involve the take of mammals under the alternatives would only occur when permitted by the NHFG, when required, and only at levels permitted.

The EA and this supplement analyze the potential impacts of mammal damage management and address activities on those properties currently under a MOU or cooperative service agreement with WS where activities have been and currently are being conducted. The EA and this supplement also address the

[5]A complete list of chemical and non-chemical methods that were available for use under the identified alternatives during the development of the EA can be found in Appendix B of the EA. However, listing methods neither implies that all methods would be used by WS to resolve requests for assistance nor does the listing of methods imply that all methods would be used to resolve every request for assistance.

impacts of mammal damage management where additional agreements may be signed in the future. Because the need for action is to reduce damage when requested and because the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional mammal damage management efforts could occur at additional locations in the State. Thus, the EA and this supplement anticipate that potential expansion and analyze the impacts of such efforts as part of the program.

Many of the mammal species addressed in the EA and this supplement can be found statewide and throughout the year in the State; therefore, damage or threats of damage can occur wherever those mammals occur. Planning for the management of mammal damage must be viewed as being conceptually similar to other federal or agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they would occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, and insurance companies. Although some of the sites where mammal damage could occur can be predicted, all specific locations or times where such damage would occur in any given year cannot be predicted. The threshold triggering an entity to request assistance from WS to manage damage associated with mammals is often unique to the individual; therefore, predicting where and when such a request for assistance would be received by WS is difficult. This EA emphasizes major issues as those issues relate to specific areas whenever possible; however, many issues apply wherever mammal damage and the resulting management actions occurs and are treated as such.

Chapter 2 of the EA identifies and discusses issues relating to mammal damage management in New Hampshire. The standard WS Decision Model (Slate et al. 1992, USDA 2005*a*) would be the site-specific procedure for individual actions conducted by WS in New Hampshire. Damage management decisions made using the model would be in accordance with WS' directives[6] and those standard operating procedures (SOPs) described in this EA as well as relevant laws and regulations.

The analyses in the EA and this supplement to the EA are intended to apply to any action that may occur in any locale and at any time within New Hampshire. In this way, WS believes it meets the intent of the NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with the NEPA and still be able to accomplish its mission.

Public Involvement

This supplement to the EA, along with the EA and the 2005 Decision/FONSI, will be made available for public review and comment through the publication of a legal notice announcing a minimum of a 30-day comment period. The legal notice will be published at a minimum in *The Concord Monitor* and posted on the APHIS website located at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml according to WS' public notification requirements (72 FR 13237-13238). A notice of availability for this supplement to the EA will also be directly mailed to agencies, organizations, and individuals with probable interest in the proposed program. Comments received during the public involvement process will be fully considered for new substantive issues and alternatives.

X. AFFECTED ENVIRONMENT

Damage or threats of damage caused by those mammal species addressed in the EA and this supplement can occur statewide in New Hampshire wherever those mammals occur. However, mammal damage

[6]At the time of preparation, WS' Directives could be found at the following web address: http://www.aphis.usda.gov/wildlife_damage/ws_directives.shtml.

management would only be conducted by WS when requested by a landowner or manager and only on properties where a MOU, cooperative service agreement, or other comparable document has been signed between WS and a cooperating entity. Most species of mammals addressed in the EA and this supplement can be found throughout the year across the State where suitable habitat exists for foraging and shelter. Those mammal species addressed in this EA are capable of utilizing a variety of habitats, including rural and urban areas. Since those mammal species addressed in the EA and this supplement can be found throughout the State, requests for assistance to manage damage or threats of damage could occur in areas occupied by those mammal species. Additional information on the affected environment is provided in Chapter 4 of the EA.

Upon receiving a request for assistance, the proposed action or those actions described in the other alternatives could be conducted on private, federal, State, tribal, and municipal lands in New Hampshire to reduce damages and threats associated with mammals to agricultural resources, natural resources, property, and threats to human safety. The analyses in the EA and this supplement are intended to apply to actions taken under the selected alternative that could occur in any locale and at any time within the analysis area. The EA and this supplement analyze the potential impacts of mammal damage management and address activities in New Hampshire that are currently under a MOU or cooperative service agreement with WS where activities have been and currently are being conducted. The EA and this supplement also address the impacts of mammal damage management in the State where additional agreements may be signed in the future.

More specific locations could include areas in and around commercial, industrial, public, and private buildings, facilities and properties and at other sites where mammals may burrow, feed, or otherwise occur. Examples of areas where mammal damage management activities could be conducted are, but are not necessarily limited to: agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, aquaculture facilities, fish hatcheries, grain mills, grain handling areas, railroad yards, waste handling facilities, industrial sites, natural areas, government properties and facilities, private properties, corporate properties, schools, hospitals, parks, woodlots, recreation areas, communally-owned homeowner/property owner association properties, wildlife refuges, wildlife management areas, coastal and tidal beaches, ponds, rivers, and inlets, military bases, and airports.

Airports

Of all the mammal species, deer are ranked as the most hazardous to aircraft especially to smaller general aviation aircraft (Dolbeer et al. 2000), which represent a serious threat to human health and safety. Airports are often secured areas with chain-link security fencing. Sometimes deer, and other mammals, gain entrance into those airports where there is adequate cover and food, and they live there for all or part of the year. Because many mammal species are ubiquitous throughout the State, it is possible for those species to be present at nearly any airport or military airbase. WS may be requested to remove mammals from airport properties at any of the airports or airbases where those mammals pose a threat to aircraft and passenger safety. Those mammal species confined inside a perimeter fence on airport property originate from free-ranging populations outside the perimeter fence. Therefore, those mammal species confined on airport property would not be considered a unique population.

Federal Property

Many federal properties are controlled access areas with security fencing. Those properties often are unconcerned with the presence of mammals until the populations of those species are large enough to negatively affect natural resources on the facility and the growth of the confined population exceeds the biological and social carrying capacity of the facility. Examples of those types of fenced federal facilities include, but are not limited to, military bases, research facilities, and federal parks. WS may be requested

to assist facilities in the management of mammal damage at such properties. In those cases where a federal agency requests WS' assistance with managing damage caused by mammals, the requesting agency would be responsible for analyzing those activities in accordance with the NEPA. However, the EA and this supplement to the EA would cover such actions if the requesting federal agency determined the analyses and scope of this EA were appropriate for those actions and the requesting federal agency adopted the EA through their own Decision based on the analyses in the EA. Therefore, actions taken on federal lands have been analyzed in the scope of the EA and this supplement to the EA.

Similar to mammals found on airport properties, mammals confined inside a perimeter fence at federal facilities originated from free-ranging populations; thus, those animals confined inside a perimeter fence would not be considered a unique population.

State Property

Activities could be conducted on properties owned and/or managed by the State when requested, such as parks, forestland, historical sites, natural areas, scenic areas, conservations areas, and campgrounds. Activities could be requested to occur on state highway right-of-ways and interstate highway right-of ways.

Municipal Property

Activities under the alternatives could be conducted on city, county, town, or other local governmental properties when requested by those entities. Those areas could include, but would not be limited to city parks, landfills, woodlots, cemeteries, greenways, treatment facilities, utilities areas, and recreational areas. Similar to other areas, mammals can cause damage to natural resources, agricultural resources, property, and threaten human safety in those areas. Areas could also include properties in urban and suburban areas of the State.

Private Property

Requests for assistance to manage mammal damage and threats could also occur from private property owners and/or managers. Private property could include areas in private ownership in urban, suburban, and rural areas, which could include agricultural lands, timberlands, pastures, industrial parks, residential complexes, subdivisions, businesses, railroad right-of-ways, and utility right-of-ways. Areas could also include property owned by businesses that are located within fenced properties.

Disease Surveillance and Monitoring Activities

Upon receiving a request for assistance, activities could be conducted on private, federal, state, county, and municipal lands in the State for the purposes of studying, containing, and curtailing disease outbreaks in mammal populations. Areas of the proposed action where disease sampling could occur would include, but would not limited to, state, county, municipal and federal natural resource areas, park lands, and historic sites; state and interstate highways and roads; railroads and their right-of-ways; property in or adjacent to subdivisions, businesses, and industrial parks; timberlands, croplands, and pastures; public and private properties in rural/urban/suburban areas where mammals are a threat to human safety through vehicle collisions and the spread of disease. The area of the proposed action would also include airports and military airbases where mammals are a threat to human safety and to property; areas where mammals negatively affect wildlife, including threatened and endangered species; and public property where mammals are negatively affecting historic structures, cultural landscapes, and natural resources. Activities are only conducted by WS when requested and only on those properties where a MOU,

cooperative service agreement, or other comparable document has been signed between WS and the entity requesting WS' assistance.

XI. ISSUES ANALYZED IN DETAIL

Issues are concerns raised regarding potential environmental problems that might occur from a proposed action. Such issues must be considered in the NEPA decision-making process. Issues related to managing damage and threats associated with mammals in New Hampshire were developed by WS in consultation with the NHFG. The EA was also made available for public review and comment to identify additional issues.

The major issues are discussed in detail in Chapter 2 of the EA (USDA 2005*a*). Alternatives identified during the development of the EA to address those issues are discussed in Chapter 3 of the EA (USDA 2005*a*). The following issues were identified during the scoping process for the EA:

- Issue 1 - Effects on target mammal species
- Issue 2 - Effects on other wildlife species, including threatened and endangered species
- Issue 3 - Effects on human health and safety
- Issue 4 - Impacts to stakeholders, including aesthetics
- Issue 5 - Humaneness and animal welfare concerns of methods used

Based on those damage management activities conducted previously by WS, those issues identified during the development of the EA remain applicable and appropriate to resolving damage and threats of damage associated with mammals.

In addition to those issues identified during the development of the EA, an additional issue has been identified during the development of this supplement to the EA relating to the removal of beaver dams on the status of wetlands. As part of requests for assistance associated with beaver addressed in this supplement to the EA, WS could be requested to alleviate flooding damage or the threat of flooding damage associated with beaver dams. Therefore, the following issue will be analyzed in detail in this supplement to the EA:

Issue 6 – Effects of Beaver Removal and Dam Manipulation on the Status of Wetlands in the State

Wetlands are a valuable component of land-based ecosystems that provide numerous direct and indirect benefits to people and wildlife (*e.g.*, see Costanza et al. 1997, Millennium Ecosystem Assessment 2005). Between the 1780s and the 1980s, Dahl (1990) estimated 53% of the original wetland acres in the lower 48 states were lost, primarily from human development. Over that 200-year time span, Dahl (1990) estimated the wetland acres in Tennessee decreased from 1,937,000 acres to 787,000 acres, which represented a 59% decline. Beaver, through their building of dams and impounding water can have a unique role in establishing wetlands that not only provide benefit to the beaver, but to people and other wildlife. Beaver are often considered a "*keystone*" species for their ability to manipulate and create their own habitats, which can also provide benefits to other wildlife and people. Beaver may also be an inexpensive way of restoring wetlands or creating new wetlands (*e.g.*, see Hey 1995, Muller-Schwarze and Sun 2003, Buckley et al. 2011).

The issue of WS' potential impacts to wetlands would occur from activities conducted to alleviate damage or threats of damage associated with beaver, primarily from the breaching or removal of beaver dams. Beaver dam breaching or removal during activities to manage damage caused by beaver sometimes occurs in areas inundated by water from water impounded by beaver dams. Dam material

usually consists of mud, sticks, and other vegetative material. Their dams obstruct the normal flow of water, which can change the preexisting hydrology from flowing or circulating waters to slower, deeper, more expansive waters that accumulate bottom sediment over time. The depth of the bottom sediment depends on the length of time an area is covered by water and the amount of suspended sediment in the water.

Beaver dams, over time, can establish new wetlands. The regulatory definition of a wetland stated by the United States Army Corps of Engineers and the EPA (40 CFR 232.2) is:

"Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Therefore, the breaching or removal of a beaver dam could result in the degrading or removal of a wetland, if wetland characteristics exist at a location where a beaver dam occurs. The preexisting habitat (prior to the building of the dam) and the altered habitat (areas flooded by impounded water) have different ecological values to the fish and wildlife native to the area. Some species may benefit by the addition of a beaver dam that creates a wetland, while the presence of some species of wildlife may decline. For example, darters listed as federally endangered require fast moving waters over gravel or cobble beds, which beaver dams can eliminate; thus, reducing the availability of habitat. In areas where bottomland forests were flooded by beaver dams, a change in species composition could occur over time as trees die. Hardwood trees are often killed when flooding persists for extended periods, as soils become saturated. Conversely, beaver dams could be beneficial to some wildlife such as river otter, neotropical migratory birds, and waterfowl that require aquatic habitats.

If a beaver dam was not removed and water was allowed to stand, hydric soils and hydrophytic vegetation could eventually form. This process could take anywhere from several months to years depending on preexisting conditions. Hydric soils are those soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions. In general, hydric soils form much easier where wetlands have preexisted. Hydrophytic vegetation includes those plants that grow in water or on a substrate that is at least periodically deficient in oxygen because of excessive water content. If those conditions were met, then a wetland has developed that would have different wildlife habitat values than an area that has been more recently impounded by beaver dam activity.

In addition, concerns are often raised regarding the use of lethal methods to remove beaver to alleviate damage or threats. If beaver were lethally removed from an area and any associated beaver dam was removed or breached, the manipulation of water levels by removing/breaching the dam could prevent the establishment of wetlands in areas where water has been impounded for an extended period by beaver dams. If beaver were removed but the beaver dam was left undisturbed, the lack of maintenance to the dam by beaver would likely result in the eventual recession of the impounded water as weathering eroded the dam.

XII. ISSUES ADDRESSED BUT NOT ANALYZED IN DETAIL

In addition to the identified major issues considered in detail, five issues were considered in section 2.3 of the EA, but were not analyzed in detail with the rationale provided in the EA (USDA 2005*a*). WS has reviewed the issues not considered in detail as described in the EA and has determined that the analyses provided in the EA are still appropriate regarding those issues.

XIII. ALTERNATIVES ANALYZED IN DETAIL

The alternatives considered and evaluated using the identified issues are described and discussed in detail in Chapter 3 of the EA (USDA 2005*a*). In addition, the EA contains a detailed description and discussion of the alternatives and the effects of the alternatives on the issues identified (USDA 2005*a*). Appendix B of the EA provides a description of the methods that could be used or recommended by WS under each of the alternatives. The EA describes four alternatives that were developed to address the issues identified above. Alternatives analyzed in detail include:

- Alternative 1 - Technical Assistance Only
- Alternative 2 - Integrated Mammal Damage Management Program (Proposed Action/No Action)
- Alternative 3 - Non-lethal Mammal Damage Management Only By WS
- Alternative 4 - No federal WS Mammal Damage Management

XIV. MAMMAL DAMAGE MANAGEMENT STRATEGIES AND METHODOLOGIES

A description of the methods that could be used or recommended by WS under the alternatives is provided in section 3.2 of the EA and Appendix B of the EA (USDA 2005*a*). Section 3.2 of the EA also provides examples of damage management strategies that could be employed by WS under the alternatives.

This supplement to the EA also evaluates additional methods to resolve mammal damage that have become available since the completion of the EA. Since the completion of the EA, Forward Looking Infrared (FLIR) devices and night vision equipment have become available and could be used or recommended as part of an integrated damage management strategy to alleviate mammal damage by WS.

XV. ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Several additional alternatives were considered, but were not analyzed in detail in the EA. Alternatives considered but not analyzed in detail are discussed in Section 3.3 of the EA (USDA 2005*a*). WS has reviewed the alternatives not analyzed in detail in the EA and has determined that the analyses provided in the EA have not changed and are still appropriate.

XVI. STANDARD OPERATING PROCEDURES

The current WS program uses many Standard Operating Procedures (SOPs) which are discussed in Chapter 3 (see Section 3.4) of the EA (USDA 2005*a*). The SOPs discussed in the EA remain appropriate for WS' wildlife damage management activities conducted in the State.

XVII. ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

The major issues are discussed in detail in Chapter 2 of the EA (USDA 2005*a*). Alternatives developed and identified during the development of the EA to meet the need for action and to address those issues are discussed in Chapter 3 of the EA (USDA 2005*a*). Chapter 4 of the EA contains a detailed discussion and comparison of the identified alternatives and the major issues (USDA 2005*a*). The issues were identified as important to the scope of the analysis in the EA (40 CFR 1508.25).

Issue 1 - Effects on Target Mammal Species

A common issue is whether damage management actions would adversely affect the populations of target mammal species. Methods that would be available under the alternatives to resolve damage or threats are considered either non-lethal methods or lethal methods. Non-lethal methods can disperse or otherwise make an area unattractive to target species causing damage, which reduces the presence of those species at the site, and potentially the immediate area around the site where non-lethal methods are employed. Lethal methods would be employed to remove a mammal or those mammals responsible for causing damage or posing threats to human safety. The use of lethal methods would therefore result in local population reductions in the area where damage or threats were occurring. The number of target species removed from the population using lethal methods or dispersed from an area using non-lethal methods under the alternatives would be dependent on the number of requests for assistance received, the number of individuals involved with the associated damage or threat, and the efficacy of methods employed.

The analysis for magnitude of impact on populations from the use of lethal methods would be based on a measure of the number of animals killed in relation to their abundance. Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations would be based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations would be based on population trends and harvest trend data, when available. Take would be monitored by comparing the number of animals killed with overall populations or trends in populations to assure the magnitude of take was maintained below the level that would cause significant adverse effects to the viability of a native species population. Under the alternatives where lethal methods could be employed or recommended, the lethal take (killing) of mammals would only occur at the request of a cooperator seeking assistance and only after the take of those species identified as targets had been permitted by the NHFG, when required.

The alternatives discussed in Chapter 3 of the EA were developed in response to the issues identified in Chapter 2 as well as to meet the need for action identified in Chapter 1. The issue of the potential impacts of conducting the alternatives on the populations of those mammal species addressed in the EA and this supplement are analyzed for each alternative below.

Alternative 1 - Technical Assistance Only

Under this alternative, WS would provide those cooperators requesting assistance with managing damage and threats associated with mammals with technical assistance only. Technical assistance could provide those cooperators experiencing damage or threats associated with mammals with information, demonstrations, and recommendations on available and appropriate methods available. The implementation of methods and techniques to resolve or prevent damage would be the responsibility of the requester with no direct involvement by WS. In some cases, WS may provide supplies or materials that are of limited availability for use by private entities. Technical assistance may be provided through a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to managing damage; these strategies are based on the level of risk, need, and the practicality of their application. In some instances, wildlife-related information provided to the requestor results in tolerance/acceptance of the situation. In other instances, damage management options are discussed and recommended. Only those methods legally available for use by the appropriate individual would be recommend or loaned by WS. Similar to Alternative 1 and Alternative 4, those methods described in Appendix B of the EA would be available to those persons experiencing damage or threats associated with mammals in the State except for immobilizing drugs and euthanasia drugs, which are only available to WS or the NHFG.

The WS program regularly provides technical assistance to individuals, organizations, and other federal, state, and local government agencies for managing mammal damage. Technical assistance includes

collecting information about the species involved, the nature and extent of the damage, and previous methods that the cooperator has attempted to resolve the problem. WS then provides information on appropriate methods that the cooperator may consider to resolve the damage themselves. Types of technical assistance projects may include a visit to the affected property, written communication, telephone conversations, or presentations to groups such as homeowner associations or civic leagues.

This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, and/or private businesses. Those persons experiencing damage or threats could take action using those methods legally available to resolve or prevent mammal damage as permitted by federal, state, and local laws and regulations or those persons could take no action.

Mammal populations would not be directly impacted by WS from a program implementing technical assistance only. However, persons experiencing damage or threats from mammals may implement methods based on WS' recommendations. Under a technical assistance only alternative, WS would recommend and demonstrate for use both non-lethal and lethal methods legally available for use to resolve mammal damage. Methods and techniques recommended would be based on WS' Decision Model using information provided from the requestor or from a site visit. Requestors may implement WS' recommendations, implement other actions, or take no action. However, those requesting assistance are likely those that would implement damage abatement methods in the absence of WS' recommendations.

Under a technical assistance only alternative, those persons experiencing threats or damage associated with mammals could lethally take mammals despite WS' lack of direct involvement in the management action. Therefore, under this alternative the number of mammals lethally taken would likely be similar to the other alternatives since take could occur through the issuance of a permit by the NHFG, take of non-native mammal species can occur without the need for a permit from the NHFG, and take would continue to occur during the harvest season for those species. WS' participation in a management action would not be additive to an action that could occur in the absence of WS' participation.

With the oversight of the NHFG, it is unlikely that mammal populations would be adversely impacted by implementation of this alternative. Under this alternative, WS would not be directly involved with damage management actions and therefore, direct operational assistance could be provided by other entities, such as the NHFG, private entities, and/or municipal authorities. If direct operational assistance is not available from WS or other entities, it is possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal take, which could lead to real but unknown effects on other wildlife populations. People have resorted to the illegal use of chemicals and methods to resolve wildlife damage issues (White et al. 1989, USFWS 2001, Food and Drug Administration 2003).

Trap monitors, FLIR devices, and night vision equipment would continue to be available for use by other entities under this alternative. Although, the cost associated with purchasing the equipment can be prohibitive to individual properties owners, other municipal and/or governmental entities that could provide assistance could purchase and use those methods when funding is available.

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

Under the proposed action, WS would continue to provide both technical assistance and direct operational assistance to those persons requesting assistance with managing damage and threats associated with mammals in the State. WS could employ those methods described in Appendix B of the EA or this supplement in an adaptive approach that would integrate methods to effectively reduce damage and threats associated with mammals in the State.

The issue of the effects on target mammal species arises from the use of non-lethal and lethal methods to address the need for reducing damage and threats. As part of an integrated approach to managing damage and threats, WS could apply both lethal and non-lethal methods when requested by those persons experiencing damage. Non-lethal methods can disperse or otherwise make an area unattractive to mammals causing damage; thereby, reducing the presence of mammals at the site and potentially the immediate area around the site where non-lethal methods are employed. Non-lethal methods would be given priority when addressing requests for assistance (see WS Directive 2.101). However, non-lethal methods would not necessarily be employed to resolve every request for assistance if deemed inappropriate by WS' personnel using the WS Decision Model.

For example, if a cooperator requesting assistance, has already attempted to disperse mammals using non-lethal harassment methods, WS would not necessarily employ those methods again during direct operational assistance since those methods had already been proven to be ineffective in that particular situation. Non-lethal methods are used to exclude, harass, and disperse target wildlife from areas where damage or threats are occurring. When effective, non-lethal methods would disperse mammals from the area resulting in a reduction in the presence of those mammals at the site where those methods were employed. However, mammals responsible for causing damage or threats are moved to other areas with minimal impact on those species' populations. Non-lethal methods are not employed over large geographical areas or applied at such intensity that essential resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over a wide geographical scope that long-term adverse effects would occur to a species' population. Non-lethal methods are generally regarded as having minimal impacts on overall populations of wildlife since individuals of those species are unharmed. The use of non-lethal methods would not have adverse impacts on mammal populations in the State.

Lethal methods could be employed to resolve damage associated with those mammals identified by WS as responsible for causing damage or threats to human safety only after receiving a request and only after a permit has been issued for the take of the species by the NHFG, when required. The use of lethal methods would therefore result in local population reductions in the area where damage or threats were occurring since target individuals would be removed from the population. Lethal methods are often employed to remove mammals that have been identified as causing damage or posing a threat to human safety. The use of lethal methods would therefore result in local reductions of mammals in the area where damage or threats were occurring. The number of mammals removed from the population using lethal methods under the proposed action would be dependent on the number of requests for assistance received, the number of mammals involved with the associated damage or threat, and the efficacy of methods employed.

Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage. WS' take would be monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause undesired adverse effects to the viability of native species populations. The potential impacts on the populations of target mammal species from the implementation of the proposed action are analyzed for each species below.

WS maintains ongoing contact with the NHFG to ensure activities are within management objectives for those species. WS submits annual activity reports to the NHFG. The NHFG monitors the total take of mammals from all sources and factors in survival rates from predation, disease, and other mortality data. Ongoing contact with the NHFG assures local, state, and regional knowledge of wildlife population trends are considered.

WS has provided direct damage management and technical assistance in response to requests for assistance since the completion of the EA. Descriptions and application of direct damage management and technical assistance projects are discussed in detail in section 3.2 of the EA (USDA 2005*a*). All activities conducted by WS were pursuant to relevant federal, State, and local laws and regulations. Integrated damage management activities conducted under the selected alternative in the EA from FY 2005 through FY 2011 are discussed below by year.

Population Impact Analysis from WS' activities in New Hampshire from FY 2005 through FY 2011

WS' cumulative take of mammals by species from FY 2005 through FY 2011 to alleviate damage or threats of damage is shown in Table 17. The take of mammal species by WS from FY 2005 through FY 2011 that were specifically addressed in the EA occurred within the impact parameters analyzed. Those mammal species lethally taken by WS are not considered to be of low density in the State. Feral swine, house mice, and Norway rats are considered non-native species that can have negative effects on native wildlife species. Any reduction in those species populations could be considered as being beneficial to the natural environment. In addition to lethal take, WS also live-captured feral cats that were released to animal shelters for care and determination of adoptability.

Table 17 - WS' lethal take of mammals in New Hampshire from FY 2005 through FY 2011

Species	Fiscal year							Total
	2005	2006	2007	2008	2009	2010	2011	
Beaver	0	0	0	0	0	24	3	**27**
Feral Swine	0	0	0	0	0	17	14	**31**
Red Fox	0	0	0	0	0	4	0	**4**
Muskrat	0	0	24	0	0	0	22	**46**
Opossum	0	0	1	0	0	0	0	**1**
Raccoon	0	0	0	0	0	2	1	**3**
Striped Skunk	0	0	1	0	2	4	0	**7**
Norway Rat	0	0	11	0	0	0	0	**11**
Woodchuck	3	2	2	10	12	2	0	**31**
Deer Mice	0	0	0	0	0	68	40	**108**
House Mice	0	0	0	0	0	5	45	**50**
Voles	0	0	0	0	0	2	0	**2**
Shrews	0	0	0	0	0	0	12	**12**

Beaver, coyotes, gray fox, red fox, muskrats, opossum, raccoons, and striped skunks all maintain sufficient densities in the State to allow for annual harvest seasons for those species. No daily take limits or possession limits exist for trapping coyotes, fox, raccoons, skunks, opossum, beaver, mink, and muskrats during the open trapping seasons. Coyotes, fox, opossum, skunks, raccoons, and weasels can be harvested during the regulated hunting season without limit. Property owners or their agents can lethally take beaver, muskrat, raccoons, opossum, skunks, fox, coyotes, squirrels, moles, voles, mice, and shrews when those mammal species are causing damage to property or agricultural resources using lawful procedures at any time in accordance with State law and local ordinances. Feral swine and Norway rats are non-native species and are afforded no protection from take. Woodchucks, porcupine, red squirrels, mice, voles, moles, and shrews are considered "*other wildlife*" within the State with no take restrictions or harvest season (NHFG 2010).

Harvest data from the NHFG are shown in Table 18. Data shown in Table 18 includes those mammal species harvested during annual regulated harvest seasons, which could include a hunting season and/or a

trapping season. The number of mammal species lethally taken to alleviate damage by other entities is currently not available.

Table 18 - Species harvested during the hunting and trapping seasons in New Hampshire, 2005-2010[a].

Species	Harvest Season						Total
	2005	2006	2007	2008	2009	2010	
Beaver	2,595	3,057	3,371	2,210	2,709	2,478	**16,420**
Coyote	661	464	560	378	517	396	**2,976**
White-tailed Deer	10,595	11,766	13,559	10,916	10,384	9,759	**66,979**
Red Fox	408	239	336	218	282	210	**1,693**
Gray Fox	117	71	190	113	180	179	**850**
Muskrat	2,348	2,109	2,651	1,518	1,138	1,625	**11,389**
Black Bear	434	352	615	440	758	707	**3,306**
Raccoon	634	350	495	449	395	385	**2,708**

[a]Information based on harvest survey information from the NHFG (NHFG 2010).

When WS' take in Table 17 is compared to the annual harvest levels of those mammal species in New Hampshire from Table 18, WS' take represents a small percentage of the annual take of those species. WS' take could be considered of low magnitude when compared to the cumulative take of those mammal species. Population estimates for those mammal species in the State are currently not available. Since WS' take has been within the parameters evaluated in the EA and if the populations of those mammal species have remained at least stable, the annual take of those species that occurs within the impact parameters evaluated in the EA would remain of a low magnitude when compared to those species' population estimates provided in the EA. No additional information was available on those species populations in New Hampshire; therefore, those population estimates provided in the EA remain the best available information.

The EA concluded that the effects of WS' damage management activities in New Hampshire would not adversely affect those populations of mammal species addressed in the EA when damage management activities occurred within the scope analyzed. Analyses conducted during the monitoring of WS' activities in New Hampshire for the management of mammal damage determined that WS' lethal take of mammals was not adversely affecting populations based on the best available information on those species' populations. The permitting of those activities by the NHFG provides additional analyses and outside review that WS' activities since FY 2005 have not negatively impacted populations of those mammals addressed in the EA.

Population Impact Analysis of the Proposed Supplement to the EA

This supplement will further address WS' increased take of raccoons and striped skunks to reduce damage and threats to human safety. In addition, this supplement will evaluate the potential impacts to feral swine, opossum, porcupine, gray squirrel, red squirrel, Northern flying squirrel, Southern flying squirrel, feral cat, deer mice, white-footed mice, house mice, meadow jumping mice, woodland jumping mice, Northern short-tailed shrews, masked shrews, water shrews, smoky shrews, long-tailed shrews, pygmy shrews, least shrews, hairy-tailed moles, Eastern moles, star-nosed moles, Southern red-backed voles, meadow voles, rock voles, woodland voles, and Norway rats in the State from damage management activities.

Raccoon Population Impact Analysis

The raccoon is a stocky mammal about 61 to 91 cm (2 to 3 feet) long, weighing 4.5 to 13.5 kg (10 to 30 lbs.). It is distinctly marked, with a prominent black mask over the eyes and a heavily furred, ringed tail. The animal is a grizzled salt-and-pepper gray and black above, although some individuals are strongly washed with yellow (Boggess 1994).

The raccoon is one of the most omnivorous of animals. It will eat carrion, garbage, birds, mammals, insects, crayfish, mussels, other invertebrates, and a wide variety of grains, various fruits, other plant materials and most or all foods prepared for human or animal consumption (Sanderson 1987). They occasionally kill poultry (Boggess 1994), and come into conflict with man frequently in urban and suburban environments by raiding garbage cans and pet food sources.

The raccoon is found throughout most of the United States, with the exception of the higher elevations of mountainous regions and some areas of the arid southwest (Boggess 1994, National Audubon Society 2000). Raccoons are more common in the wooded eastern portions of the United States than in the more arid western plains (Boggess 1994), and are frequently found in cities or suburbs as well as rural areas (National Audubon Society 2000). Movements and home ranges of raccoons vary according to sex, age, habitat, food sources, season, and other factors. In general, males have larger home ranges than females. Home range diameters of raccoons have been reported as being 1 to 3 km (0.6 to 2.9 mi.) maximum, with some home range diameters of dense suburban populations to be 0.3 to 0.7 km (0.2 to 0.4 mi.).

Absolute raccoon population densities are difficult or impossible to determine because of the difficulty in knowing the percentage of the population that has already been counted or estimated and the additional difficulty of knowing how large an area the raccoons are using (Sanderson 1987). Due to their adaptability, raccoon densities reach higher levels in urban areas than that of rural areas. Relative raccoon population densities have been variously inferred by take of animals per unit area. For instance, Twichell and Dill (1949) reported removing 100 raccoons from tree dens in a 41 ha (101 acres) waterfowl refuge area, while Yeager and Rennels (1943) studied raccoons on 881 ha (2,177 acres) in Illinois and reported trapping 35-40 raccoons in 1939, 170 in 1940, and 60 in 1941. Slate (1980) estimated 1 raccoon per 7.8 ha (19.3 acres) in New Jersey in predominantly agricultural land on the inner coastal plain. Raccoon densities of 100 per square mile (1 raccoon per 6.4 acres) can be attained around abundant food sources (Kern 2002). Kennedy et al. (1991) estimated 13 raccoons per 100 ha (1 raccoon per 19 acres) of lowland forest in Tennessee.

There are no true population estimates available for raccoons in New Hampshire. However, the lowest statewide population has been estimated to range from 34,847 to 185,848 raccoons (USDA 2009*a*). The average raccoon density in Coos County, New Hampshire in 2001, 2002, and 2011 was 3.9 raccoons per square kilometer (WS-NRMP, WS unpublished data). Additionally, the furbearer management program with the NHFG relies on trapper data to monitor furbearer populations. Furbearer population trends are monitored by trapper catch rates. More specifically, trapper catch per unit effort data (catch per 100 trap nights) are used as species-specific population indices. Based on data from the NHFG, raccoon population values remained relatively stable and were well within historic norms ranging from 3.0 in 2004-2005 to 3.49 in 2009-2010 (catch per 100 trap nights; NHFG 2010).

In New Hampshire, raccoons cause damage to gardens, residential and non-residential buildings, domestic fowl, and pets, as well as general property damage. Results of their feeding may be the total loss of ripened sweet corn in a garden. Damage to buildings generally occurs when they seek to gain entry or begin denning in those structures. Raccoons may den in uncapped chimneys, or may tear off shingles or fascia boards to gain access to attics or wall spaces. They may also damage or destroy sod by rolling it up in search of earthworms and other invertebrates (Boggess 1994).

Health and safety issues associated with raccoons are also a concern. These diseases include, but are not limited to, canine distemper and rabies, and the roundworm *Baylisascaris procyonis*, the eggs of which survive for extremely long periods in raccoon feces and soil contaminated by them. Ingestion of these eggs can result in serious or fatal infections in other animals as well as humans (Davidson and Nettles 1997; see Table 4). WS conducts efforts to combat the spread of raccoon rabies in New Hampshire. These activities are part of the national rabies barrier program covered under separate environmental analyses (USDA 2001). Other rabies monitoring or control activities may occur as part of this program.

WS conducted 582 technical assistance projects associated with raccoons between FY 2005 and FY 2011. Nearly 50% of projects were associated with the threats raccoons pose to human health and safety. WS lethally removed three raccoons during direct operational assistance projects conducted between FY 2005 and FY 2011 (see Table 17). This number constitutes only a very small percentage of the estimated total population of this species in the State.

Raccoons are managed by the NHFG as a furbearer game species and may be trapped from October 15 through December 31 and November 1 through January 15 depending on the State Management Unit. Additionally, raccoons may be hunted from September 1 through March 31. There is no daily or season take limit for either trapping or hunting raccoons. In damage situations, property owners, dwelling occupants, farmers, and their agents, may take raccoons, with no permit required, via lawful procedures to alleviate damage to property, agricultural resources (including livestock, crops, or poultry), and other resources.

As shown in Table 18, trappers within New Hampshire harvested 2,708 raccoons between 2005 and 2010, which is an average of 452 raccoons harvested annually. The highest level of take between 2005 and 2010 occurred during the 2005 trapping season when 634 raccoons were harvested in the State. The lowest take occurred during the 2006 trapping season when 350 raccoons were harvested. The fluctuating harvest trend is likely more of a function of declining fur values rather than indicating a declining population trend. The number of individuals harvested annually for fur is often a function of the value of pelts with harvest increasing as fur prices increase and harvest declining as fur prices decline.

In future programs, WS may be requested to address damage being caused by raccoons anywhere in New Hampshire to protect resources or human health and safety. Activities would target single animals or local populations of the species at sites where their presence was causing unacceptable damage to agriculture, human health, natural resources, or property. Some local populations may be temporarily if raccoons are lethally removed. Based upon an anticipated increase for requests for WS' assistance, up to 100 raccoons could be lethally removed by WS annually to alleviate damage, including raccoons that may be lethally taken during post-bait trapping activities associated with the ORV distribution program for rabies. The EA evaluated an annual take of up to 20 raccoons (USDA 2005*a*).

Using the lowest population estimate of 34,847 raccoons, the take of 100 raccoons would represent 0.3% of the population. Using a population estimated at 185,848 raccoons, the lethal take of up to 100 raccoons by WS would represent 0.1% of the estimated population. If WS had lethally removed 100 raccoons every year from FY 2005 through FY 2010, WS' take would have represented from 13.6% to 22.2% of the total known harvest of raccoons.

The unlimited harvest levels allowed by the NHFG during the length of the hunting and trapping seasons provides an indication that cumulative take, including take for damage management, would not reach a level where overharvest of the raccoon population would occur resulting in an undesired population decline. The NHFG has regulatory authority over the management of wildlife, including raccoons, and all take by WS has occurred and would continue to occur only after being authorized by the NHFG and only

at the levels authorized. The NHFG has determined that there is no evidence to suggest that additional removal of raccoons by WS would have a negative impact on the overall raccoon population (M. Ellingwood, NHFG, pers. comm. 2011).

WS also provides assistance in managing the spread of raccoon rabies in New Hampshire. These activities are part of the national rabies barrier program covered under separate environmental analyses (USDA 2001). Other rabies monitoring or control activities may occur as part of this program. Raccoons killed under the ORV program are covered by the EA and FONSI – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Foxes, and Coyotes in the United States (USDA 2001) but are included in this EA for cumulative impact analysis.

Striped Skunk Population Impact Analysis

Although easily recognized by their black and white fur, the striped skunk may be most readily recognized by the odiferous smell of its musk. They are common throughout the United States and Canada (Rosatte 1987). Striped skunks are primarily nocturnal and do not have a true hibernation period, although during extremely cold weather they may become temporarily dormant. The striped skunk is an omnivore, feeding heavily on insects such as grasshoppers and crickets, beetles and bees and wasps (Godin 1982). The diet of the striped skunk also includes small mammals, the eggs of ground-nesting birds, and amphibians. Striped skunks are typically not aggressive and attempt to flee when people approach (Rosatte 1987). However, when provoked, skunks will give a warning and assume a defensive posture prior to discharging their foul-smelling musk. The striped skunk may use abandoned burrows of other animals as a home. They may also dig their own burrow, or use a protected place, such as a hollow log, crevice, or the space beneath a building. Skunks are currently the chief carrier of rabies in the United States (National Audubon Society 2000).

Adult skunks begin breeding in late February. Yearling females (born in the preceding year) mate in late March. Gestation usually lasts about seven to 10 weeks, and there is usually only one litter annually. Litters commonly consist of four to six young. The home range of striped skunks is usually not consistent. Home ranges appear to be reliant upon life history requirements such as winter denning, feeding activities, dispersal, and parturition (Rosatte 1987). Home ranges of striped skunks in rural areas of Minnesota and Illinois averaged between 2.2 and 4.9 km^2 (0.85 to 1.9 $miles^2$) (Rosette 1987, Novak et al. 1987). During the breeding season, males may travel larger areas in search of females. Skunk densities vary widely according to season, food sources, and geographic area. Densities have been reported to range from one skunk per 77 acres to one per 10 acres (Rosatte 1987).

No population estimates are available for striped skunks in New Hampshire. Striped skunks can be found in a variety of habitats across the State. Therefore, a population estimate will be derived based on the best available information for skunks to provide an indication of the magnitude of take proposed by WS to alleviate damage and threats of damage. There are more than four million acres of rural land in New Hampshire (USDA 2009*b*). If only 50% of the rural lands throughout the State have sufficient habitat to support stripped skunks, skunks are only found in rural habitat, and skunk densities average one skunk per 77 acres, a statewide stripped skunk population could be estimated at nearly 26,000 skunks. Skunks can be found in a variety of habitats, including urban areas, throughout the State; therefore, skunks likely occupy more than 50% of the rural land area in the State. However, to determine the magnitude of the proposed take by WS to alleviate or prevent damage, skunks occupying only 50% of the rural land area was used to provide a minimum population estimate.

In New Hampshire, the striped skunk is managed by the NHFG as a furbearer species with a hunting season that occurs from September 1 through March 31. Skunks may be trapped during the trapping season from October 15 through December 31 or from November 1 through January 15 depending on

State Management Unit. There is no daily or season take limit for either trapping or hunting of striped skunks. In damage situations, property owners, dwelling occupants, farmers, and their agents, may take raccoons (no State permit required) via lawful procedures to alleviate damage to property, agricultural resources (including livestock, crops, or poultry), and other resources. Information regarding the total number of skunk harvested in New Hampshire annually is not available.

WS responded to 1,188 requests (average = 170/yr.) for technical assistance associated with striped skunk damage from FY 2005 through FY 2011. Resources affected included human health and safety, general property, residential and non-residential buildings, livestock, pets, and landscaping. Damage also included burrowing/digging, odor, nuisance, rabies threats, and other threats. Most complaints were handled by providing technical assistance advice on methods for addressing damage. Damage related to human health and safety was the most commonly reported damage type at 66% of all requests for assistance. WS employed lethal methods to take seven striped skunks in New Hampshire from FY 2005 through FY 2011.

Managing damage and threats of damage associated with skunks were specifically addressed in the EA (USDA 2005*a*). Since the completion of the EA, WS has received an increasing number of requests for assistance with skunks. In association with the increasing number of requests for assistance is the likelihood that those persons requesting assistance will request WS address skunk damage using lethal methods. Therefore, the number of skunks taken annually by WS to address the increasing number of requests for assistance is also likely to increase. The EA evaluated an annual take of up to 20 skunks (USDA 2005*a*). However, based on recent requests for assistance and in anticipation of receiving additional requests for assistance, WS could annually take up to 100 skunks to alleviate damage or threats of damage associated with those requests.

Based on the best available information on skunk densities, the minimum population in the State could be estimated at nearly 26,000 skunks. Skunks maintain sufficient densities to allow for annual hunting and trapping seasons that allow an unlimited number of skunks to be harvested during the open season. However, the number of skunks harvested during the annual hunting and trapping seasons and to alleviate damage is currently unknown.

With a statewide population estimated at 26,000 skunks, an annual take of up to 100 skunks by WS would represent 0.4% of the population, if the population remains at least stable. The unlimited harvest allowed by the NHFG during the annual hunting and trapping seasons provides some indication the population of skunks in the State is not subject to overharvest during the annual harvest seasons and from damage management activities.

Beaver Population Impact Analysis

Activities associated with managing damage and threats of damage caused by beaver in the State were specifically addressed in the EA (USDA 2005*a*). Since the completion of the EA, WS has received an increasing number of requests for assistance with beaver. In association with the increasing number of requests for assistance is the likelihood that those persons requesting assistance will request WS address beaver damage manage using lethal methods. Therefore, the number of beaver taken annually by WS to address the increasing number of requests for assistance is also likely to increase. The EA evaluated an annual take of up to 20 beaver (USDA 2005*a*). However, based on recent requests for assistance and in anticipation of receiving additional requests for assistance, WS could annually take up to 250 beaver to alleviate damage or threats of damage associated with those requests. WS anticipates an increase in the need to address damage and threats associated with beaver at airports, on federal, State, municipal and private property, landfills, along road and railways, and to protect T&E species from beaver flooding, tree

felling, and habitat manipulation. In addition, WS could manipulate the water levels impounded by beaver dams by removing, breaching, or installing water flow devices in up to 100 beaver dams annually.

Beaver are managed by the NHFG as a furbearer game species and may be trapped from October 15 through December 31 or from November 1 through January 15 depending on the State Management Unit (NHFG 2011). There is no limit on the number of beaver that can be harvested during the trapping season. The NHFG furbearer management program relies on trapper data to monitor furbearer populations. Furbearer population trends are monitored by trapper catch rates. More specifically, trapper catch per unit effort data (catch per 100 trap nights) are used as species-specific population indices. The reliance on catch per unit effort data as a population index is based on the widely held view that trapper efficiency is a function of species abundance. Based on data from the NHFG, beaver population values remained relatively stable and were well within historic norms ranging from 8.09 in 2004-2005 to 7.49 in 2009-2010 (catch per 100 trap nights; NHFG 2010).

WS responded to 650 requests (average = 93/yr.) for technical assistance with beaver damage from FY 2005 through FY 2011. Resources affected included human health and safety, general property, residential and non-residential buildings, roadways, and landscaping. Beaver damage included natural areas, as well as commercial forestry, pastures, and landscaping. Damage was primarily a result of beaver induced flooding or feeding activity. Most complaints were handled by providing technical assistance advice or materials on methods for addressing damage. From FY 2005 through FY 2011, WS lethally removed 27 beaver in New Hampshire during all damage management projects. However, requests for assistance related to beaver damage continue to rise in New Hampshire.

Based on the best available information on beaver densities and wetland habitat within the State, beaver maintain sufficient densities to allow for annual trapping seasons, which permit an unlimited number of beaver to be harvested during the open season. As shown in Table 18, trappers harvested 16,420 beaver between 2005 and 2010, which is an average of 2,737 beaver harvested annually. The highest level of take between 2005 and 2010 occurred during the 2007 trapping season when 3,371 beaver were harvested. The lowest take occurred during the 2008 trapping season when 2,210 beaver were harvested. The fluctuating trend of beaver harvested annually is likely more of a function of declining fur values rather than indicating a declining population trend. The number of individuals harvested annually for fur is often a function of the value of pelts with harvest increasing as fur prices increase and harvest declining as fur prices decline.

Based on an average annual take of 2,737 beaver from 2005 through 2010, WS' take of 250 beaver would have represented 9.1% of the average annual harvest of beaver. WS lethally removing 250 beaver annually from 2005 through 2011 would only represent a minor component of the overall take and would not increase the cumulative take to a level where adverse effects to the beaver population would occur. Conflicts related to beaver damage and threats to property have remained an issue. Abundant habitat and the unlimited harvest allowed by the NHFG during the annual trapping season provides some indication the population of beaver in the State is not subject to overharvest during the annual trapping seasons and from damage management activities. The NHFG has determined that there is no evidence to suggest that additional removal of beaver by WS would have a negative impact on the overall beaver population (M. Ellingwood, NHFG, pers. comm. 2011).

Feral Swine Population Impact Analysis

Feral swine are a non-native species in New Hampshire that are negatively affecting resources and causing extensive damage. Feral swine have no legal game status in New Hampshire but are considered escaped private property and may only be hunted with permission by said property owner. Since 1949, feral swine have been defined in the state as animals "*Running at Large*" under RSA 467:3. Historically,

feral swine populations in New Hampshire have been either Eurasian wild boar or hybrids. Reports of feral swine have been documented as early as 1895 and continue today statewide, but are primarily found in Grafton, Sullivan, and Cheshire Counties. Although it is difficult to estimate the number of feral swine, the number of damage complaints and sightings has been increasing. The current population of feral swine is difficult to estimate but is likely around 500 individuals and possibly higher (A. Musante, WS unpublished data).

Under this supplement to the EA, activities would occur to manage damage and threats associated with feral swine in New Hampshire when a request for assistance is received and a cooperative service agreement, MOU, or comparable document has been signed by a cooperating agency or agencies and the property owner or property manager. Although the NHFG does not regulate the take of feral swine, any reduction in the feral swine population in New Hampshire would be a collaborative effort. WS has the opportunity to work cooperatively with the NHFG, the New Hampshire Department of Agriculture, Markets and Foods, the USDA, APHIS, Veterinary Services (VS), and the Blue Mountain Forest Association (Corbin Park) on the management of feral swine damage and threats to human, livestock and wildlife health from feral swine in New Hampshire. Feral swine are an invasive species which can cause damage to natural resources, native vegetation, landscaping and crops, and which compete with native wildlife for food and resources. Feral swine are vectors of a number of diseases including pseudorabies (PRV), swine brucellosis (SB), porcine respiratory and reproductive syndrome (PRRS), and classical swine fever (CSF) which may be passed to livestock and, in some cases, native wildlife. Pseudorabies, SB and PRRS have been identified in feral swine populations in the United States. Pseudorabies has also been detected in native wildlife including raccoons, foxes, skunks, and mice. Classical swine fever is not currently present in the United States, but outbreaks in other parts of the world and global trade in animals have raised concerns about the possible spread of disease to the United States.

Although harvest records are not kept in the State, opportunistic hunters are thought to remove five to 50 feral swine annually (A. Musante, WS unpublished data). In addition to those feral swine lethally taken by hunters, WS has also been requested to assist with reducing damages associated with feral swine. WS employed lethal methods to alleviate damages and removed 31 feral swine between FY 2010 and FY 2011 (see Table 18). Based on previous requests for assistance and in anticipation of receiving additional requests for assistance in the future, WS anticipates that up to 250 feral swine could be removed annually in the State to alleviate damage or threats of damage.

Feral swine are a non-native species and not an essential component of native ecosystems and have negative impacts on the environment. Consequently, any reduction in feral swine populations would be considered beneficial to the State of New Hampshire. Long-term objectives of the involved cooperators would include the suppression or complete removal of feral swine from New Hampshire. Therefore, WS proposes to take 250 feral swine annually statewide would occur within the management objectives of the NHFG and the New Hampshire Department of Agriculture, Markets and Foods . All activities to manage feral swine in New Hampshire would be conducted by working with property owners of animals "*Running at Large*" pursuant to RSA 467:3 and from the direction of the NHFG and the New Hampshire Department of Agriculture, Markets and Foods, as well as additional affected cooperators.

Feral swine damage management could involve a number of non-lethal and lethal strategies. Non-lethal methods may include fencing or using guard animals to protect livestock or property, but in most cases are more expensive and less practical than lethal methods. Trapping is the most effective and efficient means which includes the use of corral, box and cage style traps. Cage trap designs may be constructed as a rectangular enclosure made of heavy-gauge wire livestock panels welded to angle iron or square tube framing which can be more easily transported. A corral trap can be designed to be stationary and easily expanded due to heavy gauge wire panels being attached to posts driven into the ground. A description of

many of the wildlife damage management methods available are provided in Appendix B of the EA (USDA 2005*a*). Feral swine live-captured would be euthanized in accordance with WS Directive 2.505.

In addition, feral swine could be fitted with a radio collar or satellite-tracking device and released. Feral swine are social and will often locate other swine in the area once released. The tracking of feral swine movements can assist with locating other groups of feral swine responsible for causing damage and to understanding their movement patterns. Understanding movement patterns of feral swine can be used to more effectively apply methods and alleviate damage.

Virginia Opossum Population Impact Analysis

Opossums are the only marsupials (*i.e.*, possess a pouch in which young are reared) found north of Mexico (Seidensticker et al. 1987). They frequent most of the eastern and central United States, except Minnesota, northern Michigan, and New England, extending west to Wyoming, Colorado, and central New Mexico (National Audubon Society 2000). Opossum are also found in parts of the southwestern United States, California, Oregon, and Washington (Jackson 1994*b*). Adults range in size from less than 1 kg (2.2 lbs.) to about 6 kg (13 lbs.), depending on sex and time of year. They grow throughout life (Seidensticker et al. 1987). They have a broad range of pelage colors, but are usually considered as "*gray*" or "*black*" phase. Their fur is grizzled white above; long white hairs cover black tipped fur below. They climb well and feed on a variety of foods, including carrion, which forms much of its diet. In addition, opossum eat insects, frogs, birds, snakes, small mammals, earthworms, and berries and other fruits; persimmons, apples, and corn are favorite foods (National Audubon Society 2000). They use a home range of 4 to 20 hectares (10 to 50 acres), foraging throughout this area frequently (Jackson 1994*b*), but concentrating on a few sites where fruits abound, when they are in season (Seidensticker et al. 1987).

The reproductive season of the Virginia opossum typically occurs from December to February, depending on latitude (Gardner 1982). Gestation is short (average of 12.8 days) with 1 to 17 young born in an embryonic state which climb up the mothers belly to the marsupium (pouch), attach to teats, and begin to suckle (Gardner 1982, National Audubon Society 2000). Those young remain in the pouch for about two months at which time they will begin to explore and may be found traveling on their mother's back with their tails grasping hers (Whitaker, Jr., and Hamilton, Jr. 1998). Opossums live for only one to two years, with as few as 8% of a population of those animals surviving into the second year in a study in Virginia conducted by Seidensticker et al. (1987). In that five-year study, it was also observed that there was a wide variation in opossum numbers, in what was considered excellent habitat for the species. Those variations were observed seasonally and in different years. However, the mean density during the study was 10.1 opossum per square mile with a range of 1.3 opossum per square mile to 20.2 opossum per square mile (Seidensticker et al. 1987). This was comparable to other opossum population densities in similar habitats in Virginia. Verts (1963) found a density estimate of 10.1 opossum per square mile in farmland areas in Illinois while Wiseman and Hendrickson (1950) found a density of 6.0 opossum per square mile in mixed pasture and woodlands in Iowa. However, VanDruff (1971) found opossum densities in waterfowl nesting habitat as high as 259 opossum per square mile.

Opossum are common throughout New Hampshire in appropriate habitat; however, no population estimates are available. Therefore, a population estimate will be derived based on the best available information for opossum to provide an indication of the magnitude of take proposed by WS to alleviate damage and threats of damage. The rural land area of New Hampshire covers four million acres (USDA 2009*b*). If opossum were only found on 50% of the rural land area using a mean density of 10.1 opossum per square mile found by Seidensticker et al. (1987) in Virginia, the population would be estimated at nearly 31,600 opossum. Using the range of opossum found by Seidensticker et al. (1987) estimated at 1.3 opossum per square mile to 20.2 opossum per square mile and only 50% of the rural land area of the State being occupied by opossum, the statewide population would range from a low of 4,060 opossum to a high

of 63,000 opossum. Opossum can be found in a variety of habitats, including urban areas, so opossum occupying only 50% of the rural land area of the State is unlikely since opossum can be found almost statewide. However, opossum occupying only 50% of the rural land area was used to provide a minimum population estimate to determine the magnitude of the proposed take by WS to alleviate or prevent damage.

Opossum are considered a furbearing species in the State and can be harvested during annual hunting and trapping seasons. During the development of the EA, opossum could be harvested during hunting and trapping season with no limit on the number that could be taken during those seasons. In addition, opossum can be lethally taken when causing damage or posing a threat of damage without the need for a permit from the NHFG. However, the number of opossum lethally taken to alleviate damage and the number of opossum harvested during the annual harvest seasons is currently unknown.

Activities to reduce damage and threats of damage caused by opossum were not specifically addressed in the EA. However, WS continues to receive requests for assistance associated with opossum. WS received 111 technical assistance requests from FY 2005 through FY 2011 about opossum damage or threats of damage. Requests for assistance were primarily related to human health and safety concerns. As part of damage management activities conducted by WS, one opossum has been lethally taken from FY 2005 through FY 2011. Based on previous requests for assistance received by WS and in anticipation of additional requests for assistance, WS could lethally remove up to 100 opossum annually as part of efforts to reduce damage and threats of damage. Given the range of population estimates, the take of 100 opossum by WS annually would represent from 0.2% to 2.5% of the estimated statewide population, if the overall population remains at least stable.

The NHFG allows an unlimited number of opossum to be harvested during the annual hunting and trapping season, which provides an indication the population of opossum, is not likely to decline from overharvest. The permitting of the take by the NHFG ensures take would occur within population objectives established by the Department. Although the number of opossum lethally taken during the annual harvest seasons and for damage management is unknown, the cumulative take of opossum, including the proposed take of up to 100 opossum annually by WS, would be of a low magnitude when compared to the actual statewide opossum population.

Shrew, Vole, Mole, and Mouse Population Impact Analysis

There is a need for damage management activities associated with shrews, voles, moles, and mice, primarily at airports where small mammals can act as attractants for other wildlife species that pose strike risks at those airports when densities are high. Airports often maintain habitat conditions that are preferred by species such as shrews, voles, moles, and mice. The ranges of these small mammals often overlap and multiple species can be found at a particular location. WS could be requested to conduct surveillance and damage management activities associated with deer mice, white-footed mice, house mice, meadow jumping mice, woodland jumping mice, Northern short-tailed shrews, masked shrews, water shrews, smoky shrews, long-tailed shrews, pygmy shrew, least shrews, hairy-tailed mole, Eastern moles, star-nosed moles, Southern red-backed voles, meadow voles, rock voles, and woodland voles.

Shrews, voles, moles, and mice may also cause problems by entering homes, cabins, and other structures that are not rodent-proof and building nests, storing food, and causing considerable damage to upholstered furniture, mattresses, clothing, paper, or other materials that they find suitable for nest-building. They can also cause extensive damage in reseeding programs, causing failure of such operations by feeding on planted seeds (Timm and Howard 1994).

Voles feed on a variety of green vegetation, including grasses, forbs, and tubers, and in late summer they store seeds, tubers, bulbs, and rhizomes (O'Brien 1994, National Audubon Society 2000). They eat bark at times, primarily in fall and winter, and will eat crops, especially when their populations are high. Occasional food items include snails, insects, and animal remains. Voles may cause extensive damage to orchards, ornamentals, and tree plantings due to their girdling of seedlings and mature trees while feeding on bark. This usually occurs in fall and winter. Field crops such as alfalfa, clover, grain, potatoes, and sugar beets may be damaged or completely destroyed by voles. Their activities in such crops may interfere with crop irrigation by displacing water and causing levees and checks to wash out. They can also ruin lawns, golf courses, and ground covers. Moles also eat seeds and some other plant materials with the most common damage, occurring as tunnels in gardens, lawns, golf courses and other grassy areas, results from their incessant search for food.

In addition to this damage to planting efforts and human property, deer mice have been associated with two serious diseases in recent years: Lyme disease, a bacterial infection, and Ranta virus, a respiratory illness. Lyme disease is carried by deer ticks, tiny ticks that when immature reside on deer mice. Ranta virus appeared in New Mexico in the early 1990s and caused a number of deaths; it is carried by the deer mouse and has been found in many regions in several other *Peromyscus* species as well as in *Microtus* species (Timm and Howard 1994, National Audubon Society 2000).

There are no protected shrew, vole, mole, or mouse species in New Hampshire but are classified as "*Other Nongame Wildlife*" by the NHFG; therefore, there are no restrictions on take of these species (NHFG 2011). Nongame species in New Hampshire are managed by the Nongame and Endangered Species Program of the NHFG. If the method of take would involve non-target take of a listed species, then there may be a need for issuance of a Scientific Collecting Permit (RSA 214:29) issued by the NHFG. Although statewide populations of shrews, voles, and mice are unknown, none of the species are considered to be threatened, endangered, or at low densities within the State and are considered common in appropriate habitat. The reproductive potential of these small mammal species is very high. Densities of shrews vary by habitat and species, but have been estimated to range from two to 70 individual shrews per acre in North America (Schmidt 1994). Additionally, rodents and insectivores are known prolific breeders that can have multiple litters per year.

Small mammals such as shrews, voles, moles, and mice would primarily be taken during wildlife hazard assessments conducted at airports to obtain information on densities of small mammals. Higher densities of shrews and other small mammals often attract higher numbers of raptors and other predatory wildlife to airports, which increase strike risks. Therefore, as part of a comprehensive wildlife hazard assessment conducted at airports to identify strike risks, small mammal surveys are often conducted using live-traps or body-grip style quick-kill traps (*e.g.*, snap trap). Based on previous assessments conducted, and in anticipation of conducting additional surveys at airports, WS could lethally take up to 200 individuals of each species addressed in this supplement. The limited proposed take by WS of up to 200 individuals of each of the shrew, vole, mole, and mouse species addressed in this supplement would not reach a magnitude where adverse effects to the populations of those species would occur.

Norway Rat Population Impact Analysis

Since the completion of the EA in 2005, WS has received requests for assistance with managing damage or threats of damage associated with many rodent species including Norway rats. Norway rats may be taken by WS during wildlife hazard management, assessment, and monitoring at airports and airbases. Although Norway rats do not cause direct hazards to aviation safety, rats do serve as prey attractants to raptors and mammalian predators that may pose serious threats to aircraft safety. Typically, take is associated with small mammal trapping surveys at airports or with operational prey base management activities to reduce hazards created by avian or mammalian predators in the aircraft operations area. The

level of WS' involvement in those activities may vary considerably from year to year depending on the number of airports requesting assistance from WS. In addition, WS could receive requests for assistance with rats associated with agriculture damage and/or receive requests to manage predation threats to T&E species associated with Norway rats.

In association with the increasing number of requests for assistance is the likelihood that those persons requesting assistance will ask WS to address Norway rat damage using lethal methods. Therefore, the number of rats taken annually by WS to address the increasing number of requests for assistance is also likely to increase. Based on recent requests for assistance and in anticipation of receiving additional requests for assistance, WS could annually take up to 500 Norway rats to alleviate damage or threats of damage associated with those requests.

Norway rats are a non-native species in New Hampshire that often competes with native wildlife for resources and are afforded no protection from take. The statewide population of Norway rats is currently unknown. The number of rats that are lethally taken annually is unknown, but given the prolific nature of rats, the take of rats by other entities to alleviate damage or threats of damage is not likely causing a population decline. Any reduction in the local or statewide population could benefit the natural environment by reducing competition between the non-native rats and native rat and other small mammal species. Executive Order 13112 directs federal agencies whose actions may affect the status of invasive species to reduce invasion of those species and the associated damages to the extent practicable and permitted by law.

Norway rats are a non-native species and not an essential component of native ecosystems and have negative impacts on the environment. Consequently, any reduction in Norway rat populations would be considered beneficial to the State of New Hampshire. Due to the species' relatively high reproductive rates and because management activities would be restricted to specific local sites, WS' activities under the proposed action would have minimal impacts on overall rat populations in the State.

Other Target Species Impact Analysis

Target species, in addition to the mammals analyzed above and not included in the EA (USDA 2005*a*), have been lethally taken in small numbers by WS or could be lethally taken when requested and have included or could include no more than 20 individuals of the following species: porcupine, Eastern chipmunk, gray squirrel, red squirrel, Northern flying squirrel, Southern flying squirrel, and feral cat. None of those mammal species are expected to be taken by WS at any level that would adversely affect overall mammal populations. Damage management activities would target single animals or local populations at sites where their presence was causing unacceptable damage to agriculture, human health or safety, natural resources, or property. Some local populations may be temporarily reduced as a result of removal activities to reduce damage at a local site.

Other target species listed in the EA were white-tailed deer, black bear, coyote, red fox, and gray fox and take was limited to 20 annually (USDA 2005*a*). Based on current requests for WS' assistance, an increase in the number of individuals that could be lethally removed annually is not anticipated. None of those mammal species are expected to be taken by WS at any level that would adversely affect populations of those species. Deer, bear, coyote, red fox, gray fox, and gray squirrel have hunting and/or trapping seasons that allow those species to be harvested. Coyotes have no closed hunting season and take can occur at any time. If up to 20 individuals of each of those species was lethally removed by WS to alleviate damage or threats of damage, the take would be of low magnitude when compared to the number of those species harvested each year and would be of extremely low magnitude when compared to the statewide population of those species. Those species are not considered to be of low densities in the State.

Porcupine, Eastern chipmunk, red squirrel, Northern flying squirrel, Southern flying squirrel, and feral cat are classified as "*Other Nongame Wildlife*" by the NHFG; therefore, there are no restrictions on take of these species (NHFG 2011). The NHFG, as the agency with management responsibility, could impose restrictions on lethal removal activities as needed to assure cumulative take does not adversely affect the continued viability of populations. This should assure that cumulative impacts on these mammal populations would have no significant adverse impact on the quality of the human environment.

Based on the above information, the oversight of WS' proposed activities by the NHFG, and the limited lethal take proposed by WS in New Hampshire, WS should have minimal effects on local or statewide populations of those species.

Disease Surveillance and Monitoring

The ability to efficiently conduct surveillance for and detect diseases is dependent upon rapid detection of the pathogen if it is introduced. Effective implementation of a surveillance system would facilitate planning and execution at regional and state levels, and coordination of surveillance data for risk assessment. It would also facilitate partnerships between public and private interests, including efforts by federal, state, and local governments as well as non-governmental organizations, universities, and other interest groups.[7]

Under disease sampling strategies that could be implemented to detect or monitor diseases in the United States, WS' implementation of those sampling strategies would not adversely affect mammal populations in the State. Sampling strategies that could be employed involve sampling live-captured mammals that could be released on site after sampling occurs. The sampling (*e.g.*, drawing blooding, tissue sample, fecal sample) and the subsequent release of live-captured mammals would not result in adverse effects since those mammals are released unharmed on site. In addition, sampling of sick, dying, or hunter harvested mammals would not result in the additive lethal take of mammals that would not have already occurred in the absence of a disease sampling program. Therefore, the sampling of mammals for diseases would not adversely affect the populations of any of the mammals addressed in this EA nor would result in any take of mammals that would not have already occurred in the absence of disease sampling (*e.g.*, hunter harvest).

Analysis of the Availability of Additional Methods to Resolve Mammal Damage and Threats

As described previously, since the completion of the EA, FLIR devices and night vision equipment have become available for use while conducting mammal damage management activities. Those methods aid in the use of other methods or allow other methods to be applied more selectively and efficiently. Since those methods are components of other methods, there would be no adverse effects on the populations of mammals from the use of those methods.

Alternative 3 - Non-lethal Mammal Damage Management Only By WS

Under this alternative, WS would be required to implement and recommend the use of non-lethal methods only to resolve damage caused by mammals. Only those methods discussed in Appendix B of the EA that are considered non-lethal would be employed by WS. No lethal take of mammals would occur by WS. The use of lethal methods could continue to be used under this alternative by those persons experiencing damage by mammals. Exclusionary devices can be effective in preventing access to resources in certain circumstances. Exclusion is most effective when applied to small areas to protect high value resources.

[7]Data collected by organizations/agencies conducting research and monitoring will provide a broad species and geographic surveillance effort.

However, exclusionary methods are neither feasible nor effective for protecting human safety, agriculture, or native wildlife species from mammals across large areas. The non-lethal methods used or recommended by WS under this alternative would be identical to those identified in any of the alternatives.

In situations where non-lethal methods were impractical or ineffective to alleviate damages, WS could refer requests for information regarding lethal methods to the NHFG, local animal control agencies, or private businesses or organizations. Under this alternative, however, property owners/managers might be limited to using non-lethal methods only as they may have difficulty obtaining permits for lethal methods, especially in urban areas.

Property owners or managers could conduct management using lethal methods that is legal. Property owners or managers might choose to implement WS' non-lethal recommendations, implement lethal methods, or request assistance from a private or public entity other than WS. Property owners/managers frustrated by lack of WS' assistance with the full range of mammal damage management techniques may try methods not recommended by WS or use illegal methods (*e.g.*, poisons). In some cases, property owners or managers may misuse some methods or use some methods in excess of what is necessary which could then become hazardous and pose threats to the safety of humans and non-target species.

Similar to Alternative 1 and Alternative 4, mammals could still be taken under this alternative. The potential effects on the populations of those mammal species in the State from the use of lethal methods by other entities would be similar among all the alternatives for this issue. WS' involvement would not be additive to take that could occur since the cooperator requesting WS' assistance could conduct mammal damage management activities using lethal methods or seek assistance from other entities to use lethal methods. Therefore, actions using lethal methods to resolve damage or reduce threats associated with mammals could occur by other entities despite the use or recommendation of only non-lethal methods by WS under this alternative.

Alternative 4 - No Federal WS Mammal Damage Management

Under this alternative, WS would not conduct activities in the State. WS would have no direct involvement with any aspect of addressing damage caused by mammals and would provide no technical assistance. No take of mammals by WS would occur. Mammals could continue to be lethally taken to resolve damage and/or threats occurring through permits issued by the NHFG, during the regulated hunting or trapping seasons, or in the case of certain species, take can occur anytime using legally available methods. Management actions taken by non-federal entities would be considered the environmental status quo.

Local mammal populations could decline, stay the same, or increase depending on actions taken by those persons experiencing mammal damage. Some resource/property owners may take illegal, unsafe, or environmentally harmful action against local populations of mammals out of frustration or ignorance. While WS would provide no assistance under this alternative, other individuals or entities could conduct lethal damage management resulting in impacts similar to the proposed action.

Since mammals would still be taken under this alternative, the potential effects on the populations of those mammal species in the State would be similar among all the alternatives for this issue. WS' involvement would not be additive to take that could occur since the cooperator requesting WS' assistance could conduct mammal damage management activities without WS' direct involvement or seek assistance from other entities. Therefore, any actions to resolve damage or reduce threats associated with mammals could occur by other entities despite WS' lack of involvement under this alternative.

Similar to the other alternatives, trap monitors, FLIR devices, and night vision equipment would be available for use by the appropriate entities under this alternative. Although, WS would not be involved with any aspect of mammal damage management activities under this alternative, other entities could employ those methods to alleviate damage or threats of damage. However, the effects on target species populations would be similar to those analyzed under the proposed action alternative since other entities could use those methods despite WS' lack of involvement under this alternative.

Issue 2 - Effects on Other Wildlife Species, Including Threatened and Endangered Species

A concern is often raised about the potential impacts to non-target species, including T&E species, from the use of methods to resolve damage caused by mammals. The potential effects on the populations of non-target wildlife species, including T&E species, are analyzed below.

Alternative 1 - Technical Assistance Only

Under a technical assistance alternative, WS would have no direct impact on non-target species, including T&E species. Methods recommended or provided through loaning of equipment could be employed by those persons requesting assistance. Recommendations would be based on WS' Decision Model using information provided by the person requesting assistance or through site visits. Recommendations would include methods or techniques to minimize non-target impacts associated with the methods being recommended or loaned. Methods recommended could include non-lethal and lethal methods as deemed appropriate by WS' Decision Model and as permitted by laws and regulations.

The potential impacts to non-targets under this alternative would be variable and based on several factors. If methods are employed, as recommended by WS and cooperating agencies, the potential impacts to non-targets are likely similar to the proposed action. If recommended methods and techniques are not followed or if other methods are employed that were not recommended, the potential impacts on non-target species, including T&E species is likely higher compared to the proposed action.

The potential impacts of harassment and exclusion methods to non-target species would be similar to those described under the proposed action. Harassment and exclusion methods are easily obtainable and simple to employ. Since identification of targets occurs when employing shooting as a method, the potential impacts to non-target species are likely low under this alternative.

Those persons experiencing damage from mammals may implement methods and techniques based on the recommendations of WS. The potential for impacts would be based on the knowledge and skill of those persons implementing recommended methods. Potential impacts from providing only technical assistance could be greater than those described in the proposed action if those experiencing damage do not implement methods or techniques correctly. Incorrectly implemented methods or techniques recommended by WS could lead to an increase in non-target take.

If requestors are provided technical assistance but do not implement any of the recommended actions, the potential impacts to non-targets would be lower compared to the proposed action. If those requesting assistance implement recommended methods appropriately and as instructed or demonstrated, the potential impacts to non-targets would be similar to the proposed action. Methods or techniques not implemented as recommended or used inappropriately would likely increase potential impacts to non-targets. Therefore, the potential impacts to non-targets, including T&E species would be variable under a technical assistance only alternative. However, USFWS and NHFG consultation would still be required when T&E species are involved.

If non-lethal methods recommended by WS under this alternative were deemed ineffective by those requesting assistance, lethal methods could be employed by those experiencing damage. Those requesting assistance are those likely to use lethal methods since a damage threshold has been met for that individual requestor that has triggered seeking assistance to reduce damage. The potential impacts on non-targets by those experiencing damage would be highly variable. People whose mammal damage problems were not effectively resolved by non-lethal control methods would likely resort to other means of legal or illegal lethal control. This could result in less experienced persons implementing control methods and could lead to greater take of non-target wildlife than the proposed action. When those persons experiencing damage caused by wildlife reach a level where assistance does not adequately reduce damage or where no assistance is available, people have resorted to using chemical toxicants that are illegal for use on the intended target species that often results in loss of both target and non-target wildlife (White et al. 1989, USFWS 2001, Food and Drug Administration 2003). The use of illegal toxicants by those frustrated with the lack of assistance or assistance that inadequately reduces damage to an acceptable level can often result in the indiscriminate take of wildlife species.

The ability to reduce negative impacts caused by mammals to wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing damage management actions. It would be expected that this alternative would have a greater chance of reducing damage than Alternative 4 since WS would be available to provide information and advice.

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

The potential adverse effects to non-targets occur from the employment of methods to address mammal damage. Under the proposed action, WS could provide both technical assistance and direct operational assistance to those requesting assistance. The use of non-lethal methods as part of an integrated direct operational assistance program would be similar to those risks to non-targets discussed in the other alternatives.

Personnel from WS are experienced and trained in wildlife identification and to select the most appropriate methods for taking targeted animals and excluding non-target species. To reduce the likelihood of capturing non-target wildlife, WS would employ the most selective methods for the target species, would employ the use of attractants that are as specific to target species as possible, and determine placement of methods to avoid exposure to non-targets. SOPs to prevent and reduce any potential adverse impacts on non-targets are discussed in Chapter 3 of this EA. Despite the best efforts to minimize non-target take during program activities, the potential for adverse impacts to non-targets exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety. However, formal consultation would still be required when T&E species are involved.

Non-lethal methods have the potential to cause adverse effects to non-targets primarily through exclusion, harassment, and dispersal. Any exclusionary device erected to prevent access of target species also potentially excludes species that are not the primary reason the exclusion was erected; therefore, non-target species excluded from areas may potentially be adversely impacted if the area excluded is large enough. The use of auditory and visual dispersal methods used to reduce damage or threats caused by mammals are also likely to disperse non-targets in the immediate area the methods are employed. Therefore, non-targets may be permanently dispersed from an area while employing non-lethal dispersal techniques. However, like target species, the potential impacts on non-target species are expected to be temporary with target and non-target species often returning after the cessation of dispersal methods. Although any work impacting T&E species would require formal consultation with appropriate agencies.

Other non-lethal methods available for use under this alternative include live traps, nets, and repellents. Live traps and nets restrain wildlife once captured and are considered live-capture methods. Live traps

have the potential to capture non-target species. Trap and net placement in areas where target species are active and the use of target-specific attractants will likely minimize the capture of non-targets. If traps and nets are attended to appropriately, any non-targets captured can be released on site unharmed.

Non-lethal methods that use auditory and visual stimuli to reduce or prevent damage are intended to elicit fright responses in wildlife. When employing those methods to disperse or harass target species, any non-targets near when those methods are employed would also likely be dispersed from the area. Similarly, any exclusionary device constructed to prevent access by target species also excludes access to non-target species. The persistent use of non-lethal methods will likely result in the dispersal or abandonment of those areas where non-lethal methods are employed of both target and non-target species. Therefore, any use of non-lethal methods has similar results on both non-target and target species. Though non-lethal methods do not result in lethal take of non-targets, the use of non-lethal methods can restrict or prevent access of non-targets to beneficial resources. Overall, potential impacts to non-targets from the use of non-lethal methods would not adversely affect populations since those methods are often temporary. Only those repellents registered with the EPA pursuant to the FIFRA that are registered for use in the State would be recommended and used by WS under this alternative. Therefore, the use and recommendation of repellents would not have negative impacts on non-target species when used according to label requirements. Most repellents for mammals pose a very low risk to non-targets when exposed to or when ingested.

Mammals could still be lethally taken during the regulated harvest season, when causing, and through the issuance of permits under this alternative. Impacts to non-targets from the use of non-lethal methods would be similar to the use of non-lethal methods under any of the alternatives. Non-targets would generally be unharmed from the use of non-lethal methods under any of the alternatives since no lethal take would occur. Non-lethal methods would be available under all the alternatives analyzed. WS' involvement in the use of or recommendation of non-lethal methods would ensure non-target impacts are considered under WS' Decision Model. Impacts to non-targets under this alternative from the use of and/or the recommendation of non-lethal methods are likely to be low.

WS would also employ and/or recommend lethal methods under the proposed action alternative to alleviate damage. Lethal methods available for use to manage damage caused by mammals under this alternative would include shooting, body-gripping traps, and euthanasia after live-capture. Available methods and the application of those methods to resolve mammal damage is further discussed in Appendix B of the EA.

The use of firearms is essentially selective for target species since animals are identified prior to application; therefore, no adverse impacts are anticipated from use of this method.

While every precaution is taken to safeguard against taking non-targets during operational use of methods and techniques for resolving damage and reducing threats caused by mammals, the use of such methods can result in the incidental take of unintended species. Those occurrences are rare and should not affect the overall populations of any species under the proposed action. WS' take of non-target species during activities to reduce damage or threats to human safety associated with mammals in New Hampshire is expected to be extremely low to non-existent. Despite this, any potential adverse impacts to T&E species would require formal consultation with the appropriate agencies prior to any project initiation.

Non-target Species Analysis from WS' Activities in the State from FY 2005 through FY 2011

While every precaution is taken to safeguard against taking non-targets during operational use of methods and techniques for resolving damage and reducing threats caused by wildlife, the use of such methods can result in the incidental take of unintended species. Those occurrences are minimal and should not affect

the overall populations of any species. Between FY 2005 and FY 2011, there were no non-target species captured during WS' mammal damage management activities in New Hampshire. WS' take of non-target species during activities to reduce damage or threats to human safety caused by mammals is expected to continue to be low to non-existent. WS would continue to monitor annually the take of non-target species to ensure program activities or methodologies used in damage management activities do not adversely impact non-targets. However, any scope of work posing a potential impact to T&E species would require formal consultation and must be addressed prior to initiating any project.

The EA concluded that WS' damage management activities would have no adverse effects on other wildlife species (non-target), including threatened and endangered species throughout the State when those activities were conducted within the scope analyzed in the EA. Methods used by WS are essentially selective for target species when applied appropriately. In addition, WS adheres to those SOPs discussed in the EA to minimize the potential for non-target take. As discussed previously, the primary methods used during direct operational assistance by WS from FY 2005 through FY 2011 to resolve requests for assistance were shooting with firearms, traps (*e.g.*, cage traps, snap traps, body-gripping traps, corral traps), cable restraints, and gas cartridges.

No adverse effects to non-targets were observed or reported to WS during previous activities conducted to alleviate damage. WS would continue to monitor annually the take of non-target species to ensure program activities or methodologies used in mammal damage management do not adversely impact non-targets. WS' activities are not likely to adversely affect the viability of any wildlife populations from damage management activities.

Non-target Species Impact Analysis under the Proposed Supplement to the EA

The supplement to the EA evaluates those activities conducted by WS pursuant to the proposed action in the EA to resolve an increasing number of requests to manage damage or threats of damage to resources associated with feral swine, opossum, porcupine, squirrels, feral cats, mice, shrews, voles, moles, and rats. WS' response to an increasing number of requests for direct operational assistance would result in the increased use of methods to resolve those requests. The number of methods employed to resolve the increasing requests for assistance could also increase under the proposed supplement to the EA. In addition, the frequency of individual method application to resolve requests for assistance is also likely to increase.

Take of other wildlife would also be expected under the supplement to the EA, but would likely be similar to the take levels that have occurred from FY 2005 through FY 2011. Take of other wildlife species is expected to be extremely low to non-existent. All non-target take would be evaluated annually to ensure non-target take does not reach a level that would cause adverse effects to non-target species. All non-target take is reported to the NHFG to ensure WS' take is considered as part of the management objectives. The take of non-targets under the supplement is not expected to reach a magnitude that would cause adverse effects to those non-target populations likely to be taken during activities.

Threatened and Endangered Species Analysis

No threatened or endangered species were taken or adversely affected by WS' actions conducted from FY 2005 through FY 2011. A review of threatened and endangered species listed by the USFWS and the NMFS showed that no additional federal listings of species in New Hampshire have occurred since the completion of the EA in 2005 (see Appendix A). However, there have been some additions by the State of New Hampshire for state-listed species which include the White Mountain fritillary butterfly (*Boloria titania montinus*), Blanding's turtle (*Emydoidea blandingii*), New England cottontail (*Sylvilagus transitionalis*), American brook lamprey (*Lampetra bifrenatus*), White Mountain arctic butterfly (*Oeneis*

Melissa semidea), spotted turtle (*Clemmys guttata*), black racer (*Coluber constrictor*), and bridle shiner (*Notropis bifrenatus*) (see Appendix B). Also noted in Appendix B of this supplement, since 2005, there have been 33 state-listed plant species added to the State listed species in New Hampshire. Appendix A and B of this supplement to the EA contains the current list of threatened and endangered species listed by the USFWS, NMFS, and the State of New Hampshire.

***Analysis of the Proposed Supplement to the EA on Threatened and Endangered Specie*s**

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. SOPs to avoid T&E effects are described in Chapter 3 of the EA (USDA 2005*a*).

The New England Field Office of the USFWS has developed a website[8] that provides up-to-date species occurrence information and provides an outline for action agencies to assist in determining whether consultation for projects are needed under Section 7 of the ESA (see Figure 1). More recently, the USFWS has developed the Information, Planning, and Conservation System (IPaC) and website[9] which provide the user an interactive planning and mapping tool for streamlining the environmental review process. WS would review these websites and the online measures on a site-by-site basis to determine if any T&E species are located within the project area in order to conclude with a determination of effects.

WS has obtained and reviewed the list of T&E or species of special concern (see Appendix B in this supplement) designated by the NHFG and the New Hampshire Division of Forest and Lands - New Hampshire Natural Heritage Bureau and has determined that the proposed WS' activities would not likely adversely affect any species listed as vulnerable or threatened and endangered, but consultations with the NHFG would be conducted on a case by case basis. If WS' activities are requested that may be beneficial to species listed by the State as vulnerable, threatened, or endangered by enhancing reproduction or survival of individuals through reduction of harassment, competition, or predation associated with mammals, WS would initiate consultation with the State prior to start of any action.

Effects on Non-targets from the Use of those Methods Addressed in the Supplement to the EA

Those additional methods discussed in the proposed supplement to the EA that are available to manage damage associated with mammals, that have become available since the completion of the EA, allow for methods discussed in the EA to be employed more effectively and to be more target specific.

Night vision equipment and FLIR devices are most often used in association with the use of firearms and are employed to allow activities to be conducted at night. Night vision and FLIR equipment allow for the identification of target species during night activities, which reduces the risks to non-targets and reduces human safety risks. Since night vision equipment and FLIR devices only aid in the identification of wildlife and are not actual methods of take, the use of visual aids would not contribute to the take of non-targets. Therefore, the use of night vision and FLIR equipment would not adversely affect non-targets.

The use of night vision equipment, FLIR devices, and trap monitors would have no effect on threatened and endangered species listed in New Hampshire, including their designated critical habitats.

[8] The New England Field Office website for endangered species consultation could be found at www.fws.gov/newengland/endangeredspec-consultation.htm during the development of this EA.
[9] The USFWS IPaC website can be found at ecos.fws.gov/ipac

Alternative 3 - Non-lethal Mammal Damage Management Only By WS

Similar to the other alternatives, the use or recommendation of only-lethal methods by WS would likely result in the dispersal of target and non-target species. Non-lethal methods can disperse or otherwise make an area unattractive to mammals causing damage; thereby, reducing the presence of mammals at the site and potentially the immediate area around the site where non-lethal methods are employed. Non-lethal methods are used to exclude, harass, and disperse target wildlife from areas where damage or threats are occurring. When effective, non-lethal methods would disperse mammals, including non-targets, from the area resulting in a reduction in the presence of those species at the site where those methods were employed. However, non-targets would be moved to other areas with minimal impact on those species' populations. Non-lethal methods are not employed over large geographical areas or applied at such intensity that essential resources (*e.g*., food sources, habitat) would be unavailable for extended durations or over a wide geographical scope that long-term adverse effects would occur to a species' population. Non-lethal methods are generally regarded as having minimal impacts on overall populations of wildlife since individuals of those species are unharmed.

However, similar to the other alternatives, other entities could continue to employ lethal methods under this alternative, which could result in the lethal take of non-targets. People whose mammal damage problems were not effectively resolved by non-lethal control methods would likely resort to other means of legal or illegal lethal control. This could result in less experienced persons implementing control methods and could lead to greater take of non-target wildlife than the proposed action. When those persons experiencing damage caused by wildlife reach a level where assistance does not adequately reduce damage or where no assistance is available, people have resorted to using chemical toxicants that are illegal for use on the intended target species that often results in loss of both target and non-target wildlife (White et al. 1989, USFWS 2001, Food and Drug Administration 2003). The use of illegal toxicants by those frustrated with the lack of assistance or assistance that inadequately reduces damage to an acceptable level can often result in the indiscriminate take of wildlife species.

Alternative 4 - No federal WS Mammal Damage Management

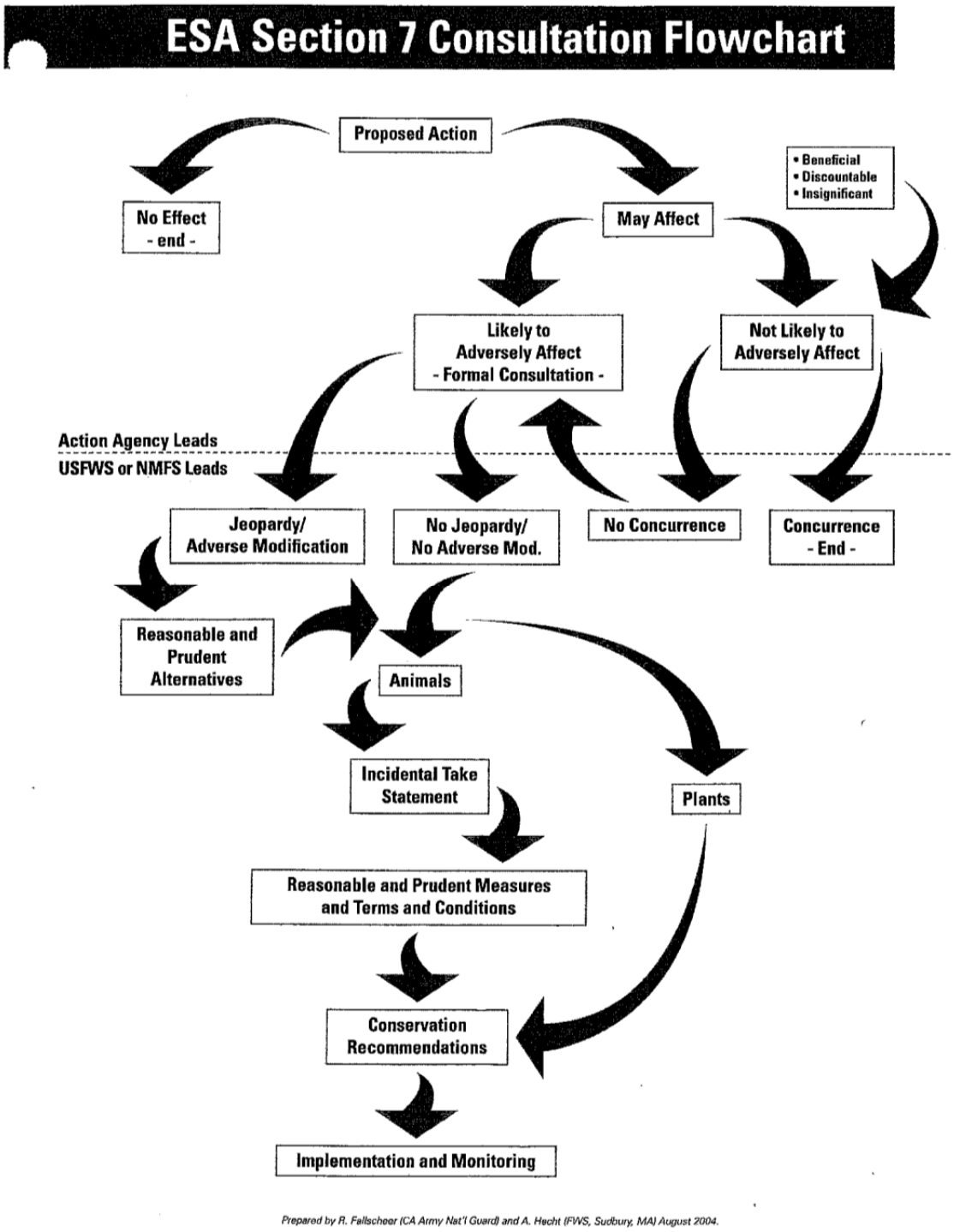
Under this alternative, WS would not be directly involved with activities associated with managing damage caused by mammals in the State. Therefore, no direct impacts to non-targets or T&E species would occur by WS under this alternative. Mammals would continue to be taken under permits issued by the NHFG, take would continue to occur during the regulated harvest season, and mammal species could continue to be taken without the need for a permit when causing damage. Risks to non-targets and T&E species would continue to occur from those persons who implement activities to manage damage on their own or through recommendations by the other federal, state, and private entities. Although some risks occur from those persons that implement mammal damage management in the absence of any involvement by WS, those risks are likely low and are similar to those under the other alternatives.

The ability to reduce negative impacts caused by mammals to other wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing damage management actions under this alternative.

Issue 3 - Effects on Human Health and Safety

Based on the analyses in the EA, when WS' activities are conducted according to WS' directives and SOPs; federal, state, and local laws; and label requirements, those activities pose minimal risks to human safety (USDA 2005*a*). The analyses in the EA also concluded that WS' activities to reduce damage and threats associated with mammals were likely to have positive benefits to human health and safety by addressing safety issues and disease transmission associated with those mammal species.

Figure1. USFWS Consultation Flowchart for Endangered Species Act Section 7.



Alternative 1 - Technical Assistance Only

Under this alternative, WS would be restricted to making recommendations of methods and the demonstration of methods only to resolve damage. WS would only provide technical assistance to those requesting assistance with mammal damage and threats. Although hazards to human safety from non-lethal methods exist, those methods are generally regarded as safe when used by trained individuals who are experienced in their use. Although some risk of fire and bodily harm exists from the use of pyrotechnics and propane cannons, when used appropriately and in consideration of those risks, they can be used with a high degree of safety.

Under a technical assistance only alternative, the use of immobilizing drugs and euthanasia drugs would not be available to the public. Personnel employing nets are present at the site during application to ensure the safety of the public and operators. Although some fire and explosive hazards exist with rocket nets during ignition and storage of the explosive charges, safety precautions associated with the use of the method, when adhered to, pose minimal risks to human safety and primarily occur to the handler. Nets would not be employed in areas where public activity is high which further reduces the risks to the public. Nets would be employed in areas where public access is restricted whenever possible to reduce risks to human safety. Overall, nets would pose minimal risks to the public.

The use of chemical methods that are considered non-lethal would also be available under this alternative. Chemical methods available would include repellents. There are few chemical repellents registered for use to manage mammals in the State. Most repellents require ingestion of the chemical to achieve the desired effects on target species. Repellents that require ingestion are intended to discourage foraging on vulnerable resources and to disperse mammals from areas where the repellents are applied. Repellents, when used according to label directions, are generally regarded as safe especially when the ingredients are considered naturally occurring. Some risk of exposure to the chemical occurs to the applicator and to others from the potential for drift as the product is applied. Some repellents also have restrictions on whether application can occur on edible plants with some restricting harvest for a designated period after application. All restriction on harvest and required personal protective equipment would be included on the label and if followed, would minimize risks to human safety associated with the use of those products.

The recommendation by WS that mammals be harvested during the regulated hunting and/or trapping season, which is established by the NHFG, would not increase risks to human safety above those risks already inherent with hunting and trapping mammals. Recommendations of allowing hunting or trapping on property owned or managed by a cooperator to reduce mammal populations, which could then reduce mammal damage or threats, would not increase risks to human safety. Safety requirements established by the NHFG for the regulated hunting and trapping season will further minimize risks associated with hunting. Although hunting and trapping accidents do occur, the recommendation of allowing hunting or trapping to reduce localized mammal populations will not increase those risks.

The recommendation of shooting with firearms either as a method of direct lethal take could occur under this alternative. Safety issues due arise related to misusing firearms and the potential human hazards associated with firearms use when employed to reduce damage and threats. When used appropriately and with consideration for human safety, risks associated with firearms are minimal. If firearms are employed inappropriately or without regard to human safety, serious injuries could occur. Under this alternative, recommendations for the use of firearms by WS would include human safety considerations. Since the use of firearms to alleviate mammal damage would be available under any of the alternatives and the use of firearms by those persons experiencing mammal damage could occur whether WS was consulted or contacted, the risks to human safety from the use of firearms would be similar among all the alternatives.

If non-chemical methods are employed according to recommendations and as demonstrated by WS, the potential risks to human safety would be similar to the proposed action. If methods are employed without guidance from WS or applied inappropriately, the risks to human safety could increase. The extent of the increased risk would be unknown and variable. Non-chemical methods inherently pose minimal risks to human safety given the design and the extent of the use of those methods.

Given the use profile of many methods to manage damage and threats associated with mammals, the risks to human safety from the use of those methods would be low. The cooperator requesting assistance is also made aware of threats to human safety associated with the use of those methods. SOPs for methods are discussed in Chapter 3 of this EA. Risks to human safety from activities and methods recommended under this alternative would be similar to the other alternatives since the same methods would be available. If misused or applied inappropriately, any of the methods available to alleviate mammal damage could threaten human safety. However, when used appropriately, methods available to alleviate damage would not threaten human safety.

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

The cooperator requesting assistance is made aware through a MOU, cooperative service agreement, or a similar document that those methods agreed upon could potentially be used on property owned or managed by the cooperator; thereby, making the cooperator aware of the use of those methods on property they own or manage to identify any risks to human safety associated with the use of those methods.

Under the proposed action, those methods discussed in Appendix B of the EA and this supplement, would be integrated to resolve and prevent damage associated with mammals. WS would use the Decision Model to determine the appropriate method or methods that would effectively resolve the request for assistance. Those methods would be continually evaluated for effectiveness and if necessary, additional methods could be employed. Non-lethal and lethal methods could be used under the proposed action. WS would continue to provide technical assistance and/or direct operational assistance to those persons seeking assistance with managing damage or threats from mammals. Risks to human safety from technical assistance conducted by WS would be similar to those risks addressed under the other alternatives. The use of non-lethal methods as part of an integrated approach to managing damage that would be employed as part of direct operational assistance by WS would be similar to those risks addressed by the other alternatives.

Lethal methods available under the proposed action would include the use of firearms, live-capture followed by euthanasia, and the recommendation that mammals be harvested during the regulated hunting or trapping season established for those species by the NHFG.

WS' employees who conducted activities would be knowledgeable in the use of methods, wildlife species responsible for causing damage or threats, and WS' directives. That knowledge is incorporated into the decision-making process inherent with the WS' Decision Model that is applied when addressing threats and damage caused by mammals. When employing lethal methods, WS' employees considered risks to human safety when employing those methods based on location and method. Risks to human safety from the use of methods is likely greater in urban areas when compared to rural areas that are less densely populated. Consideration is also given to the location where damage management activities will be conducted based on property ownership. If locations where methods will be employed occur on private property in rural areas where access to the property is controlled and monitored, the risks to human safety from the use of methods is likely less. If damage management activities occur at parks or near other

public use areas, then risks of the public encountering damage management methods and the corresponding risk to human safety increases.

The use of live-capture traps have also been identified as a potential issue. Live-capture traps are typically set in situations where human activity is minimal to ensure public safety. Traps rarely cause serious injury and are triggered through direct activation of the device. Live-capture traps available for mammals are typically walk-in style traps where mammals enter but are unable to exit. Therefore, human safety concerns associated with live traps used to capture mammals require direct contact to cause bodily harm.

Other live-capture devices, such as cannon nets, pose minor safety hazards to the public since activation of the device occurs by trained personnel after target species are observed in the capture area of the net. Lasers also pose minimal risks to the public since application occurs directly to target species by trained personnel, which limits the exposure of the public to misuse of the method.

Safety issues do arise related to misusing firearms and the potential human hazards associated with firearm use when employed to reduce damage and threats. To help ensure safe use and awareness, WS' employees who use firearms to conduct official duties are required to attend an approved firearm safety training course and to remain certified for firearm use, WS' employees must attend a re-certification safety training course in accordance with WS Directive 2.615. WS' employees who carry and use firearms as a condition of employment, are required to sign a form certifying that they have not been convicted of a misdemeanor crime of domestic violence. A thorough safety assessment will be conducted before firearms are deemed appropriate to alleviate or reduce damage and threats to human safety when conducting activities. WS would work closely with cooperators requesting assistance to ensure all safety issues were considered before the use of firearms was deemed appropriate. All methods, including firearms, must be agreed upon with the cooperator to ensure the safe use of methods.

All WS' personnel who handle and administered chemical methods will be properly trained in the use of those methods. Training and adherence to agency directives will ensure the safety of employees applying chemical methods. Mammals euthanized by WS or taken using chemical methods will be disposed of in accordance with WS Directive 2.515. All euthanasia will occur in the absence of the public to further minimize risks, whenever possible. Minimization measures and SOPs are further described in Chapter 3 of this EA.

The recommendation of repellents or the use of those repellents registered for use to disperse mammals in the State could occur under the proposed action as part of an integrated approach to managing mammal damage. Those chemical repellents that would be available to recommend for use or be directly used by WS under this alternative would also be available under any of the alternatives. Therefore, risks to human safety from the recommendation of repellents or the direct use of repellents would be similar across all the alternatives. Risks to human safety associated with the use or recommendation of repellents is addressed under the technical assistance only alternative (Alternative 1) and would be similar across all the alternatives. WS' involvement, either through recommending the use of repellents or the direct use of repellents, would ensure that label requirements of those repellents are discussed with those persons requesting assistance when recommended through technical assistance or would be specifically adhered to by WS' personnel when using those chemical methods. Therefore, the risks to human safety associated with the recommendation of or direct use of repellents could be lessened through WS' participation.

Drugs used in capturing, handling, and euthanizing wildlife for wildlife hazard management purposes include ketamine, a mixture of ketamine/xylazine, sodium pentobarbital, potassium chloride, and Beuthanasia-D. Meeting the requirements of the Animal Medicinal Drug Use Clarification Act should prevent any significant adverse impacts on human health with regard to this issue. SOPs include:

- All drug use in capturing and handling wildlife would be under the direction and authority of state veterinary authorities, either directly or through procedures agreed upon between those authorities and WS.
- As determined on a state-level basis by those veterinary authorities (as allowed by Animal Medicinal Drug Use Clarification Act), wildlife hazard management programs may choose to avoid capture and handling activities that utilize immobilizing drugs within a specified number of days prior to the hunting or trapping season for the target species to avoid release of animals that may be consumed by hunters prior to the end of established withdrawal periods for the particular drugs used. Ear tagging or other marking of animals drugged and released to alert hunters and trappers that they should contact state officials before consuming the animal.
- Most animals administered drugs would be released well before controlled hunting/trapping seasons which would give the drug time to completely metabolize out of the animals' systems before they might be taken and consumed by humans. In some instances, animals collected for control purposes would be euthanized when they are captured within a certain specified time period prior to the legal hunting or trapping season to avoid the chance that they would be consumed as food while still potentially having immobilizing drugs in their systems.

By following those procedures in accordance with Animal Medicinal Drug Use Clarification Act, wildlife management programs would avoid any significant impacts on human health with regard to this issue.

The recommendation by WS that mammals be harvested during the regulated hunting and/or trapping season, which is established by the NHFG, would not increase risks to human safety above those risks already inherent with hunting or trapping those species. Recommendations of allowing hunting and/or trapping on property owned or managed by a cooperator to reduce mammal populations, which could then reduce damage or threats, would not increase risks to human safety. Safety requirements established by the NHFG for the regulated hunting and trapping season will further minimize risks associated with hunting and trapping. Although hunting and trapping accidents do occur, the recommendation of allowing hunting or trapping to reduce localized populations of mammals will not increase those risks.

Human Safety Analysis from WS' Activities in the State from FY 2005 through FY 2011

Mammal management activities conducted by WS from FY 2005 through FY 2011 did not result in any injuries or illness to any members of the public or to WS' personnel. WS' program activities had a positive impact in those situations that reduced the risks of potential injury, illness, and loss of human life from injurious mammal species. The EA concluded that an integrated approach to wildlife damage management had the greatest potential of successfully reducing potential risks to human health and safety in New Hampshire.

Human Safety Analysis under the Proposed Supplement to the EA

The supplement to the EA evaluates the implementation of the proposed action to address an increasing number of requests for assistance to manage damage and threats associated with feral swine, beaver, raccoon, skunk, opossum, and rodents, which could result in methods being employed with more frequency to resolve damage. Those methods described in the EA inherently pose minimal risks to human safety when used appropriately and in consideration of human safety. WS would continue to incorporate those SOPs described in Chapter 3 of the EA into activities to manage damage that would minimize the risks to human safety. Based on the use patterns of the methods available, an increase in the use of those methods to address those activities described in the supplement to the EA would not increase risks to human safety. WS' employees are trained in the proper use of methods to ensure the safety of the employee and the public. No adverse effects to human safety have occurred or reported from WS'

activities conducted from FY 2005 through FY 2011. An increase in the number of methods used or an increase in the frequency that a method is used would not increase risks to human safety when consideration of human safety is part of the use pattern associated with those methods.

Alternative 3 - Non-lethal Mammal Damage Management Only By WS

Under this alternative, those methods discussed in Appendix B that are considered non-lethal methods, would be integrated to resolve and prevent damage associated with mammals. WS would use the Decision Model to determine the appropriate method or methods that would effectively resolve the request for assistance. Those methods would be continually evaluated for effectiveness and if necessary, additional methods could be employed. WS would continue to provide technical assistance and/or direct operational assistance to those persons seeking assistance with managing damage or threats from mammals. Risks to human safety from technical assistance conducted by WS would be similar to those risks addressed under the other alternatives. The use of non-lethal methods as part of an integrated approach to managing damage that would be employed as part of direct operational assistance by WS would be similar to those risks addressed by the other alternatives.

Alternative 4 - No federal WS Mammal Damage Management

Under the no involvement by WS alternative, WS would not be involved with any aspect of managing damage associated with mammals in the State, including technical assistance. Due to the lack of involvement in managing damage caused by mammals, no impacts to human safety would occur directly from WS. This alternative would not prevent those entities experiencing threats or damage from mammals from conducting damage management activities in the absence of WS' assistance. The direct burden of implementing permitted methods would be placed on those experiencing damage.

Similar to the technical assistance only alternative, immobilizing drugs and euthanasia chemicals would not be available under this alternative to those persons experiencing damage or threats from mammals. Since most methods available to resolve or prevent mammal damage or threats are available to anyone, the threats to human safety from the use of those methods are similar between the alternatives. However, methods employed by those not experienced in the use of methods or are not trained in their proper use, could increase threats to human safety. Overall, the methods available to the public, when applied correctly and appropriately, pose minimal risks to human safety.

Issue 4 - Impacts to Stakeholders, including Aesthetics

As described in the EA, WS would employ methods when requested that would result in the dispersal, exclusion, or removal of individuals or small groups of target mammal species to resolve damage and threats. In some instances where mammals are dispersed or removed, the ability of interested persons to observe and enjoy those mammals would likely temporarily decline. However, the populations of those mammal species in those areas would likely increase upon cessation of damage management activities.

Even the use of exclusionary devices can lead to the dispersal of mammals if the resource being damaged was acting as an attractant. Thus, once the attractant has been removed or made unavailable, mammals would likely disperse to other areas where resources are more vulnerable making them unavailable for viewing or enjoyment.

Alternative 1 - Technical Assistance Only

If those persons seeking assistance from WS were those persons likely to conduct mammal damage management activities in the absence of WS' involvement, then technical assistance provided by WS

would not adversely affect the aesthetic value of mammals similar to Alternative 2. Mammals could be lethally taken under this alternative by those entities experiencing mammal damage or threats, which would result in localized reductions in the presence of mammals at the location where damage was occurring. The presence of mammals where damage was occurring would be reduced where damage management activities are conducted under any of the alternatives. Even the recommendation of non-lethal methods is likely to result in the dispersal of mammals from the area if those non-lethal methods recommended by WS are employed by those receiving technical assistance. Therefore, technical assistance provided by WS would not prevent the aesthetic enjoyment of mammals since any activities conducted to alleviate mammal damage could occur in the absence of WS' participation in the action, either directly or indirectly.

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

Under the proposed action, methods would be employed that would result in the dispersal, exclusion, or removal of individuals or small groups of mammals to resolve damage and threats. In some instances where mammals are dispersed or removed, the ability of interested persons to observe and enjoy those mammals will likely temporarily decline.

Even the use of exclusionary devices can lead to the dispersal of wildlife if the resource being damaged was acting as an attractant. Thus, once the attractant has been removed or made unavailable, the wildlife will likely disperse to other areas where resources are more vulnerable.

The use of lethal methods would result in temporary declines in local populations resulting from the removal of mammals to address or prevent damage and threats. The goal under the proposed action is to respond to requests for assistance and to manage those mammals responsible for the resulting damage. Therefore, the ability to view and enjoy mammals would remain if a reasonable effort were made to locate mammals outside the area in which damage management activities occurred. Those mammals removed by WS are those that could be removed by the person experiencing damage.

All activities are conducted where a request for assistance has been received and only after agreement for such services have been agreed upon by the cooperator. Some aesthetic value would be gained by the removal of mammals and the return of a more natural environment, including the return of native wildlife and plant species that may be suppressed or displaced by high mammal densities.

Since those mammals removed by WS under this alternative could be removed with a permit issued by the NHFG, without the need for a permit, or the regulated hunting or trapping seasons, WS' involvement in taking those mammals would not likely be additive to the number of mammals that could be taken in the absence of WS' involvement.

WS' take of mammals from FY 2005 through FY 2011 has been of low magnitude compared to the total mortality and populations of those species. WS' activities are not likely additive to the mammals that would be taken in the absence of WS' involvement. Although mammals removed by WS would no longer be present for viewing or enjoying, those mammals would likely be taken by the property owner or manager if WS was not involved in the action since take by the property owner or manager could occur under a depredation permit, during the regulated hunting and trapping seasons, or if the mammals are non-native, take could occur without the need for a permit. Given the limited take proposed by WS under this alternative when compared to the known sources of mortality of mammals, WS' mammal damage management activities conducted pursuant to the proposed action would not adversely affect the aesthetic value of mammals. The impact on the aesthetic value of mammals and the ability of the public to view and enjoy mammals under the proposed action would be similar to the other alternatives and is likely low.

Impacts to Stakeholders Analysis from WS' Activities conducted from FY 2005 through FY 2011

The EA concluded the effects on aesthetics would be variable depending on the damage situation, stakeholders' values towards wildlife, and their compassion for those persons who are experiencing damage from mammals. The WS program in New Hampshire only conducts activities at the request of the affected property owner or resource manager. Upon receiving a request for assistance, WS addresses issues/concerns and explanations are given for the reasons why a particular method or group of methods would be the most effective in reducing damage for the specific situation. Methods employed to reduce or resolve damage is agreed upon by the cooperator according to a cooperative service agreement.

Information in this supplement to the EA indicates that WS' take of mammal species has been minimal and of a low magnitude when compared to the populations of those species. WS' take has not reached a magnitude of take that would severely limit the ability to view and enjoy mammals. Only those mammals identified as causing damage were targeted by WS during damage management activities and only after a request for such action was received. However, mammals can be viewed outside the area where damage management activities were conducted if a reasonable effort is made to locate those species of mammals outside of the damage management area. WS receives requests to conduct damage management activities on only a small portion of the land area in New Hampshire. Therefore, activities are not conducted over large areas that would greatly limit the aesthetic value of mammals.

Impacts to Stakeholders Analysis under the Proposed Supplement to the EA

The increased take of those species addressed in the supplement to the EA could result in a greater number of mammals being lethally taken at a location or could result in an increase in the number of locations where mammals are lethally removed. The use of lethal methods could result in temporary declines in local populations resulting from the removal of target mammal species to resolve requests for assistance. WS' goal is to respond to requests for assistance and to manage those mammals responsible for the resulting damage. Therefore, the ability to view and enjoy mammals in New Hampshire would remain if a reasonable effort were made to locate those species of mammals outside the area in which damage management activities occurred.

The ability to view and enjoy the aesthetic value of mammals at a particular site would be somewhat limited if those mammals causing damage or posing threats were removed as part of an integrated approach to managing damage. However, new mammals would most likely use the site in the future, although the length of time until those mammals arrive at the damage management site is variable, depending on the site, time of year, and population densities of those mammals in the surrounding areas. The opportunity to view mammals is available if a person makes the effort to visit sites outside of the damage management area.

As shown under Issue 1, the magnitude of WS' proposed take of mammals under the supplement to the EA could be considered low if take levels occurred at the levels proposed. WS' proposed activities addressed in the supplement would not result in declines of mammal populations over a large geographical area, but would be limited to site-specific locations where mammal damage has occurred or was likely to occur. Therefore, even with the proposed increased take of mammals under the supplement, those mammal populations would remain high in the State and the aesthetic value of those species could be enjoyed if a reasonable attempt is made to locate those mammals outside of the damage management area.

Alternative 3 - Non-lethal Mammal Damage Management Only By WS

As discussed previously, non-lethal methods have the potential to cause adverse effects to wildlife primarily through exclusion, harassment, and dispersal. Any exclusionary device erected to prevent access of target species also potentially excludes species that are not the primary reason the exclusion was erected; therefore, non-target species excluded from areas may potentially be adversely impacted if the area excluded is large enough. The use of auditory and visual dispersal methods used to reduce damage or threats caused by mammals are also likely to disperse mammals in the immediate area the methods are employed. Therefore, mammals may be permanently dispersed from an area while employing non-lethal dispersal techniques. However, the potential impacts on mammal species are expected to be temporary with target and non-target species often returning after the cessation of dispersal methods.

Non-lethal methods that use auditory and visual stimuli to reduce or prevent damage are intended to elicit fright responses in wildlife. When employing those methods to disperse or harass target wildlife, any target and non-target wildlife near when those methods were employed would also likely be dispersed from the area. Similarly, any exclusionary device constructed to prevent access by target species also excludes access to non-target species. The persistent use of non-lethal methods would likely result in the dispersal or abandonment of those areas where non-lethal methods are employed of both target and non-target species. Therefore, any use of non-lethal methods has similar results on both non-target and target species. Though non-lethal methods do not result in lethal take of non-targets, the use of non-lethal methods can restrict or prevent access of wildlife to areas where damage was occurring which likely disperses those animals to other areas.

When effective, non-lethal methods would disperse mammals from the area resulting in a reduction in the presence of those mammals at the site where those methods were employed. The use of methods would be intended to reduce the number of mammals present at a location where damage is occurring by targeting those mammals causing damage or posing threats. Therefore, the intent with using lethal methods would be to remove those animals causing damage, which is similar to the intent with the use of non-lethal methods, which would be to disperse those target animals from areas where damage was occurring.

Alternative 4 - No federal WS Mammal Damage Management

Under the no mammal damage management by WS alternative, the actions of WS would have no impact on the aesthetic value of mammals in the State. Those experiencing damage or threats from mammals would be responsible for researching, obtaining, and using all methods as permitted by federal, state, and local laws and regulations. Mammals would continue to be dispersed and lethally taken under this alternative in the State. Lethal take would continue to occur when permitted by the NHFG through the issuance of permits, take could occur during the regulated harvest season, and in the case of non-native species, take could occur any time without the need for a permit.

Since mammals will continue to be taken under this alternative, despite WS' lack of involvement, the ability to view and enjoy mammals would likely be similar to the other alternatives. The lack of WS' involvement would not lead to a reduction in the number of mammals dispersed or taken since WS' has no authority to regulate take or the harassment of mammals in the State. The NHFG with management authority over mammals would continue to adjust all take levels based on population objectives for those mammal species in the State. Therefore, the number of mammals lethally taken annually through hunting and under permits are regulated and adjusted by the NHFG.

Those experiencing damage or threats would continue to use those methods they feel appropriate to resolve mammal damage or threats, including lethal take. WS' involvement in mammal damage

management is therefore, not additive to the mammals already taken in the State. The impacts to the aesthetic value of mammals would be similar to the other alternatives.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods Used

As discussed in the EA, a common issue often raised is concerns about the humaneness of methods available under the alternatives for resolving mammal damage and threats. The issues of method humaneness relating to the alternatives are discussed below.

Alternative 1 - Technical Assistance Only

The issues of humaneness of methods under this alternative are likely to be perceived to be similar to humaneness issues discussed under the proposed action. This perceived similarity is derived from WS' recommendation of methods that some consider inhumane. WS would not directly be involved with damage management activities under this alternative. However, the recommendation of the use of methods would likely result in the requester employing those methods. Therefore, by recommending methods and thus a requester employing those methods, the issue of humaneness would be similar to the proposed action.

WS would instruct and demonstrate the proper use and placement of methodologies to increase effectiveness in capturing target mammal species and to ensure methods are used in such a way as to minimize pain and suffering. However, the efficacy of methods employed by a cooperator would be based on the skill and knowledge of the requestor in resolving the threat to safety or damage situation despite WS' demonstration. Therefore, a lack of understanding of the behavior of mammals or improperly identifying the damage caused by mammals along with inadequate knowledge and skill in using methodologies to resolve the damage or threat could lead to incidents with a greater probability of being perceived as inhumane. In those situations, the pain and suffering are likely to be regarded as greater than those discussed in the proposed action.

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

As discussed in the EA, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal. People may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

Some individuals believe any use of lethal methods to resolve damage associated with wildlife is inhumane because the resulting fate is the death of the animal. Others believe that certain lethal methods can lead to a humane death. Others believe most non-lethal methods of capturing wildlife to be humane because the animal is generally unharmed and alive. Still others believe that any disruption in the behavior of wildlife is inhumane. With the varied attitudes on the meaning of humaneness, the analyses must consider the most effective way to address damage and threats caused by wildlife in a humane manner. WS is challenged with conducting activities and employing methods that are perceived to be humane while assisting those persons requesting assistance to manage damage and threats associated with wildlife. The goal of WS is to use methods as humanely as possible to effectively resolve requests for assistance to reduce damage and threats to human safety. WS continues to evaluate methods and activities to minimize the potential pain and suffering of wildlife when attempting to resolve requests for assistance.

As mentioned previously, some methods have been stereotyped as "*humane*" or "*inhumane*". However, many "*humane*" methods can be inhumane if not used appropriately. For instance, a cage trap is

generally considered by most members of the public as "*humane*". Yet, without proper care, live-captured wildlife in a cage trap can be treated inhumanely if not attended to appropriately.

Therefore, WS' mission is to effectively address requests for assistance using methods in the most humane way possible that minimize the stress and pain of the animal. WS' personnel are experienced and professional in their use of management methods, and methods are applied as humanely as possible.

Humaneness Analysis from WS' Activities Conducted from FY 2005 through FY 2011

Methods used in mammal damage management activities in New Hampshire from FY 2005 through FY 2011 and their potential impacts on humaneness and animal welfare did not change from those analyzed in the EA. All methods employed by WS from FY 2005 through FY 2011 to alleviate mammal damage were discussed in the EA (USDA 2005*a*). WS continued to employ methods as humanely as possible to minimize distress. Live-captured mammals addressed in the EA were euthanized using methods considered appropriate for wild mammals by the American Veterinary Medical Association (AVMA). Therefore, the analyses of the humaneness of methods used by WS to manage damage and threats caused by mammals from FY 2005 through FY 2011 did not change from those analyzed in the EA.

Humaneness Analysis under the Proposed Supplement to the EA

Since those methods described in Appendix B of the EA would continue to be available under the proposed supplement to the EA, the issue of humaneness would be similar despite the increase in frequency of the use of methods. Those methods considered inhumane by certain segments of society would be considered inhumane no matter the frequency of the use of those methods. Those methods considered inhumane that were addressed in the EA would continue to be considered inhumane under the supplement to the EA. Therefore, the analyses in the EA for the humaneness of methods would not change under the supplement to the EA. WS would continue to employ methods as humanely as possible and would continue to employ euthanasia methods recommended for wild mammals by the AVMA.

The issue of humaneness from those proposed activities in the supplement would remain as addressed in the EA since the methods available for use under the proposed supplement are the same as those methods addressed in Appendix B of the EA. The potential increase in activities by WS to address damage and threats to human safety and property proposed in the supplement would not result in humaneness issues outside of those addressed in the EA for the methods available for use. The proposed use of FLIR and night vision equipment to remove mammals may improve the perceived humanness of the removal of mammals as shooting is generally considered to involve less stress to the animal than trapping or the use of toxicants.

Alternative 3 - Non-lethal Mammal Damage Management Only By WS

Under this alternative, non-lethal methods would be used by WS that would generally be regarded as humane. Although some issues of humaneness could occur from the use of non-lethal methods, those methods, when used appropriately and by trained personnel, would not result in the inhumane treatment of wildlife. Concerns from the use of those non-lethal methods would be from injuries to animals while those animals were restrained and from the stress of the animal while being restrained or during the application of the method. Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals. If mammals are to be live-captured by WS, WS' personnel would be present on-site during capture events or methods would be checked frequently to ensure mammals captured are addressed timely and to prevent injury. Although stress could

occur from being restrained, timely attention to live-captured wildlife would alleviate suffering. Stress would likely be temporary.

Alternative 4 - No federal WS Mammal Damage Management

Under this alternative, WS would not be involved with any aspect of mammal damage management in New Hampshire. Those experiencing damage or threats associated with mammals could continue to use those methods legally available. Those methods would likely be considered inhumane by those persons who would consider methods proposed under any alternative as inhumane. The issue of humaneness would likely be directly linked to the methods legally available to the public since methods are often labeled as inhumane by segments of society no matter the entity employing those methods.

The humaneness of methods would be based on the skill and knowledge of the person employing those methods. A lack of understanding of the target species or methods used could lead to an increase in situations perceived as being inhumane to wildlife despite the method used. Despite the lack of involvement by WS under this alternative, those methods perceived as inhumane by certain individuals and groups would still be available to the public to use to resolve damage and threats caused by mammals.

Issue 6 - Effects of Beaver Removal and Dam Manipulation on the Status of Wetlands in the State

Concern has also been expressed regarding the potential effects of the proposed action and the alternatives on wetland ecosystems associated with activities that could be conducted to address beaver damage or threats. Concerns have been raised that removing and/or modifying beaver dams in an area would result in the loss of wetland habitat and the plant and animal species associated with those wetlands. In addition, concerns are often raised regarding the use of lethal methods to remove beaver to alleviate damage or threats. If beaver were lethally removed from an area and any associated beaver dam was removed or breached, the manipulation of water levels by removing/breaching the dam could prevent the establishment of wetlands in areas where water has been impounded by beaver dams for an extended period.

Over time, the impounding of water associated with beaver dams can establish new wetlands. Because beaver dams may involve waters of the United States, the removal of a beaver dam is regulated under Section 404 of the CWA. The United States Army Corps Of Engineers and the EPA regulatory definition of a wetland (40 CFR 232.2) is: "*Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas*."

Although beaver can cause damage to resources, there can be many benefits associated with beaver and beaver activities. Beaver can provide ecological benefits associated with the creation of wetland habitats (Munther 1982, Wright 2002, Rossell et al. 2005, Bergman et al. 2007, Pollock 2007, Fouty 2008*a*, Fouty 2008*b*, Hood and Bayley 2008). Beaver can also provide aesthetic and recreational opportunities for wildlife observation (Wade and Ramsey 1986, Ringleman 1991), improve water quality (Muller-Schwarze and Sun 2003), and provide cultural and economic gains from fur harvest (Hill 1976, McNeely 1995, Lisle 1996, Lisle 2003).

Beaver impoundments can increase surface and groundwater storage, which can help reduce problems with flooding by slowing the downstream movement of water during high-flow events and help to mitigate the adverse effects of drought (Fouty 2008*a*, Hey and Phillips 1995, Naiman et al. 1988, Wade and Ramsey 1986). Hood and Bayley (2008) determined that the presence of beaver could help reduce

the loss of open water wetlands during warm, dry years. The presence of active beaver lodges accounted for over 80% of the variability in the amount of open water present in the mixed-wood boreal region of east-central Alberta (Hood and Bayley 2008). Hood and Bayley (2008) also found temperature and rainfall influenced the amount of open-water wetlands, but to a much lesser extent than the presence of beaver. During wet and dry years, the presence of beaver was associated with a 9-fold increase in open water area over the same areas when beaver were absent. Hood and Bayley (2008) noted that beaver could mitigate some of the adverse impacts of global warming through their ability to create and maintain areas of open water. Beaver ponds and associated wetlands can provide a potential water source for livestock, serve as basins for the entrapment of streambed silt and eroding soil (Hill 1982), and help to filter nutrients from the water; thereby, maintaining the quality of nearby water systems (Arner and Hepp 1989).

Beaver may increase habitat diversity by opening forest habitats via dam building and tree cutting, which can result in a greater mix of plant species, and different-aged plant communities (Hill 1982, Arner and Hepp 1989). The creation of standing water, edge habitat, and plant diversity, all in close proximity, can result in excellent habitat for many wildlife species (Jenkins and Busher 1979, Arner and DuBose 1982, Hill 1982, Arner and Hepp 1989, Medin and Clary 1990, Medin and Clary 1991). The wetland habitat that can be created by beaver ponds can be beneficial to some fish (primarily warm water species), reptiles, amphibians, waterfowl, shorebirds, and furbearers such as muskrats, otter, and mink (Arner and DuBose 1982, Naimen et al. 1986, Miller and Yarrow 1994). For example, in Mississippi, beaver ponds over three years in age were found to have developed plant communities valuable as nesting and brood rearing habitat for wood ducks (Arner and DuBose 1982). Reese and Hair (1976) found that beaver pond habitats were highly attractive to a large number of birds throughout the year and that the value of beaver pond habitat to waterfowl was minor when compared to other species of birds (Novak 1987). Beaver ponds can be beneficial to some T&E species. The USFWS estimates that up to 43% of T&E species rely directly or indirectly on wetlands for their survival (EPA 1995).

Under the proposed action alternative, WS could recommend and/or implement methods to manipulate water levels associated with water impounded by beaver dams to alleviate flooding damage. If the technical assistance alternative was selected, WS could recommend methods to people requesting assistance that could result in the manipulation of water levels associated with water impounded by beaver dams. WS would not be involved with any aspect of activities associated with beaver dams under the no involvement by WS alternative. Methods that would generally be available under all the alternatives would include explosives, exclusion devices, and water flow devices. However, the availability to breach or remove beaver dams using explosives would be limited under Alternative 2 and Alternative 3, since the property owner or manager seeking to remove or breach a dam would be required to locate a person certified to use explosives to conduct the work. In addition, the use of backhoes or other mechanical methods could be employed by property owners or managers to remove or breach beaver dams under any of the alternatives; however, WS would not operationally employ backhoes or other large machinery to remove or breach dams.

Exclusion devices and water control systems have been used for many years to manipulate the level of water impounded by beaver dams with varying degrees of success (United States General Accounting Office 2001). Landowner management objectives play a role in how the efficacy of a level system is perceived (Nolte et al. 2001). Nolte et al. (2001) found that survey respondents classified pond levelers installed to manage wetlands for waterfowl habitat more successful than levelers installed to provide relief from flooding. Langlois and Decker (1997) reported that "*...very few beaver problems...can actually be solved with a water level control device*" with a 4.5% success rate in Massachusetts and a 3% success rate in New York. Nolte et al. (2001) reported only 50% of installed pond levelers in Mississippi met landowner objectives and found that pond levelers placed in sites with high beaver activity more frequently failed if installed without implementing population control measures. Higher success rates

have been reported for newer exclusion and water control systems ranging from 87% to 93% (Callahan 2005, Boyles 2006, Simon 2006, Boyles 2007). Lisle (2003) reported the use of water control devices or a combination of a Beaver Deceiver™ and flow management device virtually eliminated the need for maintenance and beaver removal at 20 sites where clogged culverts and flooded roads had previously been a routine issue.

When using exclusion and water control systems, those methods must be specifically designed to meet the needs of each site (Langlois and Decker 1997). Consequently, devices installed by inexperienced individuals may have a higher failure rate than those installed by a professional (Lisle 1996, Callahan 2003, Boyles 2006, Simon 2006, Spock 2006). Higher success rates reported for newer exclusion and water control devices may be indicative of increased understanding of the kinds of situations where those devices work best. For example, Callahan (2005) noted that exclusion and water control systems installed at culvert sites were more successful than similar systems installed at freestanding dams. Callahan (2003) and Callahan (2005) also provided a list of sites that were not well suited to the use of exclusion or water control devices. Boyles (2006) and Boyles (2007) reported some of the highest success rates for newer exclusion and water control systems; however, those devices were only tested at culvert sites.

Beaver build dams to raise water levels to meet their needs for security and access to forage. While pond levelers allow for the retention of some water, if the water level does not meet the needs of the beaver, they may move a short distance upstream or downstream and build a new dam, or abandon the area (Langlois and Decker 1997, Callahan 2003, Clemson University 2006). This may merely result in moving the problem to a new landowner or, depending upon site characteristics, the resulting pond may result in new or increased damage problems for the original landowner. McNeely (1995) reported the most common reasons cited for lack of success of water flow devices were clogging caused by debris or silt and beaver construction of additional dams upstream or downstream of the management device. In a study by Callahan (2005), construction of a new dam upstream or downstream of a pond leveler device was the most common cause of failure for free-standing dams (*e.g.*, dams not associated with a culvert or other similar constriction in water flow, 11 of 156 sites). Callahan (2005) also found that insufficient pipe capacity (6 sites), dammed fencing (2 sites), and lack of maintenance (2 sites) were also causes for pond leveler failures. Nolte et al. (2001) also reported the need to address problems with dams upstream or downstream of a device. At culvert sites, Callahan (2005) found a lack of maintenance was the primary cause of failure with culvert exclusion devices (4 of 227 sites). Callahan (2005) also found vandalism resulted in the failure of a culvert device at one of the sites. At two culvert sites, Callahan (2005) found dammed fencing reduced or completely impeded the operation of exclusion devices.

Most pond levelers and exclusion devices require maintenance. The amount of maintenance required can vary considerably among sites, depending on site conditions and the type of device (Nolte et al. 2001, Callahan 2005, Boyles 2006, Spock 2006). Stream flow, leaf fall, floods, and beaver activity can continuously bring debris to the intake of a water control device. Ice damage and damage from debris washed downstream during high water events may also trigger the need for maintenance (*e.g.*, cleaning out the intake pipe). Although most exclusion and water control devices generally require some level of maintenance, there are reports of devices that have remained effective for a period of years with no maintenance (Nolte et al. 2001). Nolte et al. (2001) reported that post-installation maintenance had been performed by property owners or managers on 70% of the 20 successfully operating Clemson pond levels installed by WS in Mississippi. The most common action was to adjust the riser on the pipe to manipulate water levels. Other maintenance included removal of vegetation and secondary dams built after the installation of the devices. In a survey of individuals who had received assistance with exclusion and water control devices, Simon (2006) found 18 of 36 survey respondents reported maintaining their devices, while installation program staff monitored an additional 10 devices. Of those survey respondents, Simon (2006) found that 61% reported that routine maintenance took 15 minutes or less

while 93% reported that maintenance took a half hour or less. Boyles (2006) reported that time spent in device maintenance ranged from one to 4.75 hours per year.

Installation and upkeep of water control devices can vary from site to site. For example, transporting materials over long distances in difficult terrain to install devices in remote locations where road access is not available could increase costs compared to the ability to transport materials for installation at a culvert site along a roadway. Callahan (2005) reported that the average cost for an exclusion fence at a culvert was $750 with an average annual maintenance cost of approximately $200. Flexible leveler pipe systems cost an average of $1,000 to install and $100 per year in maintenance, while the average cost to install a combination fence and leveler was $1,400 with approximately $150 per year in maintenance (Callahan 2005). Over a ten-year period, Callahan (2005) estimated the cost of installation and annual maintenance would range from $200 to $290 per year depending on the device installed. Spock (2006) reported that exclusion and/or water control device installation cost ranged from < $600 to over $3,000 dollars, with slightly more than half the systems (58.2%) ranging between $600 and $1,000 to install. In many cases, Spock (2006) found the cost included the first year of maintenance. The more expensive installations tended to be extensive fence and leveler systems or systems with numerous leveler pipes (Spock 2006). Boyles (2006) reported that device installation cost an average of $1,349 per device and $3,180 per site with subsequent annual maintenance cost averaging $19.75 per site per year (Boyles 2006). However, unlike the study by Callahan (2005) the devices evaluated by Boyles (2006) had only been in place for a relatively short time (average time in place 15 months, range 6 to 22 months versus average time in place 36.6 months, range 3 to 75 months). The cost of maintenance may vary over time as site conditions change.

Alternative 1 - Technical Assistance Only

The issues regarding the effects on wetlands under this alternative would likely be similar to wetlands issues discussed under the proposed action. This similarity would be based on WS' recommendation of methods to manage damage caused by beaver and the recommendation of methods to manage the water impounded by beaver dams. Based on information provided by the person requesting assistance or based on site visits, WS could recommend that a landowner or manager manipulate beaver dams to reduce flooding damage or threats of damage. WS would not be directly involved with conducting activities associated with the manipulation of beaver dams under this alternative. However, the recommendation of the use of methods would likely result in the requestor employing those methods or employing an agent to employ them. Therefore, by recommending methods and thus a requester employing those methods, the potential for those methods to reduce the presence of impounded water would be similar to the proposed action.

WS could instruct and demonstrate the proper use and placement of flow control and exclusionary devices, as well as recommend the breaching or removal of beaver dams, when appropriate. WS would also assist requestors by providing information on permit requirements, which municipal and state agencies need to be contacted to obtain appropriate permits to manipulate the levels of water impounded by beaver dams.

The efficacy of methods employed by a cooperator would be based on the skill and knowledge of the requestor or their agent despite WS' recommendations or demonstration. Therefore, a lack of understanding of the behavior of beaver along with inadequate knowledge and skill in using methodologies to resolve flooding could lead to incidents with a greater probability of unforeseen impacts to wetlands. In those situations, the potential for dam manipulation to adversely affect the status of wetlands would likely to be regarded as greater than those discussed in the proposed action.

WS would recommend the landowner or manager seek and obtain the proper permits to manipulate water levels impounded by beaver dams under this alternative; however, WS would not be responsible for ensuring that appropriate permits were obtained, proper methods were implemented for manipulating water levels, or for reviewing sites for the presence of T&E species. Those responsibilities would be incurred by property owner/manager and/or their designated agent who may or may not properly follow WS' recommendations.

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

Manipulation of water levels associated with water impoundments caused by beaver dams could be addressed by WS under the proposed action using either dam breaching, dam removal, or the installation of water flow devices, including exclusion devices. Those methods allow dams to be breached or removed to maintain the normal flow of water. Heavy equipment, such as backhoes or bulldozers, would not be used by WS to breach, remove, or install water flow devices; although, heavy machinery could be utilized by a cooperator or their agents. WS may utilize small all-terrain or amphibious vehicles and/or watercraft for transporting personnel, equipment, and supplies to worksites.

The breaching or removal of dams could be conducted by hand. Breaching is normally conducted through incremental stages of debris removal from the dam that allows water levels to be gradually lowered. Breaching of dams would normally occur to limit the potential for flooding downstream by gradually allowing water levels to lower as more of the dam was breached over time. Breaching also minimizes the release of debris and sediment downstream by allowing water to move slowly over or through the dam. Depending on the size of the impoundment, water levels could be slowly lowered over several hours or days when breaching dams. When breaching dams, only that portion of the dam blocking the stream or ditch channel would be altered or breached, with the intent of returning water levels and flow rates to historical levels or to a level that eliminates damage threats or habitat alteration that would be acceptable to the property owner or resource manager. Similar to breaching dams, the removal of the dam removes the debris impounding water and restores the normal flow of water.

Beaver dams would generally be breached or removed by hand with a rake or power tools (*e.g.*, a winch). However, explosives would also be available to remove beaver dams. Explosives could potentially be utilized by WS' personnel specially trained and certified to conduct such activities. Explosives are defined as any chemical mixture or device that serves as a blasting agent or detonator. Explosives would generally be used to remove beaver dams that were too large to remove by hand. Explosives would only be used after beaver were removed from the site.

WS' personnel would only utilize binary explosives (*i.e.*, explosives comprised of two parts that must be mixed at the site before they can be detonated as an explosive material) for beaver dam removal, when requested. Binary explosives consist of ammonium nitrate and nitro-methane; however, those two components separated are not classified as explosives until mixed. Therefore, binary explosives would be subject to fewer regulations and controls. However, once mixed, binary explosives would be considered high explosives and subject to all applicable federal and state regulations. Detonating cord and detonators would also be considered explosives and WS would adhere to all applicable state and federal regulations for storage, transportation, and handling. WS' use of explosives and safety procedures would occur in accordance with WS Directive 2.435.

In addition to dam breaching and removal, water flow devices and exclusion methods would also be available for WS to employ during direct operational assistance or to recommend during technical assistance. Several different designs of water flow devices and exclusion methods would be available; however, the intent of all those methods would be to lower water levels by allowing water to flow through the beaver dam using pipes and wire mesh. After installation, beaver dams would be left intact with water

levels maintained at desired levels by adjusting the water flow device. Water flow devices and exclusion methods allow beaver to remain at the site and maintain the beaver dam.

Although dams could be breached/removed manually or with binary explosives, those methods are usually ineffective because beaver can quickly repair or replace the dam if the beaver were not removed prior to breaching or removing the dam (McNeely 1995). Damage may be effectively reduced in some situations by installing exclusion and water control devices. Exclusion and water control devices can be designed so that the level of the beaver-created water impoundment can be managed to eliminate or minimize damage from flooding while retaining the ecological and recreational benefits derived from beaver impounding water over time. For example, WS may recommend modifications to site and culvert design (Jensen et al. 1999) as a non-lethal way of reducing problems with beaver dams at culverts.

Manipulating water levels impounded by beaver dams under the proposed action alternative would generally be conducted to maintain existing stream channels and drainage patterns, and to reduce water levels to alleviate flooding. WS could be requested to assist with manipulation of a beaver dam to alleviate flooding to agricultural crops, timber resources, public property, such as roads and bridges, private property, and water management structures, such as culverts. The intent of breaching or removing beaver dams would not be to drain established wetlands. With few exceptions, requests for assistance received by WS from public and private entities would involve breaching or removing dams to return an area to the condition that existed before the dam had been built, or before the impounded water had been affecting the area long enough for wetland characteristics to become established.

Most activities conducted by WS in New Hampshire do not have the potential to affect wetlands, since those activities would not be conducted near or in wetlands. Under this alternative, water levels would be manipulated to return streams, channels, dikes, culverts, and canals to their original function. Most requests to alleviate flooding from impounded water would be associated roads, crops, merchantable timber, pastures, and other types of property or resources that were not previously flooded. Most dams removed would have been created because of recent beaver activity. WS' personnel receive most requests for assistance associated with beaver dams soon after affected resource owners discover damage.

Upon receiving a request to manipulate the water levels in impoundments caused by beaver dams, WS would visually inspect the dam and the associated water impoundment to determine if characteristics exist at the site that would meet the definition of a wetland under section 404 of the Clean Water Act (40 CFR 232.2). If wetland conditions were present at the site, the entities requesting assistance from WS would be notified that a permit might be required to manipulate the water levels impounded by the dam and to seek guidance from the NHDES, the Environmental Protection Agency, and the United States Corps of Engineers pursuant to State laws and the Clean Water Act. If the area does not already have hydric soils, it usually takes several years for them to develop and a wetland to become established; this often takes greater than 5 years as indicated by the Swampbuster provision of the Food Security Act. Most beaver dam removal by WS would occur under exemptions stated in 33 CFR parts 323 and 330 of Section 404 of the Clean Water Act or parts 3821 and 3822 of the Food Security Act. However, manipulating water levels associated with some beaver dams could trigger certain portions of Section 404 that require landowners to obtain permits from the United States Army Corps of Engineers prior to removing a blockage. WS' personnel would determine the proper course of action upon inspecting a beaver dam impoundment. Appendix C describes the procedures used by WS to assure compliance with the pertinent laws and regulations.

The manipulation of water impoundment levels by WS by dam breaching, dam removal, or installation of water flow devices would typically be associated with dams constructed from recent beaver activity and would not have occurred long enough to take on the qualities of a true wetland (*i.e.* hydric soils, hydrophytic vegetation, and hydrological function). WS' activities associated with beaver dam

breaching, beaver dam removal, or the installation of flow control device would only be conducted to restore the normal flow of water through drainages, streams, creeks, canals, and other watercourses where flooding damage was occurring or would occur. Beaver dam breaching or removal would not affect substrate or the natural course of streams.

In the majority of instances, beaver dam removal would be accomplished by manual methods (*i.e*., hand tools). WS' personnel would not utilize heavy equipment, such as trackhoes or backhoes, for beaver dam removal. Only the portion of the dam blocking the stream or ditch channel would be breached or removed. In some instances, WS would install water flow devices to manage water levels at the site of a breached beaver dam. In those situations where a non-federal cooperator had already made the decision to breach or remove a beaver damage to manipulate water levels with or without WS' assistance, WS' participation in carrying out the action would not affect the environmental status quo.

Additional concern has been raised relating to the lethal removal of beaver by WS or the recommendation of lethal methods to alleviate damage or threats of damage under the proposed action alternative. Beaver lethally removed could be replaced by other beaver requiring additional assistance later. Houston (1995) indicated that beaver tend to reoccupy vacant habitats. The likelihood that a site would be recolonized by beaver varies depending on many factors. For example, removal of beaver and a beaver dam from a relatively uniform section of irrigation canal may resolve the problem for an extended period because the relatively uniform nature of the canal does not predispose a site to repeat problems. Re-colonization would also depend on the proximity and density of the beaver population in the surrounding area. Isolated areas or areas with a lower density of beaver would normally take longer for beaver to recolonize than areas with higher beaver densities. Activities conducted under the proposed action would be directed at specific beaver and/or beaver colonies and would not be conducted to suppress the overall beaver population in the State.

In accordance with WS Directive 2.101, preference would be given to non-lethal methods where practical and effective. Although use of exclusion and water control devices could greatly reduce the need for lethal beaver removal, beaver removal may still be needed in some situations even though a flow device or water control system had been installed (Wood et al. 1994, Nolte et al. 2001, Simon 2006, Spock 2006). Callahan (2005) states the trapping of beaver to alleviate damage should occur "*...where a flow device is either not feasible or fails, the water level needs to be drastically lowered, or the landowner wants no beavers or ponds on their property*". Spock (2006) reported that beaver had to be trapped out of one site when an exclusion system was augmented by the installation of a water control device. Lisle (1996) noted that it might be necessary to remove beaver that have learned to dam around exclusion and water control devices. In some instances, trapping during the annual trapping season for beaver continued to occur at or near the area where water control devices were installed but was not prompted by the failure of the devices (Lisle 1996, Simon 2006, Spock 2006).

Exclusion and water control devices may not be the most effective method in specific types of terrain and are not suitable for every site (Langlois and Decker 1997, Wood et al. 1994, Nolte et al. 2001, Callahan 2005). Exclusion devices and water control devices may not be suitable for man-made, uniform channels such as agricultural drainage ditches and irrigation canals; reservoirs; areas where human health, property or safety would be threatened with even minor elevation in water level; and areas where the landowner has expressed zero tolerance for beaver activity on their property (Callahan 2003, Callahan 2005, Simon 2006). Water control devices may be ineffective in beaver ponds in broad, low-lying areas because even a slight increase in water depth can result in a substantial increase in the area flooded (Organ et al. 1996). Exclusion and water control systems would not resolve problems related to beaver construction of bank dens. Depending upon site characteristics, beaver may build bank dens instead of lodges by burrowing into banks, levees, and other earthen impoundments. When bank dens are built in earthen levees or in banks supporting roadways or railroad tracks, they can greatly weaken the earthen structure. Burrowing

into embankments can weaken the integrity of impoundments. Burrows allow water to infiltrate embankments, which can allow water to seep through the embankments causing erosion and weakening water impoundments. In those situations, removal of the beaver (either by translocation or by lethal methods) could be the only practical solution to resolve the potential for damage.

Water control devices may also be inappropriate in areas that are managed for aquatic species that need free-flowing water conditions and gravel substrate to survive. The still water and silt that accumulates behind beaver dams can be detrimental to some species. In addition, beaver dams could impede the movement of fish upstream. Avery (2004) found the removal of beaver dams resulted in substantial increases in the stream area where trout could be found. For example, a 9.8-mile treatment zone on the North Branch of the Pemebonwon River in Wisconsin and an additional 17.9 miles of seven tributaries to the treatment section of the river were maintained free of beaver dams since 1986. In 1982, prior to dam removal, wild brook trout were found in only four of the seven tributaries within the treatment zone and at only four of the 12 survey stations. In the spring of 2000, wild brook trout were present in all seven tributaries and at all 12 survey stations (Avery 2004). In some cases, water control devices could be modified to improve fish passage (Close 2003). Although the presence of beaver dams could be detrimental to some species of fish, some fish species may benefit from the presence of a beaver dam (Rossell et al. 2005, Bergman et al. 2007, Pollock et al. 2007).

Although beaver serve a valuable role in wetland ecology, the presence of beaver dams in intensively managed wetlands could be a concern to property owners or managers. In those areas, man-made water control structures are used to manage the water level in the wetland area in order to maximize habitat value for waterfowl and specific types of wetland-dependent wildlife (USDI 2008). While general elevations or reductions in water levels might conceivably be achieved by installing pipe systems through beaver dams, the devices tend to be more difficult to adjust than the water control structures. More importantly, the primary difficulty comes when drawdowns are used to achieve wetland management objectives. Drawdowns generally involve reducing the water level until large sections of mudflat are exposed. Many plant species valuable to waterfowl and other wetland bird species need exposed mudflats to sprout. Shorebirds use the mudflats to forage for invertebrates (USDI 2008). Once the plants have matured, the water level can be gradually increased until approximately half of the marsh has open water and half has standing plants (USDI 2008). Drawdowns may also be used in fall as a means of eliminating invasive fish (USDI 2008). The extent of the water level reduction conflicts with the beaver's desire for water deep enough to provide protection, and water area of sufficient extent to provide relatively easy access to foraging sites. The extent of the water level reduction during a drawdown would likely increase the risk of new dam creation in other locations that may cause new problems (Callahan 2003).

Alternative 3 - Non-lethal Mammal Damage Management Only By WS

Under this alternative, WS could employ those methods available to manipulate water levels associated with beaver dams, including breaching dams, removing dams, and the installation of water flow devices. Similar to the proposed action alternative, WS could employ hand tools to breach dams or could employ hand tools and/or explosives to remove dams. Those water flow devices discussed previously would be available for WS to employ and recommend under this alternative. Therefore, the potential to affect the status of wetlands from manipulating water levels would be similar to the proposed action alternative.

Alternative 4 - No federal WS Mammal Damage Management

Under this alternative, WS not be involved with any aspect of managing water levels associated with beaver dam impoundments. Under the no involvement by WS alternative, WS would not be involved with any aspect of managing damage associated with beaver in the State, including technical assistance. Due to the lack of involvement in managing damage caused by beaver, no impacts to wetlands would

occur directly from WS. This alternative would not prevent those entities experiencing threats or damage due to flooding from manipulating water levels associated with beaver dams in the absence of WS' assistance. Those methods described previously would be available to other entities to breach or remove dams, including water flow devices. However, the use of explosives to remove dams under this alternative would be limited to those persons trained and licensed to use explosives. A property owner or manager could seek the services of an entity trained and licensed to use explosives to remove beaver dams under this alternative. The direct burden of implementing permitted methods would be placed on those persons experiencing damage.

Since the same methods would be available to resolve or prevent beaver damage or threats related to beaver dams, effects on the status of wetlands in the State from the use of those methods would be similar between the alternatives. However, manipulating water levels by those persons not experienced in identifying wetland characteristics or unaware of the requirement to seek appropriate permits to alter areas considered as a wetland, could increase threats to wetlands and the associated flora and fauna.

XVIII. CUMULATIVE IMPACTS

Cumulative impacts, as defined by the Council on Environmental Quality (CEQ) (40 CFR 1508.7), are impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time.

WS would be the primary federal program with damage management responsibilities; however, other private entities may conduct similar activities in New Hampshire as permitted by the NHFG. Through ongoing coordination with the NHFG, WS is aware of such activities and may provide technical assistance in such efforts. WS does not normally conduct direct damage management activities concurrently with other entities in the same area, but may conduct activities at adjacent sites within the same timeframe. The potential cumulative impacts analyzed below could occur either because of WS' program activities over time or because of the aggregate effects of those activities combined with the activities of other agencies and individuals.

Chapter 4 of the EA provides further information and analyses on potential cumulative impacts of the proposed action. The following resource values in the State are not expected to be significantly impacted from cumulative activities conducted pursuant to any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, critical habitats (areas listed in threatened and endangered species recovery plans), visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. Those resources will not be analyzed further. The activities proposed in the alternatives would have a negligible cumulative effect on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur because of any of the alternatives. Those alternatives would meet the requirements of applicable laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

Issue 1 - Effects on Target Mammal Species

Evaluation of WS' activities relative to wildlife populations indicated that program activities would likely have no cumulative adverse effects on populations in New Hampshire. WS' actions would be occurring simultaneously, over time, with other natural processes and human-generated changes that are currently taking place. Those activities include, but are not limited to:

- Natural mortality of wildlife

- Mortality of wildlife from vehicle collisions, aircraft strikes, and illegal take
- Human-induced mortality of mammals through annual hunting and trapping seasons
- Human-induced mortality through private damage management activities
- Human and naturally induced alterations of wildlife habitat
- Annual and perennial cycles in population densities

All those factors play a role in the dynamics of wildlife populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate target species populations or place target species at a juncture to cause damage to resources. WS' actions taken to minimize or eliminate damage are constrained as to scope, duration and intensity, for the purpose of minimizing or avoiding impacts to the environment. WS evaluates damage occurring, including other affected elements and the dynamics of the damaging species; determines appropriate strategies to minimize effects on environmental elements; applies damage management actions; and subsequently monitors and adjusts/ceases damage management actions (Slate et al. 1992, USDA 2005*a*). This process allows WS to take into consideration other influences in the environment, such as those listed above, in order to avoid cumulative adverse impacts on target species.

No cumulative adverse impacts on wildlife populations are expected from WS' actions based on the following considerations:

Historical Outcomes of WS' Activities to Address Mammal Damage in the State

No cumulative adverse effects have been identified for wildlife because of program activities implemented over time based on analyses contained in the EA, from annual monitoring reports, or from analyses contained in this supplement. WS continues to implement an integrated damage management program that adapts to the damage situation and the species involved with causing the damage. WS only targets wildlife causing damage and only after a request for assistance is received. All program activities are coordinated with appropriate federal, state, and local entities to ensure WS' activities do not adversely affect the populations of any native wildlife species.

Since the completion of the EA, the number of species and the total number of mammal species addressed by WS in New Hampshire has increased annually which provides some indication that WS' activities are not cumulatively affecting populations. WS continues to implement an integrated program that employs primarily non-lethal dispersal and harassment methods. WS would continue to provide technical assistance to those persons requesting assistance to identify and alleviate damage.

With management authority over those mammal species addressed in the EA and this supplement to the EA in New Hampshire, the NHFG can adjust take levels, including the take by WS, to ensure population objectives for those mammal species are achieved. Consultation and reporting of take by WS would ensure the NHFG considers any activities conducted by WS.

WS' take has been and would continue to be a small component of the overall harvest of those target mammal species, which is monitored and adjusted by the NHFG to meet management objectives for those mammal populations in the State. Target species' populations in the State continue to remain relatively stable, which provides an indication that the cumulative take of those species, has not reached a level where an undesirable decline in those species' populations has occurred. WS' reporting of take to the NHFG ensures fluctuations in those species' populations across the State occurs with the knowledge of the NHFG and is considered when setting allowable take levels for those species to meet objectives. WS' activities are conducted on a small portion of the land area of the State and although local declines in some populations could occur from WS' activities, those activities would not reach a level where target species' populations would be adversely affected from those actions.

SOPs Built into WS' Program

SOPs are designed to reduce the potential negative effects of WS' actions on wildlife, and are tailored to respond to changes in wildlife populations that could result from unforeseen environmental changes. This would include those changes occurring from sources other than WS. Alterations in program activities are defined through SOPs and implementation is insured through monitoring, in accordance with WS' Decision Model (Slate et al. 1992, USDA 2005*a*).

Issue 2 - Effects on Other Wildlife Species, including Threatened and Endangered Species

Potential effects on non-target species from conducting wildlife damage management arise from the use of non-lethal and lethal methods to alleviate or prevent those damages or to alleviate threats of damage. The use of non-lethal methods during activities to reduce or prevent damage caused by target mammal species has the potential to exclude, disperse, or capture non-target wildlife. However, the effects of non-lethal methods are often temporary and often do not involve the take (killing) of non-target wildlife species. When using exclusion devices and/or repellents, both target and non-target wildlife can be prevented from accessing the resource being damaged. Since exclusion does not involve lethal take, cumulative impacts on non-target species from the use of exclusionary methods would not occur, but would likely disperse those individuals to other areas. Exclusionary methods are often expensive and require constant maintenance to ensure effectiveness. Therefore, the use of exclusionary devices would be somewhat limited to small, high-value areas and not used to the extent that non-targets are excluded from large areas that would cumulatively impact populations from the inability to access a resource, such as potential food sources. The use of visual and auditory harassment and dispersion methods are generally temporary with non-target species often returning after the cessation of those activities. Dispersal and harassment do not involve the take (killing) of non-target species and similar to exclusionary methods are not used to the extent or at a constant level that would prevent non-targets from accessing critical resources that would threaten survival of a population.

The use of lethal methods or those methods used to live-capture target species also have the potential to affect non-target wildlife through the take (killing) or capture of non-target species. Capture methods used are often methods that are set to confine or restrain wildlife after being triggered by a target individual. Capture methods are employed in such a manner as to minimize the threat to non-target species by placement in those areas frequently used by target wildlife, using baits or lures that are as species specific as possible, and modification of individual methods to exclude non-targets from capture. Most methods described in Appendix B of the EA are methods that are employed to confine or restrain wildlife that are subsequently euthanized using humane methods since translocation is currently not permitted by the NHFG. With all live-capture devices, non-target wildlife can be released on site if determined to be able to survive following release. SOPs are intended to ensure take of non-target wildlife is minimal during the use of methods to capture target wildlife.

The use of firearms, immobilizing chemicals and euthanasia chemicals are essentially selective for target species since identification of an individual is made prior to the application of the method. Both euthanasia and immobilizing drugs are applied through direct injection to target wildlife. Therefore, the use of those methods would not affect non-target species.

The methods described in Appendix B of the EA and this supplement all have a high level of selectivity and can be employed using SOPs to ensure minimal impacts to non-targets species. Between FY 2005 and FY 2011, there were no non-target species captured during WS' mammal damage management activities in New Hampshire. Based on the methods available to resolve mammal damage and/or threats, WS does not anticipate the number of non-targets taken to reach a magnitude where declines in those

species' populations would occur. Therefore, take of non-targets would not cumulatively affect the populations of non-target species. WS has reviewed the threatened and endangered species listed by the USFWS and the NMFS and has determined that activities proposed by WS in this supplement would have no effect on threatened and endangered species. WS has also determined that mammal damage management activities proposed in this supplement would have no effect on threatened and endangered species and species of concern that are listed by the NHFG. Cumulative impacts would be minimal on non-targets from any of the alternatives discussed.

Issue 3 - Effects on Human Health and Safety

Non-Chemical Methods

All non-chemical methods described in Appendix B of the EA and this supplement are used within a limited time frame, are not residual, and do not possess properties capable of inducing cumulative adverse impacts on human health and safety. All non-chemical methods are used after careful consideration of the safety of those employing methods and to the public. All capture methods are employed where human activity is minimal and warning signs are placed in conspicuous areas, when appropriate, to ensure the safety of the public. Capture methods also require direct contact to trigger ensuring that those methods, when left undisturbed would have no effect on human safety. All methods are agreed upon by the requesting entities, which are made aware of the safety issues of those methods when entering into a MOU, cooperative service agreement, or other comparable document between WS and the cooperating entity. SOPs also ensure the safety of the public from those methods used to capture or take wildlife. Firearms used to alleviate or prevent damage, though hazards do exist, are employed to ensure the safety of personnel and the public.

WS has received no reports or documented any adverse effects to human safety from WS' mammal damage management activities conducted from FY 2005 through FY 2011. Personnel employing non-chemical methods would continue to be trained to be proficient in the use of those methods to ensure safety of the applicator and to the public. Based on the use patterns of non-chemical methods, those methods would not cumulatively affect human safety.

Questions have arisen about the deposition of lead into the environment from ammunition used in firearms to lethally remove mammals. As described in Appendix B of the EA, the lethal removal of mammal species with firearms by WS to alleviate damage or threats would occur using a handgun, rifle, or shotgun. In an ecological risk assessment of lead shot exposure in non-waterfowl birds, ingestion of lead shot was identified as the concern rather than just contact with lead shot or lead leaching from shot in the environment (Kendall et al. 1996). Hunt et al. (2009) also found that deer killed with rifles using lead bullets might pose a risk of lead exposure to scavengers from ingestion of lead fragments in the carcass.

To reduce risks to human safety and property damage from bullets passing through mammal species, the use of firearms is applied in such a way (*e.g.*, caliber, bullet weight, distance) to ensure the bullet does not pass through. When using firearms, the retrieval of carcasses for proper disposal is highly likely. With risks of lead exposure occurring primarily from ingestion of shot and bullet fragments, the retrieval and proper disposal of carcasses would greatly reduce the risk of scavengers ingesting or being exposed to lead.

However, deposition of lead into soil could occur if, during the use of firearms, the projectile(s) pass through, if misses occur, or if the carcass is not retrieved. In general, hunting tends to spread lead over wide areas and at low concentrations (Craig et al. 1999). Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil is generally retained within the top 20 cm (about 8 inches). In addition, other concerns are that lead from bullets or

shot deposited in soil from shooting activities could lead to contamination of water, either ground water or surface water, from runoff. Stansley et al. (1992) studied lead levels in water that was subjected directly to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Lead did not appear to "*transport*" readily in surface water when soils were neutral or slightly alkaline in pH (*i.e.*, not acidic), but lead did transport more readily under slightly acidic conditions. Although Stansley et al. (1992) detected elevated lead levels in water in a stream and a marsh that were in the shot "*fall zones*", the study did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot where it was believed the lead contamination was due to runoff from the parking lot, and not from the shooting range areas. The study also indicated that even when lead shot is highly accumulated in areas with permanent water bodies present, the lead does not necessarily cause elevated lead contamination of water further downstream. Muscle samples from two species of fish collected in the water bodies with high lead shot accumulations had lead levels that were well below the accepted threshold standard of safety for human consumption (Stansley et al. 1992).

Craig et al. (1999) reported that lead levels in water draining away from a shooting range with high accumulations of lead bullets in the soil around the impact areas were far below the "*action level*" of 15 parts per billion as defined by the EPA (*i.e.*, requiring action to treat the water to remove lead). The study found that the dissolution (*i.e.*, capability of dissolving in water) of lead declines when lead oxides form on the surface areas of the spent bullets and fragments (Craig et al. 1999). Therefore, the transport of lead from bullets or shot distributed across the landscape is reduced once the bullets and shot form crusty lead oxide deposits on their surfaces, which serves to naturally further reduce the potential for ground or surface water contamination (Craig et al. 1999). Those studies suggest that, given the very low amount of lead being deposited and the concentrations that would occur from WS' activities using firearms, as well as most other forms of dry land small game hunting in general, lead contamination of water from such sources would be minimal to nonexistent.

WS' assistance with removing target mammal species would not be additive to the environmental status quo since those mammals removed by WS using firearms could be lethally removed by the landowners or other entities receiving the depredation permit using the same method in the absence of WS' involvement. The amount of lead deposited into the environment may be lowered by WS' involvement in activities. The proficiency training received by WS' employees in firearm use and accuracy increases the likelihood that mammals are lethally removed in a humane manner in situations that ensure accuracy and that misses occur infrequently which further reduces the potential for lead to be deposited in the soil from misses or from projectiles passing through carcasses. In addition, WS' involvement ensures carcasses would be retrieved and disposed of properly to limit the availability of lead in the environment and ensures carcasses are removed from the environment to prevent the ingestion of lead by scavengers. Based on current information, the risks associated with lead bullets or shot that are deposited into the environment from WS' activities due to misses, the bullet or shot passing through the carcass, or from carcasses that may be irretrievable, would be below any level that would pose any risk from exposure or significant contamination of water.

Chemical Methods

Chemical methods available for use under the proposed action are repellents, immobilizing drugs, and euthanizing drugs described in Appendix B of the EA (USDA 2005*a*). Immobilizing drugs are administered to target individuals using devices or methods that ensure the identification of the target animal. The immobilizing drugs discussed in Appendix B of the EA require injection of the drug directly into an animal. Injection would occur through hand injection via a syringe, by jab stick, or by a dart fired from a projector that mechanically injects the drug into the animal upon impact. Immobilizing drugs temporarily sedate an animal to minimize stress of handling and to reduce the risks to human safety.

Immobilized animals may also be euthanized using a drug described in Appendix B of the EA (USDA 2005*a*). Euthanasia drugs would only be administered after the animal has been properly restrained and immobilized and would occur through direct injection. WS' personnel are required to attend training courses and to be certified in the use of immobilizing and euthanizing drugs to ensure proper care and handling occurs, to ensure the proper doses are administered, and to ensure human safety under WS Directive 2.430. WS' personnel would continue to be trained in the proper handling and administering of immobilizing and euthanasia drugs to ensure human safety.

Direct application of chemical methods to target species would ensure that there are no cumulative impacts to human safety. All chemical methods would be tracked and recorded to ensure proper accounting of used and unused chemicals occurs. All chemicals would be stored and transported according to Food and Drug Administration and Drug Enforcement Administration regulations, including the directives of WS. The amount of chemicals used or stored by WS would be minimal to ensure human safety.

Repellents available for use to disperse mammals from areas of application must be registered with the EPA according to the Federal Insecticide, Fungicide, Rodenticide Act. Many of the repellents currently available for use have active ingredients that are naturally occurring and are generally regarded as safe. Although some hazards exist from the use of repellents, hazards occur primarily to the handler and applicator. When repellents are applied according to label requirements, no adverse effects to human safety are expected.

No adverse effects have been reported to or identified by WS from the use of chemical methods during mammal damage management conducted by WS from FY 2005 through FY 2011. When chemical methods are applied as intended and when safety guidelines are followed, no adverse effects to human safety are expected. The primary risk of exposure to chemical methods occurs to handlers and applicators. WS' personnel who use and apply chemical methods would be trained according to federal, State, and local laws and regulations, including WS' directives. Based on this information, the use of chemical methods as part of the proposed action by WS would not have cumulative impacts on human safety.

Issue 4 - Impacts to Stakeholders, including Aesthetics

The activities of WS would result in the removal of those target mammal species from those areas where damage or threats were occurring. Therefore, the aesthetic value of those mammals in those areas where damage management activities were being conducted would be reduced. However, for some people, the aesthetic value of a more natural environment would be gained by reducing densities of those species, including the return of native wildlife and plant species that may be suppressed or displaced by high densities of those species.

Some people experience a decrease in aesthetic enjoyment of wildlife because they feel that overabundant species are objectionable and interfere with their enjoyment of wildlife in general. Continued increases in numbers of individuals or the continued presence of those species may lead to further degradation of some people's enjoyment of any wildlife or the natural environment. The actions of WS could positively affect the aesthetic enjoyment of wildlife for those people that are being adversely affected by those mammal species.

Population objectives are established and enforced by the NHFG through the regulating of take during the statewide hunting season and trapping seasons along with the issuance of depredation permits after consideration of other known mortality factors. Therefore, WS has no direct impact on the status of the population of those species since all take by WS occurs at the discretion of the NHFG. Since those

landowners or persons seeking assistance could remove those species from areas where damage is occurring through RSA 207:26 or through depredation permits issued by the NHFG, WS' involvement would have no effect on the aesthetic value of those species in the area where damage was occurring. When a property owner and/or manager that is experiencing damage caused by those target species, the removal of those species under RSA 207:26 or by a depredation permit would likely occur whether WS was involved with taking those species or not.

Therefore, the activities of WS are not expected to have any cumulative adverse effects on this element of the human environment if occurring at the request of a property owner and/or manager and a permit has been issued by the NHFG who are responsible for regulating a resident wildlife species.

Issue 5 - Humaneness and Animal Welfare Concerns of Methods Used

Those methods employed by WS to reduce or prevent damage caused by mammals are addressed in Appendix B of the EA (USDA 2005*a*). WS continued to employ those methods as humanely as possible to minimize suffering and distress. WS also continues to implement SOPs to ensure methods are employed as humanely as possible. WS' SOPs are further discussed in Chapter 3 in the EA (USDA 2005*a*).

WS continues to seek new methods and ways to improve current technology to improve the humaneness of methods used to manage damage caused by mammals. Cooperation with individuals and organizations involved in animal welfare continues to be an agency priority for the purpose of evaluating strategies and defining research aimed at developing methods.

Issue 6 – Effects of Beaver Removal and Dam Manipulation on the Status of Wetlands in the State

Beaver build dams primarily in smaller riverine streams (intermittent and perennial brooks, streams, and small rivers) and in drainage areas with dams consisting of mud, sticks, and other vegetative materials. Their dams obstruct the normal flow of water and typically change the pre-existing hydrology from flowing or circulating waters to slower, deeper, more expansive waters that accumulate bottom sediment. The depth of bottom sediment depends on the length of time an area is covered by water and the amount of suspended sediment in the water.

The pre-existing habitat and the altered habitat have different ecological values to the fish and wildlife native to an area. Some species would abound by the addition of a beaver dam, while others would diminish. For example, some fish species require fast moving waters over gravel or cobble beds, which beaver dams can eliminate, thus reducing the habitat's value for these species. In general, it has been found that wildlife habitat values decline around bottomland beaver impoundments because trees are killed from flooding and mast production declines. On the other hand, beaver dams can potentially be beneficial to some species of fish and wildlife such as river otter, neotropical birds, and waterfowl.

If a beaver dam is not breached and water is allowed to stand, hydric soils and hydrophytic vegetation eventually form. This process can take anywhere from several months to years depending on pre-existing conditions. Hydric soils are those soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions. In general, hydric soils form much easier where wetlands have preexisted. Hydrophytic vegetation includes those plants that grow in water or on a substrate that is at least periodically deficient in oxygen because of excessive water content. If these conditions are met, then a wetland has developed that would have different wildlife habitat values than an area that has been more recently impounded by beaver dam activity.

The intent of most dam breaching is not to drain established wetlands. With few exceptions, requests from public and private individuals and entities that WS receives involve dam breaching to return an area back to its pre-existing condition within a few years after the dam was created. If the area does not have hydric soils, it usually takes many years for them to develop and a wetland to become established. This often takes greater than five years as recognized by the Swampbuster provisions. Most beaver dam removal by WS is either exempt from regulation under Section 404 of the Clean Water Act (CWA) as stated in 33 CFR Part 323 or may be authorized under the United States Army Corps of Engineers Nationwide Permit System in 33 CFR Part 330.

However, the breaching of some beaver dams can trigger certain portions of Section 404 that require landowners to obtain permits from the United States Army Corps of Engineers. WS personnel determine the proper course of action upon inspecting a beaver dam impoundment.

It should also be noted that beaver created wetlands are dynamic and do not remain in one state for indefinite periods. Large beaver ponds may eventually fill with sediment and create a beaver meadow. Beaver may be removed from an area due to natural predation or they may abandon an area due to lack of food. Once a dam is abandoned, it is subject to natural decay and damage due to weather. The dam would eventually fail and the wetland would return to a flowing stream or brook. WS' beaver management activities may accelerate or modify these natural processes by removing beaver and restoring or increasing water flow; however, they are generally processes that would occur naturally over time.

Muskrat management would usually be intended to maintain or protect existing wetlands by reducing threats to natural and man-made wetlands and associated floral, faunal and T&E communities. Wetlands are often created by natural or man-made dams, dikes, levees and berms that contain standing water or control drainage, particularly after precipitation events that could result in flooding. Muskrat burrowing activity can degrade the integrity of these structures by allowing water infiltration or by causing erosion by feeding on vegetation intended to stabilize dirt structures. Muskrats are omnivores and feed on a variety of aquatic and terrestrial plants and aquatic animals. At high population densities, they may disrupt or damage natural wetland floral and faunal communities or they may feed on T&E species. WS activities would be intended to protect existing wetlands from damage caused by muskrats.

Therefore, the activities of WS to manage beaver would not be expected to have any cumulative adverse effects on the status of wetlands in New Hampshire if occurring at the request of a property owner and/or manager.

XIX. SUMMARY OF CUMULATIVE IMPACTS

No significant cumulative environmental impacts are expected from activities considered under the supplement to the EA. Likewise, no significant cumulative impacts have been identified from the implementation of the proposed action in the EA since FY 2005. Under the proposed action alternative, the reduction of wildlife damage or threats using an integrated approach employing both non-lethal and lethal methods would not have significant impacts on wildlife populations in New Hampshire or nationwide. WS continues to coordinate activities with federal, state, and local entities to ensure activities do not adversely affect wildlife populations. No risk to public safety is expected when WS' activities are conducted pursuant to the proposed action or the proposed supplement to the EA. The EA further describes and addresses cumulative impacts from the alternatives, including the proposed action.

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APPENDIX A
FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES IN NEW HAMPSHIRE

Animal species listed in this state and that occur in this state

Status	Species
E	Butterfly, Karner blue (*Lycaeides melissa samuelis*)
T	Lynx, Canada (Contiguous U.S. DPS) (*Lynx Canadensis*)
T	Plover, piping except Great Lakes watershed (*Charadrius melodus*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, finback (*Balaenoptera physalus*)

Animal species listed in this state that do not occur in this state

Status	Species
E	Beetle, American burying (*Nicrophorus americanus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
T	Tiger beetle, Puritan (*Cicindela puritana*)
E	Wolf, gray Lower 48 States, except where delisted and where EXPN. Mexico. (*Canis lupus*)

Animal listed species occurring in this state that are not listed in this state

Status	Species
T	Sea turtle, green except where endangered (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Tern, roseate northeast U.S. nesting pop. (*Sterna dougallii dougallii*)

Plant species listed in this state and that occur in this state

Status	Species
E	Bulrush, Northeastern (*Scirpus ancistrochaetus*)
E	Milk-vetch, Jessup's (*Astragalus robbinsil var. jesupi*)
T	Pogonia, small whorled (*Isotria medeoloides*)

APPENDIX B
SPECIES THAT ARE STATE LISTED AS THREATENED, ENDANGERED, OR OF SPECIAL CONCERN IN THE STATE OF NEW HAMPSHIRE

Common Name	Scientific Name	NH Status	Federal Status
VERTEBRATES[a]:			
Fish			
American Brook Lamprey	*Lampetra appendix*	E	
Shortnose Sturgeon	*Acipenser brevirostrum*	E	E
Alewife (sea run only)	*Alosa psuedoharengus*	SC	
American Eel	*Anguilla rostrata*	SC	
American Shad	*Alosa sapidissima*	SC	
Bridle Shiner	*Notropis bifrenatus*	T	
Northern Redbelly Dace	*Phoxinus eos*	SC	
Blueback Herring	*Alosa psuedoharengus*	SC	
Rainbow Smelt (sea run only)	*Osmerus mordax*	SC	
Sea Lamprey	*Petromyzon marinus*	SC	
Banded Sunfish	*Enneacanthus obesus*	SC	
Finescale Dace	*Phoxinus neogaeus*	SC	
Lake Whitefish	*Coregonus clupeaformis*	SC	
Redfin Pickeral	*Esox americanus americanus*	SC	
Round Whitefish	*Prosopium cylindraceum*	SC	
Swamp Darter	*Etheostoma fusiforme*	SC	
Amphibians			
Jefferson Salamander	*Ambystoma jeffersonianum*	SC	
Blue-Spotted Salamander	*Ambystoma laterale*	SC	
Marbled Salamander	*Ambystoma opacum*	E	
Fowler's Toad	*Anaxyrus fowleri (formerly Bufo)*	SC	
Northern Leopard Frog	*Lithobates pipiens (formerly Rana)*	SC	
Reptiles			
Spotted Turtle	*Clemmys guttata*	T	
Black Racer	*Coluber constrictor*	T	
Smooth Green Snake	*Opheodrys vernalis*	SC	
Wood Turtle	*Glyptemys insculpta*	SC	
Blanding's Turtle	*Emydoidea blandingii*	E	
Eastern Hognose Snake	*Heterodon platirhinos*	E	
Eastern Box Turtle	*Terrapene carolina*	SC	
Timber Rattlesnake	*Crotalus horridus*	E	
Birds			
Common Loon	*Gavia immer*	T	
Pied-Billed Grebe	*Podilymbus podiceps*	T	
Golden Eagle	*Aquila chrysaetos*	E	
Common Nighthawk	*Chordeiles minor*	E	
Upland Sandpiper	*Bartramia longicauda*	E	
Spruce Grouse	*Falcipennis canadensis*	SC	
Least Bittern	*Ixobrychus exilis*	SC	
Bald Eagle	*Haliaeetus leucocephalus*	T	

Northern Harrier	*Circus cyaneus*	E	
Osprey	*Pandion haliaetus*	SC	
Peregrine Falcon	*Falco peregrinus*	T	
American Kestrel	*Flco sparverius*	SC	
Common Moorhen	*Gallinula chloropus*	SC	
Sora	*Porzana carolina*	SC	
Piping Plover	*Charadrius melodus*	E	T
Willet	*Tringa semipalmata*	SC	
Roseate Tern	*Sterna dougallii*	E	E
Common Tern	*Sterna hirundo*	T	
Arctic Tern	*Sterna paradisaea*	SC	
Least Tern	*Sternula antillarum*	E	
Whip-poor-will	*Caprimulugus vociferus*	SC	
Olive-sided Flycatcher	*Contopus cooperi*	SC	
Horned Lark	*Eremophila alpestris*	SC	
Sedge Wren	*Cistothorus platensis*	E	
Golden-Winged Warbler	*Vermivora chrysoptera*	SC	
Cerulean Warbler	*Dendroica cerulea*	SC	
Purple Martin	*Progne subis*	SC	
Bank Swallow	*Riparia riparia*	SC	
Cliff Swallow	*Petrochelidon pyrrhonota*	SC	
Bicknell's Thrush	*Catharus bicknelli*	SC	
American Pipit	*Anthus rubescens*	SC	
Grasshopper Sparrow	*Ammodramus savannarum*	T	
Vesper Sparrow	*Pooecetes gramineus*	SC	
Nelson's Sharp-tailed Sparrow	*Ammodramus nelsoni*	SC	
Saltmarsh Sharp-tailed Sparrow	*Ammodramus caudacutus*	SC	
Seaside Sparrow	*Ammodramus maritimus*	SC	
American Three-toed Woodpecker	*Picoides dorsalis*	T	
Eastern Meadowlark	*Sturnella magna*	SC	
Rusty Blackbird	*Euphagus carolinus*	SC	
Mammals			
New England Cottontail	*Sylvilagus transitionalis*	E	
Canada Lynx	*Lynx canadensis*	E	T
Gray Wolf	*Canis lupus*	E	T
American Martin	*Martes americana*	T	
Eastern Red Bat	*Lasiurus borealis*		
Hoary Bat	*Lasiurus cinereus*		
Silver-haired Bat	*Lasionycteris noctivagans*		
Northern long-ear bat	*Myotis septentrionalis*		
Eastern Pipistrelle changed to Tricolored Bat	*Pipistrellus subfalvus* changed to *Perrimyotis subflavus*		
Small-Footed Bat	*Myotis leibii*	E	
Northern Bog Lemming	*Synaptomys borealis sphagnicolai*	SC	

INVERTEBRATES[a]:

Mussels			
Dwarf Wedge Mussel	*Alasmidonta heterodon*	E	E
Brook Floater Mussel	*Alasmidontavaricosa*	E	
Eastern Pondmussel	*Ligmia nasuta*	SC	
Insects			
Ringed Boghaunter	*Williamsonia lintneri*	E	
Ebony Boghaunter	*Williamsoniafletcheri*	SC	
Coppery Emerald	*Somatochlora geogiana*	SC	
Rapids Clubtail	*Gomphus quadricolor*	SC	
Skillet Clubtail	*Gomphus ventricosus*	SC	
Riverine Clubtail	*Stylurus amnicola*	SC	
Scarlet Bluet	*Enallagma pictum*	SC	
Pine Barrens Bluet	*Enallagma recurvatum*	SC	
Cobblestone Tiger Beetle	*Cicindela marginipennis*	E	
Puritan Tiger Beetle	*Cicindela puritana*	E	T
Frosted Elfin Butterfly	*Callophrys irus*	E	
Karner Blue Butterfly	*Lycaeides melissa samuelis*	E	E
Pine Pinion Moth	*Lithophane lepida lepida*	T	
Phyllira Tiger Moth	*Grammia phyllira*	SC	
Cora Moth (Bird Dropping Moth)	*Cerma cora*	SC	
Pine Barrens Zanclognatha Moth	*Zanclognatha martha*	SC	
White Mountain Arctic	*Oeneis Melissa semidea*	T	
White Mountain Fritillary	*Boloria titania montinus*	E	
Persius duskywing Skipper	*Erynnis persius*	E	
Sleepy Duskywing	*Erynnis brizo brizo*	SC	
Barrens itame	*Itame sp. 1*	SC	
Barrens xylotype	*Xylotype capax*	SC	
Broad-lined catopyrrha	*Erastria coloraria*	SC	

PLANTS[a,b]:

Common Name	**Scientific Name**	**NH Status**	**Federal Status**
Anemone, Long-fruited	*Anemone cylindrica*	E	
Anemone, Rue	*Thalictrum thalictroides*	E	
Arethusa	*Arethusa bulbos*	E	
Arnica, Hairy	*Arnica lanceolat*	T	
Arrowhead, Sessile-fruited	*Sagittaria rigida*	E	
Arrowhead, Spongy-leaved	*Sagittaria montevidensis ssp. spongiosa*	E[c]	
Arrowwood, Downy	*Viburnum rafinesquianum*	E	
Ash, Northern Prickly	*Zanthoxylum americanum*	E	
Asphodel, Sticky False	*Triantha glutinosa*	E	
Aster, Ciliated	*Symphyotrichum ciliolatum*	T	
Aster, Large Salt Marsh	*Symphyotrichum tenuifolium*	E	
Aster, Skydrop	*Symphyotrichum patens*	T	

Aster, Snowy	*Oligoneuron album*	E	
Aster, White-topped	*Sericocarpus linifolius*	E	
Avens, Mountain	*Geum peckii*	T	
Awlwort	*Subularia aquatica ssp. americana*	E	
Azalea, Alpine	*Kalmia procumbens*	T	
Azalea, Pink	*Rhododendron periclymenoides*	E	
Baked Apple Berry	*Rubus chamaemorus*	T	
Bearberry, Alpine	*Arctous alpina*	E	
Bedstraw, Hairy	*Galium pilosum*	E	
Bedstraw, Large Marsh	*Galium obtusum*	E	
Bedstraw, Limestone Swamp	*Galium brevipes*	E[c]	
Beggarticks, Northern Estuarine	*Bidens hyperborea*	E[c]	
Bellwort, Large-flowered	*Uvularia grandiflora*	E	
Bellwort, Perfoliate	*Uvularia perfoliata*	E	
Bidens, Smooth	*Bidens laevis*	E	
Bilberry, Dwarf	*Vaccinium cespitosum*	T	
Bindweed, Low	*Calystegia spithamaea*	E	
Birch, Dwarf	*Betula glandulosa*	T	
Birch, River	*Betula nigra*	T	
Birch, Small	*Betula minor*	T	
Birch, Swamp	*Betula pumila*	E	
Blackberry, Wedge Sand	*Rubus cuneifolius*	E	
Bladdernut	*Staphylea trifolia*	T	
Bladderwort, Reversed	*Utricularia resupinata*	E	
Blazing Star, Northern	*Liatris novae-angliae*	E	
Blueberry, Alpine	*Vaccinium boreale*	T	
Bluegrass, Wavy	*Poa laxa ssp. fernaldiana*	E	
Bluegrass, White	*Poa glauca*	E	
Bluejoint, Harsh	*Calamagrostis canadensis var. langsdorfii*	E	
Bluets, Long-leaved	*Houstonia longifolia*	E	
Boneset, Hairy	*Eupatorium pubescens*	E	
Boneset, Upland	*Eupatorium sessilifolium*	E	
Bulrush, Dwarf	*Lipocarpha micrantha*	E	
Bulrush, Georgia	*Scirpus georgianus*	E	
Bulrush, Leafy	*Scirpus polyphyllus*	E	
Bulrush, Lined	*Scirpus pendulus*	E	
Bulrush, Long's	*Scirpus longii*	E	
Bulrush, Northeastern	*Scirpus ancistrochaetus*	E	E
Bur-reed, Branching	*Sparganium androcladum*	E	
Bur-reed, Large	*Sparganium eurycarpum*	T	
Bur-reed, Small	*Sparganium natans*	T[c]	

Bush-clover, Slender	*Lespedeza virginica*	E	
Bush-clover, Trailing	*Lespedeza procumbens*	E	
Buttercup, Early	*Ranunculus fascicularis*	E	
Butterfly Weed	*Asclepias tuberosa*	E	
Butterwort, Common	*Pinguicula vulgaris*	E	
Campion, Moss	*Silene acaulis)*	E	
Campion, Wild	*Silene caroliniana ssp. pensylvanica*	E[c]	
Chickweed, Smooth-forked	*Paronychia canadensis*	E	
Chives, Siberian	*Allium schoenoprasum*	E	
Cicely, Mountain Sweet	*Osmorhiza berteroi*	E	
Cinquefoil, Dwarf	*Potentilla robbinsiana*	E	
Cinquefoil, Pennsylvania	*Potentilla litoralis*	E[c]	
Clematis, Purple	*Clematis occidentalis*	E	
Cliffbrake, Purple	*Pellaea atropurpurea*	E	
Cliffbrake, Slender	*Cryptogramma stelleri*	E	
Clubmoss, Sitka	*Diphasiastrum sitchense*	E	
Clubmoss, Slender Bog	*Lycopodiella appressa*	E	
Clubsedge, Bashful	*Trichophorum planifolium*	E[c]	
Colic-root, White	*Aletris farinosa*	E[c]	
Coltsfoot, Sweet	*Petasites frigidus var. palmatus*	E	
Comandra, Northern	*Geocaulon lividum*	E	
Comfrey, Wild	*Cynoglossum virginianum var. boreale*	E	
Coralroot, Autumn	*Corallorhiza odontorhiza*	E	
Corydalis, Golden	*Corydalis aurea*	E	
Cotton-grass, Narrow-leaved	*Eriophorum angustifolium*	E	
Cowlily, Tiny	*Nuphar microphylla*	E	
Crabgrass, Slender	*Digitaria filiformis var. filiformi*	E	
Crabgrass, Smooth	*Digitaria filiformis var. laeviglumis*	E[c]	
Crane's-bill, Carolina	*Geranium carolinianum*	E	
Cress, Alpine Bitter	*Cardamine bellidifolia*	E	
Cress, American Winter	*Barbarea orthoceras*	E	
Cress, Bulbous Bitter	*Cardamine bulbosa*	E	
Cress, Hairy Rock	*Arabis pycnocarpa*	E	
Cress, Long's Bitter	*Cardamine longii*	E	
Cress, Missouri Rock	*Boechera missouriensis*	T	
Cress, Smooth Rock	*Boechera laevigata*	E	
Cudweed, Mountain	*Omalotheca supina*	E	
Cup, Pale Painted	*Castilleja septentrionalis*	E	
Diapensia	*Diapensia lapponica*	T	
Dock, White	*Rumex pallidus*	E	

Dodder, Buttonbush	*Cuscuta cephalanthi*	--	
Draba, Lance-leaved	*Draba breweri var. cana*	E	
Dragon, Green	*Arisaema dracontium*	E	
Dropseed, Sand	*Sporobolus cryptandrus*	E	
Dropseed, Small	*Sporobolus neglectus*	E	
Duckweed, Pale	*Lemna valdiviana*	E	
Duckweed, Star	*Lemna trisulca*	E	
Elder, Marsh	*Iva frutescens*	T	
Everlasting, Heller's Sweet	*Pseudognaphalium micradenium*	E	
Eyebright, Oakes'	*Euphrasia oakesii*	E	
Featherfoil	*Hottonia inflata*	E	
Fern, Appalachian Filmy	*Trichomanes intricatum*	E	
Fern, Climbing	*Lygodium palmatum*	E	
Fern, Fragrant	*Dryopteris fragrans*	T	
Fern, Male	*Dryopteris filix-mas ssp. brittonii*	E[c]	
Fern, Netted Chain	*Woodwardia areolata*	E	
Fern, Walking	*Asplenium rhizophyllum*	E	
Fescue, Proliferous	*Festuca prolifera*	E	
Fescue, Six Weeks	*Vulpia octoflora var. glauca*	E	
Firmoss, Mountain	*Huperzia appressa*	E	
Firmoss, Northern	*Huperzia selago*	E	
Flag, Slender Blue	*Iris prismatica*	E	
Flax, Grooved Yellow	*Linum sulcatum*	E[c]	
Fleabane, Salt Marsh	*Pluchea odorata var. succulenta*	E	
Foxglove, Downy False	*Aureolaria virginica*	E	
Fumitory, Climbing	*Adlumia fungosa*	E	
Gall-of-the-earth	*Nabalus serpentarius*	E	
Garlic, Wild	*Allium canadense*	E	
Gentian, Fringed	*Gentianopsis crinita*	T	
Gentian, Spurred	*Halenia deflexa*	T	
Gentian, Stiff	*Gentianella quinquefolia*	E	
Gerardia, Salt-marsh	*Agalinis maritima*	E	
Ginseng	*Panax quinquefolius*	T	
Glasswort, Dwarf	*Salicornia bigelovii*	E	
Glasswort, Perennial	*Salicornia ambigua*	E	
Goldenrod, Cutler's	*Solidago leiocarpa*	T	
Goldenrod, Grassleaf	*Euthamia caroliniana*	T	
Goldenrod, Showy	*Solidago speciosa*	E[c]	
Goldenrod, Square-stem	*Solidago patula*	E	
Goldenrod, Sweet	*Solidago odora*	E	
Goosefoot, Coast-blite	*Chenopodium rubrum*	E	

Goosefoot, Fogg's	*Chenopodium foggii*	E	
Grass, Alpine Meadow	*Poa pratensis ssp. alpigena*	E	
Grass, Alpine Sweet	*Anthoxanthum monticola*	T	
Grass, Beach	*Ammophila breviligulata*	T	
Grass, Bristle	*Graphephorum melicoides*	E	
Grass, Coast Barnyard	*Echinochloa walteri*	E[c]	
Grass, Frank's Love	*Eragrostis frankii*	E	
Grass, Hairy Brome	*Bromus pubescens*	E	
Grass, Kalm's Brome	*Bromus kalmii*	E	
Grass, Long-leaved Panic	*Panicum rigidulum var. pubescens*	E	
Grass, Moss Love	*Eragrostis hypnoides*	E	
Grass, Mucronated Blue-eyed	*Sisyrinchium mucronatum*	E	
Grass, Philadelphia Panic	*Panicum philadelphicum ssp. philadelphicum*	E	
Grass, Salt-meadow	*Leptochloa fusca ssp. fascicularis*	E	
Grass, Sand	*Triplasis purpurea*	E	
Grass, Sea Lyme	*Leymus mollis*	E	
Grass, Sea-beach Needle	*Aristida tuberculosa*	E	
Grass, Spherical Panic	*Dichanthelium sphaerocarpon*	E	
Grass, Spiked Needle	*Aristida longespica var. geniculata*	E	
Grass, Tundra Alkali	*Puccinellia pumila*	E	
Grass-of-Parnassus	*Parnassia glauca*	T	
Hairgrass, Mountain	*Vahlodea atropurpurea*	E	
Hawkweed, Robinson's	*Hieracium robinsonii*	E	
Hawkweed, Umbelled	*Hieracium umbellatum*	E[c]	
Hawthorn, Faxon's	*Crataegus faxonii*	--	
Hawthorn, Oakes’	*Crataegus oakesiana*	E[c]	
Hawthorn, Poplar	*Crataegus populnea*	--	
Heath, Mountain	*Phyllodoce caerulea*	T	
Heather, Golden	*Hudsonia ericoides*	E	
Hempweed, Climbing	*Mikania scandens*	E	
Horsebalm, Canada	*Collinsonia canadensis*	E	
Horse-gentian, Orange	*Triosteum aurantiacum*	E	
Horsetail, Marsh	*Equisetum palustre*	E	
Huckleberry, Dwarf	*Gaylussacia bigeloviana*	T	
Hudsonia, Hairy	*Hudsonia tomentosa*	T	
Inkberry	*Ilex glabra*	E	
Juniper, Creeping	*Juniperus horizontalis*	E	
Knotweed, Douglas'	*Polygonum douglasii*	T	
Knotweed, Erect	*Polygonum erectum*	E	
Knotweed, Prolific	*Polygonum ramosissimum ssp. prolificum*	E	

Knotweed, Robust	*Persicaria robustior*	E	
Knotweed, Slender	*Polygonum tenue*	E	
Knotweed, Viviparous	*Bistorta vivipara*	E	
Lady's Slipper, Large Yellow	*Cypripedium parviflorum var. pubescens*	T	
Lilaeopsis, Eastern	*Lilaeopsis chinensis*	E	
Lily, Turk's Cap	*Lilium superbum*	E	
Lobelia, Great	*Lobelia siphilitica*	E[c]	
Lobelia, Kalm's	*Lobelia kalmii*	T	
Loosestrife, Tufted	*Lysimachia thyrsiflora*	T	
Lupine, Wild	*Lupinus perennis*	T	
Mallow, Seaside	*Hibiscus moscheutos*	E	
Mannagrass, Eastern Floating	*Glyceria septentrionalis*	E[c]	
Mannagrass, Sharp-flowered	*Glyceria acutiflora*	E	
Maple, Black	*Acer nigrum*	T	
Marigold, Water	*Bidens beckii*	T	
Meadow-rue, Waxy-leaf	*Thalictrum revolutum*	--	
Mercury, Virginia Three-seeded	*Acalypha virginica*	E	
Mermaidweed	*Proserpinaca pectinata*	E	
Milk-vetch, Alpine	*Astragalus alpinus var. brunetianus*	--	
Milkweed, Blunt-leaved	*Asclepias amplexicaulis*	T	
Milkweed, Four-leaved	*Asclepias quadrifolia*	E	
Milkweed, Purple	*Asclepias purpurascens*	E	
Mint, Hoary Mountain	*Pycnanthemum incanum*	E	
Mint, Torry's Mountain	*Pycnanthemum torrei*	E	
Mint, Virginian Mountain	*Pycnanthemum virginianum*	E	
Moss, Peat	*Sphagnum andersonianum*	T	
Moss, Peat	*Sphagnum angermanicum*	E	
Moss, Peat	*Sphagnum brevifolium*	E	
Moss, Peat	*Sphagnum contortum*	T	
Moss, Peat	*Sphagnum flavicomans*	E	
Moss, Peat	*Sphagnum lindbergii*	E	
Moss, Peat	*Sphagnum majus ssp. norvegicum*	T	
Moss, Peat	*Sphagnum pylaesii*	T	
Moss, Peat	*Sphagnum riparium*	T	
Moss, Peat	*Sphagnum subfulvum*	E	
Moss, Peat	*Sphagnum wulfianum*	T	
Moss-plant	*Harrimanella hypnoides*	E	
Mouth, Green Adder's	*Malaxis unifolia*	T	
Mouth, White Adder's	*Malaxis monophyllos ssp. Brachypoda*	E	
Mudwort	*Limosella australis*	E	

Muhlenbergia, Slender-flowered	*Muhlenbergia tenuiflora*	E	
Muhlenbergia, Sprout	*Muhlenbergia sobolifera*	E	
Muskflower	*Mimulus moschatus*	E	
Northern Reedgrass, New England	*Calamagrostis stricta ssp. inexpansa*	T	
Nutsedge, Few-flowered	*Scleria pauciflora var. pauciflora*	E	
Nutsedge, Netted	*Scleria reticularis*	E	
Oak, Mossy-cup	*Quercus macrocarpa*	E	
Orchid, Pale Green	*Platanthera flava var. herbiola*	E	
Orchid, Three-birds	*Triphora trianthophora*	T	
Orchis, One-leaf	*Amerorchis rotundifolia*	E	
Orchis, Showy	*Galearis spectabilis*	T	
Oyster Plant	*Mertensia maritima*	--	
Painted-cup, Scarlet	*Castilleja coccinea*	--	
Parilla, Yellow	*Menispermum canadense*	E	
Pearlwort, Greater	*Sagina nodosa ssp. borealis*	E	
Pimpernel, False	*Lindernia dubia var. anagallidea*	E	
Pimpernel, False Water	*Samolus valerandi ssp. parviflorus*	E	
Pine, Jack	*Pinus banksiana*	T	
Pinedrops, Giant	*Pterospora andromedea*	E	
Pinweed, Slender	*Lechea tenuifolia*	E	
Pogonia, Large Whorled	*Isotria verticillata*	E	
Pogonia, Small Whorled	*Isotria medeoloides*	T	T
Polygala, Cross	*Polygala cruciata var. aquilonia*	E	
Pondweed, Bluntleaf	*Potamogeton obtusifolius*	E	
Pondweed, Budding	*Potamogeton gemmiparus*	E	
Pondweed, Flatstem	*Potamogeton zosteriformis*	E	
Pondweed, Horned	*Zannichellia palustris*	E	
Pondweed, Knotty	*Potamogeton nodosus*	T	
Pondweed, Leafy	*Potamogeton foliosus*	E	
Pondweed, Northern Slender	*Stuckenia filiformis*	E	
Pondweed, Richardson's	*Potamogeton richardsonii*	--	
Pondweed, Sago	*Stuckenia pectinata*	E	
Pondweed, Thin-leaved Alpine	*Potamogeton alpinus*	E	
Pondweed, Vasey's	*Potamogeton vaseyi*	E	
Pondweed, White-stem	*Potamogeton praelongus*	E	
Pygmy Weed	*Crassula aquatica*	E	
Quillwort, Acadian	*Isoetes acadiensis*	E[c]	
Quillwort, Engelmann's	*Isoetes engelmannii*	E	
Quillwort, Large-spored	*Isoetes lacustris*	E	
Quillwort, River Bank	*Isoetes riparia var. canadensis*	E	
Ragwort, Dwarf	*Packera paupercula*	T	

Ragwort, Round-leaved	*Packera obovata*	E	
Rattle, Yellow	*Rhinanthus minor sp. groenlandicus*	E	
Rattlebox, Arrow-headed	*Crotalaria sagittalis*	E	
Reedgrass, Neglected	*Calamagrostis stricta ssp. stricta*	E	
Reedgrass, Nuttall's	*Calamagrostis cinnoides*	E	
Rhododendron, Giant	*Rhododendron maximum*	T	
Rice, Canadian Mountain	*Piptatherum canadense*	E	
Root, Boott's Rattlesnake	*Nabalus boottii*	E	
Rose, Prickly	*Rosa acicularis ssp. sayi*	E	
Rosebay, Lapland	*Rhododendron lapponicum*	E	
Rue, Goat's	*Tephrosia virginiana*	E	
Rush, Alpine	*Juncus alpinoarticulatus ssp. americanus*	E	
Rush, Flat-leaved	*Juncus dichotomus*	E	
Rush, Moor	*Juncus stygius ssp. americanus*	E	
Rush, One-sided	*Juncus secundus*	E	
Rush, Short-fruited	*Juncus brachycephalus*	E	
Rye, Macgregor's Wild	*Elymus macgregorii*	E[c]	
Sagittaria, Quill-leaved	*Sagittaria teres*	E	
Saltbush, Saline	*Atriplex subspicata*	E[c]	
Sandbur, Common	*Cenchrus longispinus*	E	
Sandwort, Rock	*Minuartia michauxii*	E	
Sandwort, Smooth	*Minuartia glabra*	E	
Sanicle, Beaked	*Sanicula trifoliata*	T	
Sanicle, Cluster	*Sanicula odorata*	E	
Sanicle, Short-styled	*Sanicula canadensis*	E	
Saxifrage, Alpine Brook	*Saxifraga rivularis*	E	
Saxifrage, Livelong	*Saxifraga paniculata ssp. neogaea*	E	
Saxifrage, Nodding	*Saxifraga cernua*	E	
Sclerolepis	*Sclerolepis uniflora*	E	
Screwstem, Purple	*Bartonia iodandra*	E[c]	
Screwstem, Twining	*Bartonia paniculata*	E[c]	
Seablite, Horned	*Suaeda calceoliformis*	T[c]	
Seablite, Rich's	*Suaeda maritima ssp. richii*	E[c]	
Sea-chickweed	*Honckenya peploides ssp. robusta*	--	
Sedge, Back's	*Carex backii*	E	
Sedge, Bailey's	*Carex baileyi*	T	
Sedge, Bigelow's	*Carex bigelowii*	T	
Sedge, Black	*Carex atratiformis*	E	
Sedge, Broad-winged	*Carex alata*	E[c]	
Sedge, Bur	*Carex sparganioides*	E	
Sedge, Buxbaum's	*Carex buxbaumii*	E	

Sedge, Chestnut	*Carex castanea*	E	
Sedge, Coastal	*Carex exilis*	E	
Sedge, Creeping	*Carex chordorrhiza*	E	
Sedge, Ebony	*Carex eburnea*	E	
Sedge, Fescue	*Carex festucacea*	E[c]	
Sedge, Flaccid	*Carex glaucodea*	E	
Sedge, Garber's	*Carex garberi*	T	
Sedge, Golden-fruited	*Carex aurea*	T	
Sedge, Goodenough's	*Carex nigra*	E	
Sedge, Granular	*Carex granularis*	E	
Sedge, Gray's Umbrella	*Cyperus grayi*	E	
Sedge, Hair-like	*Carex capillaris ssp. fuscidula*	E	
Sedge, Hairy-fruited	*Carex trichocarpa*	E	
Sedge, Hay	*Carex siccata*	E	
Sedge, Head-like	*Carex arctogena*	E	
Sedge, Hidden	*Carex umbellata*	E	
Sedge, Hitchcock's	*Carex hitchcockiana*	E	
Sedge, Houghton's Umbrella	*Cyperus houghtonii*	E	
Sedge, Incurved Umbrella	*Cyperus squarrosus*	E	
Sedge, Inflated	*Carex bullata*	E	
Sedge, Lesser Panicled	*Carex diandra*	T	
Sedge, Livid	*Carex livida*	E	
Sedge, Many Forms	*Carex polymorpha*	E	
Sedge, Needle Beak	*Rhynchospora capillacea*	E	
Sedge, Piled-up	*Carex cumulata*	T	
Sedge, Reflexed	*Carex retroflexa*	E	
Sedge, Rigid	*Carex tetanica*	--	
Sedge, Scirpus-like	*Carex scirpoidea*	T	
Sedge, Separated	*Carex seorsa*	E	
Sedge, Sheldon's	*Carex albursina*	E	
Sedge, Small-crested	*Carex cristatella*	E	
Sedge, Summer	*Carex aestivalis*	E	
Sedge, Swarthy	*Carex adusta*	E[c]	
Sedge, Swollen-beaked	*Carex rostrata*	E	
Sedge, Thin-flowered	*Carex tenuiflora*	E	
Sedge, Thin-leaved	*Carex cephaloidea*	T[c]	
Sedge, Troublesome	*Carex molesta*	E[c]	
Sedge, Walter's	*Carex striata*	E	
Sedge, Wiegand's	*Carex wiegandii*	E	
Senna, Wild	*Senna hebecarpa*	E	
Senna, Wild Sensitive	*Chamaecrista nictitans*	E	

Sibbaldia	*Sibbaldia procumbens*	E	
Sickle-pod	*Boechera canadensis*	T	
Silverling	*Paronychia argyrocoma*	T	
Silverweed	*Argentina anserine*	--	
Slipper, Fairy	*Calypso bulbosa var. americana*	E	
Slipper, Ram's-head Lady's	*Cypripedium arietinum*	E	
Slipper, Showy Lady's	*Cypripedium reginae*	E	
Slipper, Yellow Lady's	*Cypripedium parviflorum var. makasin*	E	
Sorrel, Mountain	*Oxyria digyna*	E	
Spearwort, Water-plantain	*Ranunculus ambigens*	E	
Speedwell, Alpine	*Veronica wormskjoldii*	E	
Sphenopholis, Blunt	*Sphenopholis obtusata*	E	
Spike-rush, Bald	*Eleocharis erythropoda*	E	
Spike-rush, Few-flowered	*Eleocharis quinqueflora ssp. fernaldii*	E	
Spike-rush, Matted	*Eleocharis intermedia*	E	
Spike-rush, Neat	*Eleocharis nitida*	E	
Spike-rush, Ovoid	*Eleocharis ovata*	E	
Spike-rush, Pease’s Blunt	*Eleocharis obtusa var. peasei*	--	
Spike-rush, Salt-loving	*Eleocharis uniglumis*	T	
Spike-rush, Small	*Eleocharis parvula*	T	
Spike-rush, Tubercled	*Eleocharis tuberculosa*	E	
Spike-rush, Wright's	*Eleocharis diandra*	E	
Spleenwort, Narrow-leaved	*Diplazium pycnocarpon*	E	
Spurge, Seaside	*Euphorbia polygonifolia*	--	
St. John's-Wort, Great	*Hypericum ascyron*	E	
Stargrass, Hairy	*Hypoxis hirsuta*	T	
Stargrass, Water	*Heteranthera dubia*	T	
Stickseed	*Hackelia virginiana*	E	
Stickseed, Nodding	*Hackelia deflexa ssp. americana*	E	
Strawberry, Barren	*Geum fragarioides*	T	
Tail, Common Mare's	*Hippuris vulgaris*	T	
Thistle, Yellow	*Cirsium horridulum*	E	
Thoroughwort, Tubular	*Eutrochium fistulosum*	E	
Timothy, Alpine	*Phleum alpinum*	E	
Tongue, Northern Adder's	*Ophioglossum pusillum*	E	
Toothcup, Lowland	*Rotala ramosior*	E	
Toothwort, Cutleaf	*Cardamine concatenata*	E	
Toothwort, Large	*Cardamine maxima*	T[c]	
Trefoil, Maryland Tick	*Desmodium marilandicum*	E	
Trefoil, Prostrate Tick	*Desmodium rotundifolium*	T	

Trefoil, Stiff Tick	*Desmodium obtusum*	E	
Trefoil, Toothed Tick	*Desmodium cuspidatum*	E	
Tresses, Case's Ladies'	*Spiranthes casei*	E	
Tresses, Shining Ladies'	*Spiranthes lucida*	E	
Twayblade, Auricled	*Listera auriculata*	E	
Twayblade, Heart-leaved	*Listera cordata*	T	
Twayblade, Lily-leaved	*Listera convallarioides*	T	
Twayblade, Loesel's	*Liparis loeselii*	T	
Umbrella-sedge	*Cyperus erythrorhizos*	E[c]	
Valerian, Marsh	*Valeriana uliginosa*	E	
Vetch, Jesup's Milk	*Astragalus robbinsii var. jesupii*	E	E
Violet, Alpine Marsh	*Viola palustris*	T	
Violet, Bird's-foot	*Viola pedata*	T	
Violet, Kidney-leaved	*Viola nephrophylla*	E	
Violet, Palmate	*Viola palmata*	E[c]	
Wapato	*Sagittaria cuneata*	E	
Waterleaf, Northern	*Hydrophyllum virginianum*	T	
Waterwort, American	*Elatine americana*	E[c]	
Willow, Bearberry	*Salix uva-ursi*	T	
Willow, Dwarf	*Salix herbacea*	E	
Willow, Sandbar	*Salix exigua ssp. interior*	E	
Willow, Satin	*Salix pellita*	E	
Willow, Silver	*Salix argyrocarpa*	E	
Willow, Tea-leaved	*Salix planifolia*	T	
Willowherb, Alpine	*Epilobium anagallidifolium*	E	
Willowherb, Hornemann's	*Epilobium hornemannii*	T	
Willowherb, White-flower	*Epilobium lactiflorum*	E	
Wintergreen, Pink	*Pyrola asarifolia*	E	
Woodrush, Northern	*Luzula confusa*	E	
Woodrush, Spiked	*Luzula spicata*	E	
Woodsia, Blunt-lobed	*Woodsia obtusa*	E	
Woodsia, Smooth	*Woodsia glabella*	E	
Wormwood, Tall	*Artemisia campestris ssp. caudata*	E	

[a]Information provided by the New Hampshire Fish and Game Department.
[b]Information provided by the New Hampshire Division of Forest and Lands, New Hampshire Natural Heritage Bureau.
[c]Newly listed species since 2005.

Appendix C
CRITERIA FOR BEAVER DAM BREACHING/REMOVAL

Wetlands are recognized by three characteristics: hydric soils, hydrophytic vegetation, and general hydrology. Hydric soils are either entirely composed of, or have a thick surface layer of decomposed plant materials; sandy soils have dark stains or streaks from organic material in the upper layer where plant material has attached to soil particles. In addition, hydric soils may be bluish gray or gray below the surface or brownish black to black and have the smell of rotten eggs. Wetlands also have hydrophytic vegetation such as cattails, bulrushes, willows, sedges, and water plantains. The final indicator is general hydrology which includes standing and flowing water or waterlogged soils during the growing season; high water marks are present on trees and drift lines of small piles of debris are usually present. Beaver dams usually will develop a layer of organic material at the surface because siltation can occur rapidly, but aquatic vegetation and high water marks (a new high water mark is created by the beaver dam) are usually not present. However, cattails and willows can show up rapidly if they are in the vicinity, but most hydrophytic vegetation takes time to establish.

When a dam is removed, debris is discharged into the water. The debris that ends up in the water is considered "incidental fallback" or discharge fill. However, in most beaver dam removal operations, the material that is displaced, if considered to be discharge, is exempt from permit requirements under 33 CFR 323 or 330. A permit would be required if the impoundment caused by a beaver dam was considered a true wetland. WS personnel survey the beaver dam site and impoundment and determine whether conditions exist suggesting that the area may be a wetland as defined above. If such conditions exist, the landowner is asked the age of the dam or how long he/she has known of its presence to determine whether Swampbuster, Section 404 permit exemptions or NWPs allow removal of the dam. If not, the landowner is required to obtain a Section 404 permit before the dam will be removed by WS personnel.

The following information explains Section 404 exemptions and conditions that pertain to the removal of beaver dams.

33 CFR 323 – Permits For Discharges of Dredged or Fill Material into Waters of the United States. This regulation provides guidance to determine whether certain activities require permits under Section 404.

> **Part 323.4 Discharges not requiring permits.** This section establishes exemptions for discharging certain types of fill into waters of the United States without a permit. Certain minor drainage activities connected with normal farming, ranching, and silviculture activities where they have been established do not require a permit as long as these drainages do not include the immediate or gradual conversion of a wetland (i.e. beaver ponds greater than 5 years old) to a non-wetland. Specifically part (a)(1)(iii)(C)(i) states, *"…fill material incidental to connecting upland drainage facilities* [*e.g.*, drainage ditches] *to waters of the United States, adequate to effect the removal of excess soil moisture from upland croplands…"*. This indicates that beaver dams that block ditches, canals, or other structures designed to drain water from upland crop fields can be removed without a permit.
>
> Moreover, part (a)(1)(iii)(C)(iv) states the following types of activities do not require a permit "*The discharges of dredged or fill materials incidental to the emergency removal of sandbars, gravel bars, or other similar blockages which are formed during flood flow or other events, where such blockages close or constrict previously existing drainageways and, if not promptly removed, would result in damage to or loss of existing crops or would impair or prevent the plowing, seeding, harvesting or cultivating of crops in land in established use for crop*

production. Such removal does not include enlarging or extending the dimensions of, or changing the bottom elevations of, the affected drainageway as it existed prior to the formation of the blockage. Removal must be accomplished within one year of discovery of such blockages in order to be eligible for exemption." This allows the removal of beaver dams in natural streams to restore drainage of agricultural lands within one year of discovery.

Part 323.4(a)(2) allows "*Maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures. Maintenance does not include any modification that changes the character, scope, or size of the original fill design. Emergency reconstruction must occur within a reasonable period of time after damage occurs in order to qualify for this exemption."* This allows beaver dams to be removed without a permit where they have resulted in damage to roads, culverts, bridges, or levees if it is done in a reasonable amount of time.

New Hampshire regulates discharges into the waters of the state through the NHDES and grants exemptions from permitting for discharges based on guidelines and exemptions provided by the Army Corps of Engineers. NHDES does not consider removal of beaver dams by WS in the state to require permits in those situations exempted by the Corps (Dale Keirstead_,NHDES Wetlands Bureau, pers. comm. 2012). In New Hampshire according state regulations a permit is not required to remove beaver dams if they are removed by hand or machinery does not enter the water and filling or dredging in or adjacent to surface water, wetlands, or their banks does not occur (NHFG RSA 482-A, NHDES Env-Wt 303.05). Removal shall be done in a gradual manner that does not allow a sudden release of impounded water so as to cause erosion, siltation, or a safety hazard downstream.

33 CFR 330 – Nationwide Permit (NWP) Program: The Corps Chief of Engineers is authorized to grant certain dredge and fill activities on a nationwide basis if they have minimal impact on the environment. The NWPs are listed in Appendix A of 33 CFR 330 and permittees must satisfy all terms and conditions established in order to qualify for their use. Individual beaver dam removal activities by WS may be covered by any of the following NWPs if not already exempted from permit requirements by the regulations discussed above. WS complies with all conditions and restrictions placed on NWPs for any instance of beaver dam removal done under a specific NWP.

The Corps reevaluated its NWP during 2001-02 and presented revised guidelines in 2002 (USACE, 2002). Based on those guidelines, NWPs can be used **except** in any component of the National Wild and Scenic River System (16 U.S.C. §§ 1271-1287 as amended) such as the designated reaches of the Obed River in Tennessee and any other rivers or reaches and their corridors in Tennessee which have been designated as part of the Wild Rivers system authorized by The Tennessee Scenic Rivers Act. Any beaver dam removal in these designated areas which might be contemplated by WS may require consultation with the Corps and TDEC to obtain permits for any such activities.

NWP 3 authorizes the rehabilitation of those structures, such as culverts, homes, and bridges, destroyed by floods and "discrete events" such as beaver dams provided that the activity is commenced within 2 years of the date when the beaver dam was established.

NWP 18 allows minor discharges of dredged and fill material, including the removal of beaver dams, into all waters of the United States provided that the quantity of discharge and the volume of excavated area does not exceed 25 cubic yards below the plane of the ordinary high water mark (this is normally well below the level of the beaver dam) and will not cause the loss of more than $1/10^{th}$ acre of special aquatic site including wetlands. The District Engineer must be "notified" (general conditions for notification apply), if the discharge is between 10 and 25 cubic

yards for a single project if the project is in a special aquatic site, including wetlands. Beaver dams rarely would exceed 2 or 3 cubic yards of backfill into the waters and probably no more than 5 cubic yards would ever be exceeded. Therefore, this stipulation is not restrictive. Beaver dams periodically may be removed in a special aquatic area, but in most instances the aquatic site will be returned to normal. However, if a true wetland exists, and beaver dam removal is not allowed under another permit, then a permit may be obtained from the District Engineer.

NWP 27 provides for the discharge of dredge and fill for activities associated with the restoration of wetland and riparian areas with certain restrictions. On non-federal public and private lands, the owner must have: a binding agreement with USFWS or NRCS to conduct restoration; a voluntary wetland restoration project documented by NRCS; or notified the District Engineer according to "notification' procedures. On Federal lands, including Corps and USFWS, wetland restoration can take place without any contract or notification. This NWP *"…applies to restoration projects that serve the purpose of restoring "natural" wetland hydrology, vegetation, and function to altered and degraded non-tidal wetlands and "natural" functions of riparian areas. This NWP does not authorize the conversion of natural wetlands to another aquatic use…*" If operating under this permit, the removal of a beaver dam would be allowed as long as it was not a true wetland (i.e., 5 or more years old), and for non-federal public and private lands the appropriate agreement, project documentation, or notification is in place.

A quick response without delays resulting from permitting requirements can be critical to the success of minimizing or preventing damage. Exemptions contained in the above regulations or NWPs provide for the removal of the majority of beaver dams that WS in New Hampshire encounters. The primary determination that must be made by WS personnel is whether a beaver impounded area has become a true wetland or is just a flooded area. The flexibility allowed by these exemptions and NWPs is important for the efficient and effective resolution of many beaver damage problems because damage escalates rapidly in many cases the longer an area remains flooded.