SUPPLEMENT TO THE ENVIRONMENTAL ASSESSMENT: AN INTEGRATED WILDLIFE DAMAGE MANAGEMENT APPROACH FOR THE MANAGEMENT OF WHITE-TAILED DEER DAMAGE IN THE STATE OF NORTH CAROLINA

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

February 2011

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 analyze the potential environmental and social effects of managing damage to agricultural resources, property, natural resources, and threats to human safety caused by white-tailed deer (*Odocoileus virginianus*) in the State of North Carolina (USDA 2005). The EA evaluated the need for white-tailed deer damage management and assessed potential impacts on the human environment of five alternatives to address that need. WS' proposed action in the EA implements an integrated wildlife damage management program in North Carolina to fully address the need for deer damage management while minimizing impacts to the human environment.

II. PURPOSE

The purpose of the EA remains as addressed in section 1.3 of the EA (USDA 2005). This supplement to the EA examines potential environmental impacts of the proposed action alternative as it relates to new information that has become available from public comments, research findings, and data gathering since the issuance of the Decision and Finding of No Significant Impact (FONSI) in 2005 along with new methods that have become available since the Decision for the EA was issued. In addition, this supplement will clearly communicate to the public the analysis of individual and cumulative impacts of the proposed action since 2005 and document the analyses of WS' deer damage management activities in North Carolina since the Decision/FONSI was issued in 2005 to ensure program activities were within the impact parameters analyzed in the EA.

III. NEED FOR ACTION

The need for action to manage damage and threats associated with deer in North Carolina arises from requests for assistance[1] received by WS. A description of the need for action to address threats and damages associated with deer in the State is provided in section 1.4 of the EA along with a brief history of white-tailed deer management in North Carolina (USDA 2005). The need for action addressed in the EA remains applicable to this supplement to the EA. The need for action is based on a need to manage deer damage to agricultural resources, natural resources, and property, including threats to human safety. Requests for assistance received by WS associated with damage to agricultural resources are generally referred to the North Carolina Wildlife Resources Commission (NCWRC).

WS continues to receive requests for both operational assistance and technical assistance from those persons experiencing damage or threats of damage caused by deer in the State. Technical assistance is provided to those persons requesting assistance through the dissemination of handouts and information

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

regarding damage management techniques, methods demonstrations, loaning of equipment, and site visits. Through technical assistance, WS makes recommendations on the appropriate methods available for use that a requestor could employ to resolve damage or reduce threats without WS' direct involvement. Technical assistance as provided by WS to resolve damage or threats associated with deer in the State under the proposed action was discussed in the EA under Section 3.3.2 (USDA 2005).

In addition to technical assistance, WS also provided direct operational assistance in which WS was directly involved with managing damage associated with deer in the State. As directed by the selected alternative, WS continues to apply multiple methods as part of an integrated damage management program to resolve requests for assistance based on WS' Decision Model (Slate et al. 1992, USDA 1997, USDA 2005). As part of an integrated management program, that includes the employment of non-lethal methods, WS employed lethal methods to take deer in the State to alleviate or prevent damage. WS' direct operational assistance was discussed in Section 3.3.3 of the EA (USDA 2005). The procedures used by WS' personnel to determine management strategies or methods applied to specific requests for assistance using WS' Decision Model can be found in Section 3.3.5 of the EA (USDA 2005) and is discussed in detail in WS' programmatic Final Environmental Impact Statement (FEIS; USDA 1997).

Requests for assistance associated with damage or threats of deer are primarily associated with damage and threats to property. Many of those requests are associated with the threats posed by deer at airports and the damage to aircraft that occurs when those aircraft strike deer on runways and taxiways. The civil and military aviation communities have acknowledged that the threat to human 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). In several instances, wildlife-aircraft collisions in the United States have resulted in human fatalities.

Airports provide ideal conditions for feeding and bedding sites for deer due to the large grassy areas adjacent to brushy, forested habitat used as noise barriers. Access to most airport properties is restricted so deer living within airport boundaries are not harvestable during hunting seasons and are insulated from many other human disturbances.

Deer-aircraft strikes can result in loss of human life, result in injury to passengers or people on the ground, and can cause damage or malfunction of aircraft which can lead to damage occurring to aircraft navigational aids or airport facilities. Deer colliding with aircraft during the most vulnerable phases of flight, takeoff or landing, can cause the aircraft to crash or sustain physical damage. Deer are characteristically unpredictable in their initial response to approaching aircraft. Deer may wander onto runway surfaces and may be startled into the path of oncoming aircraft, and at night, they may freeze when caught in the beams of landing lights, resulting in a strike. The majority of deer-aircraft strikes occur at night and in the fall during the breeding season (Dolbeer et al. 2009). Of the deer strikes reported, 32% occurred in October and November (Dolbeer et al. 2009) which coincides with the breeding season of deer. Aircraft strikes involving terrestrial mammals occur primarily during the landing roll of the aircraft and takeoff run (Dolbeer et al. 2009). More aircraft strikes involving mammals result in damage being reported when compared to bird strikes. Approximately, 59% of the aircraft strikes involving mammal species resulted in damage to the aircraft compared to 14% of bird strikes reporting damage to the aircraft (Dolbeer et al. 2009). Deer have been involved in 41% of the reported terrestrial mammal strikes with aircraft in the United States (Dolbeer et al. 2009).

White-tailed deer are a commonly encountered problem at airfields in North Carolina, threatening the safe operation of aircraft at those facilities. Serious consequences are also possible if pilots lose control of the

aircraft while attempting to avert a collision with deer. From 1990 through 2008, there were 782 reported deer-aircraft strikes to civil aircraft in the United States resulting in 206,175 hours in aircraft down time and nearly $30 million in reported repair costs (Dolbeer et al. 2009). From January 1990 through July 2010, there were 30 reported deer-aircraft strikes involving civil aircraft in North Carolina (Federal Aviation Administration 2010). Reporting of wildlife strikes is not mandatory and it is estimated that less than 20% of aircraft strikes are reported (Cleary et al. 2005, Wright and Dolbeer 2005).

Deer-vehicle collisions are a serious concern nationwide because of losses to property and the potential for human injury and death (Conover et al. 1995, Romin and Bissonette 1996, Conover 1997). The economic costs associated with deer-vehicle collisions include vehicle repairs, human injuries and fatalities, and picking up and disposing of deer (Drake et al. 2005). The Insurance Institute for Highway Safety (2005) estimated that 1.5 million deer-vehicle collisions occur annually in the United States causing approximately 150 fatalities and $1.1 billion in damage to property. In 1995, the damage to vehicles associated with vehicles striking deer was estimated at $1,500 per strike in damages (Conover et al. 1995). Damage costs associated with deer collisions in 2009 were estimated at $3,050 which was an increase of 3.4% over the 2008 estimate (State Farm Insurance 2009). An estimated 42,126 deer-vehicle collisions occurred in North Carolina from July 1, 2008 through June 30, 2009 (State Farm Insurance 2009). Based on the average repair costs associated with vehicle strikes estimated at $3,050 in 2009 and the number of strikes that have occurred in the State estimated at 42,126 from July 2008 through June 2009, deer-vehicle collisions resulted in nearly $128.5 million in damage to property in the State.

Often, deer-vehicle collisions in which a deer carcass was not recovered or little vehicle damage occurred go unreported. A Cornell University study estimated that the actual number of deer-vehicle collisions could be as high as six times the reported number (Decker et al. 1990).

Deer have been estimated to cause over $100 million in damages to agricultural productivity in the United States annually (Conover 1997). During a 1987 wildlife damage survey, white-tailed deer were identified as the primary source of wildlife damage by state farm bureaus, wildlife extension specialists, state agricultural agencies, and state wildlife agencies (Conover and Decker 1991). According to information reported in 1994, 67% of all agricultural producers reported problems with deer (Conover 1994).

The primary form of damage caused by deer to agricultural resources and other vegetative resources is from foraging, but can occur from trampling of plants and damage to trees from antler rubbing. In areas where deer densities are high and forage is scarce, deer can cause extensive economic damage to agricultural resources and natural resources from over-browsing. Foraging by deer on agricultural crops can result in improper growth of the plant, can lead to the introduction of diseases, and when excessive browsing occurs, can lead to the death of the plant. Thus, foraging by deer can lead to a reduction in the productivity of the plant and when foraging is extensive, can result in a substantial reduction in yield leading to economic losses to agricultural producers. Yield losses can also occur from foraging directly on the desired seed-producing body of the plant (*e.g.*, ear of corn, soybean pods, fruits).

Hall and Stout (1999) found that foraging by deer significantly reduced the yield of alfalfa and alfalfa-grass mixtures resulting in substantial economic losses. Deer can also selectively forage for the alfalfa in alfalfa-grass mixtures reducing the economic value of the forage (Hall and Stout 1999). Deer have caused economic losses to corn through excessive browsing. In the ten largest corn growing states, Wywialowski (1996) estimated damage to corn caused by deer exceeded $30 million in 1993. Corn is most susceptible to deer damage during the silking-tassling stage of growth which occurs in late June to early July (Hygnstrom et al. 1992). Ears of corn damaged during the silking-tassling stage are not replaced and often become infected with fungus which can reduce yield (Eldredge 1935, Shapiro et al. 1986, Vorst 1986).

IV. FRAMEWORK FOR DEER DAMAGE MANAGEMENT IN NORTH CAROLINA

The management of wildlife species in the State of North Carolina, including white-tailed deer is the responsibility of the NCWRC. WS is the federal authority for the management of wildlife damage. 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 1992). 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. Deer 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 often 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 but could also include a loss in aesthetic value and other situations where the actions of wildlife are no longer tolerable to an individual person.

WS' Objectives

The EA identified two objectives for deer damage management conducted by WS in North Carolina (see section 1.5.1 of the EA). Those objectives were to: (1) respond to requests for assistance with the appropriate action as determined by WS' personnel in the State, applying the WS Decision Model (Slate et al. 1992, USDA 1997, USDA 2005) in consultation with the NCWRC and (2) prevent the take of non-targets during direct operational assistance where WS is directly involved with the deer damage management activities.

Relationship of This Document to Other Environmental Documents

Information from the following documents has been incorporated by reference into the EA and this supplement.

WS' Programmatic Final Environmental Impact Statement: WS has developed a programmatic FEIS that addresses the need for wildlife damage management in the United States (USDA 1997). The FEIS contains detailed discussions of potential impacts to the human environment from wildlife damage management methods used by WS. Pertinent information available in the FEIS has been incorporated by reference into the EA and this supplement to the EA.

Decisions to be Made

Based on agency relationships, Memorandum of Understandings (MOU), and legislative authorities, WS was the lead agency for the EA, and therefore, responsible for the scope, content, and decisions made. The NCWRC is responsible for managing wildlife in the State, including the establishment of population

objectives, enforcement of regulated hunting seasons for deer, and issuance of depredation permits to alleviate damage or threats of damage associated with deer. WS' activities to reduce and/or prevent deer damage in the State would be coordinated with the NCWRC which ensures WS' actions are incorporated into population objectives established by the NCWRC for deer 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 deer damage management to alleviate damage and threats in North Carolina, when requested, 2) should WS continue to implement an integrated wildlife damage management strategy, including technical assistance and direct operational assistance, to meet the need for deer damage management in the State, 3) if not, should WS attempt to implement one of the alternatives to an integrated damage management strategy as described in the EA, and 4) would continuing the proposed action 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.

V. SCOPE OF ANALYSIS

The EA and this supplement to the EA evaluate deer damage management activities in the State of North Carolina. The scope of analysis remains valid as addressed in the EA for those activities to manage damage and threats associated with deer in the State (see Section 1.6 of the EA; USDA 2005). This supplement analyzes activities that have occurred under the proposed action alternative since implementation of activities described in the alternative to ensure those activities were within the parameters evaluated in the EA and to ensure continue implementation of the selected alternative would not adversely affect the human environment.

Actions Analyzed

The EA and this supplement evaluate the need for deer damage management to reduce threats and damage to agricultural resources, natural resources, property, and threats to human safety wherever such management is requested by a cooperator. The EA and this supplement discuss the issues associated with conducting deer damage management in the State 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 threat situation, taking action, evaluating the action, and monitoring results of the actions taken. The published article provides more detail on the processes used in WS' Decision Model. WS' programmatic FEIS (USDA 1997) provides more detail and examples of how the model is used. 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 1997, USDA 2005).

The methods available for use under the alternatives evaluated are provided in Appendix B of the EA (USDA 2005) with additional information on descriptions and use patterns provided in WS' programmatic FEIS (USDA 1997). The alternatives and Appendix B in the EA also discuss how methods would be employed to manage damage and threats associated with deer in the State (USDA 2005). Therefore, the actions evaluated in the EA and this supplement to the EA are the use of those methods available and the employment of those methods by WS to manage or prevent damage and threats associated with deer from occurring when permitted by the NCWRC.

Native American Lands and Tribes

Currently, WS does not have a MOU or signed cooperative service agreements with any Native American

tribe in North Carolina. If WS enters into an agreement with a tribe for wildlife damage management on tribal property, the EA would be reviewed and supplemented, if appropriate, to insure compliance with the National Environmental Policy Act (NEPA).

Period for which the EA is Valid

If the analyses in this supplement indicates an EIS is not warranted, the EA, as supplemented, would remain valid until WS, in consultation with the NCWRC, 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 each year to ensure that the EA and supplement are sufficient. This process ensures the EA is complete and still appropriate to the scope of deer damage management activities conducted in the State by WS.

Site Specificity

The EA and this supplement analyze the potential impacts of deer damage management that has been and is currently being conducted under an existing MOU or cooperative service agreement between WS and a cooperating entity. The EA and this supplement also address the impacts of deer damage management in the State where additional agreements may be signed in the future. Because the proposed action is to reduce damage 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 deer 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. Because deer are present statewide and damage can occur where ever deer occur, it is conceivable that WS could be requested to provide assistance anywhere in the State that deer occur.

Planning for the management of deer 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 wildlife damage would occur can be predicted, all specific locations or times where such damage would occur in any given year cannot be predicted. The WS program cannot predict the specific locations or times at which affected resource owners (*i.e.*, people experiencing deer damage) would determine a damage problem has become intolerable to the point that they request assistance from WS. In addition, the WS program would not be able to prevent such damage in all areas where it might occur without resorting to the suppression of wild animal populations over broad areas at a much more intensive level than would be desired by most people, including WS and other agencies. Such broad scale population management would also be impractical or impossible to achieve within WS' policies and professional philosophies.

The EA and this supplement to the EA emphasize major issues as they relate to specific areas whenever possible; however, many issues apply wherever deer damage and the resulting management occur, and are treated as such. The standard WS' Decision Model (Slate et al. 1992, USDA 1997, USDA 2005) and WS Directive 2.201 are the routine thought processes that provide the site-specific procedure for determining methods and strategies to use or recommend for individual actions conducted by WS in the State. Appropriate strategies to addressing deer damage that are made using this thought process would be in accordance with WS' Directives and any standard operating procedures (SOPs) described herein or in the EA.

The analyses in this supplement are intended to apply to any action that may occur in any locale and at any time within the analysis area to reduce deer damage or threats within the State. 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. This supplement adds to the analysis in the EA and the 2005 Decision/FONSI. The information and analyses in the EA remain valid unless otherwise noted.

Public Involvement

The EA was made available to the public for review and comment by a legal notice published in *The News and Observer, Roanoke-Chowan County, News Herald and Gates County Index, Winston-Salem Journal, The Charlotte Observer, The Greensboro News & Record, Beaufort Hyde News, New Bern Sun Journal, Fayetteville Observer, Asheville Citizen Times,* and *Daily Advance*. A letter of availability for the EA was also mailed directly to agencies, organizations, and individuals with probable interest in the proposed program. Public review and comment occurred during a 30-day comment period. During the 30-day comment period, two comment letters were received. The comment letters received during the public involvement process were reviewed for substantive issues and alternatives which were considered in developing the Decision for the EA.

After consideration of the analysis contained in the EA and review of the comment letters received, a Decision and FONSI for the EA was issued on November 4, 2005. The Decision and FONSI selected the proposed action alternative which implemented an integrated damage management program in the State using multiple methods to adequately address the need to manage damage and threats associated with deer. Responses to comments received during the public comment period were addressed in Appendix A of the 2005 Decision/FONSI.

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 would be published at a minimum in *The News and Observer* 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 letter of availability will also be directly mailed to agencies, organizations, and individuals with probable interest in deer damage management in the State. Comments received during the public involvement process for this supplement to the EA would be fully considered for new substantive issues and alternatives.

VI. AUTHORITY AND COMPLIANCE

WS' activities to reduce threats associated with deer in North Carolina are regulated by federal, State, and local laws and regulations. The authority of WS is discussed in detail in section 1.7 of the EA (USDA 2005), along with the authorities of other federal, State, and local entities. WS' compliance with relevant laws and regulations are also discussed in detail in section 1.7 of the EA (USDA 2005). WS' authorities and those of federal, State, and local entities would remain as addressed in the EA, including compliance with all applicable federal, State, and local laws and regulations. WS would continue to coordinate activities to alleviate or prevent deer damage with the NCWRC to ensure WS' activities are considered as part of the population objectives established for deer. Compliance with laws and regulations not directly addressed in the EA are discussed below.

Coastal Zone Management Act of 1972, as amended (16 USC 1451-1464, Chapter 33; P.L. 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. As appropriate, a consistency determination would be conducted by WS to assure management actions would be consistent with Coastal Zone Management Program in the State.

VII. AFFECTED ENVIRONMENT

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 North Carolina to reduce damages and threats associated with deer 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 analyzes the potential impacts of deer damage management and addresses activities in North Carolina 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 addresses the impacts of deer damage management in the State where additional agreements may be signed in the future.

Deer damage or threats of damage can occur statewide in North Carolina where ever deer occur. However, deer damage management would only be conducted by WS when requested by a landowner or manager and only on properties where a cooperative service agreement or other comparable document has been signed between WS and a cooperating entity. Deer can be found throughout the year across the State where suitable habitat exists. Deer are capable of utilizing a variety of habitats in the State including rural and urban habitats.

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 gain entrance into airports where there is adequate cover and food, and they live there for all or part of the year. Because deer are ubiquitous throughout the State, it is possible for deer to be present at nearly any airport or military airbase. WS may be requested to remove deer from airport properties at any of the airports or airbases in the State where deer pose a threat to aircraft and passenger safety. Deer confined inside a perimeter fence on airport property originate from free-ranging deer populations outside the perimeter fence. Therefore, deer 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 deer until the herd is large enough to negatively impact vegetation on the facility and the growth of the confined deer 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 managers in

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

Similar to deer found on airport properties, deer confined inside a perimeter fence at federal facilities originate from free-ranging deer populations and thus, are not considered a unique population.

State Owned or Managed 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. Deer damage management activities could be requested to occur on state highway right-of-ways and interstate right-of ways.

Municipal Property

Activities under the alternatives could be conducted on city, 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, deer 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 deer damage and threats could also occur from private property owners and/or managers of private property. 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.

Disease Surveillance and Monitoring Activities

Upon receiving a request for assistance, deer damage management 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 deer populations. Areas of the proposed action could include, but are 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 deer 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 deer are a threat to human safety and to property; areas where deer negatively impact wildlife, including T&E species; and public property where deer are negatively impacting 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.

WS' Activities to Manage Damage Caused By Deer in North Carolina

Since the Decision and FONSI were signed in 2005, WS has provided both technical assistance and direct management activities to cooperators requesting assistance with damage caused by deer in North Carolina. Since the 2005 Decision and FONSI were signed selecting the proposed action alternative, WS has implemented 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 deer. Methods available for use to resolve damage or threats of damage were addressed in Appendix B of the EA (USDA 2005). Methods that have become available since the completion of the EA are addressed in this supplement to the EA. A major goal of the program is to resolve and prevent deer damages and to reduce threats to human safety. To meet this goal, WS, in consultation the NCWRC, has continued to respond to requests for assistance with, at a minimum, technical assistance, or when funding is available, operational damage management. Funding could occur through federal appropriations or from cooperative funding. The adaptive approach to managing damage associated with deer 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.

During federal fiscal year (FY)[2] 2005, WS received seven requests for assistance at airports in order to reduce threats to human safety. Threats to human safety and property associated with deer at airports occur from the risks associated with aircraft striking deer which can cause extensive damage to aircraft and threaten passenger safety. As part of an integrated management program implemented for those assistance requests, 63 deer were dispersed and 15 deer were lethally removed by shooting to resolve requests for assistance in FY 2005. In FY 2006, WS received one request for assistance to reduce threats to human safety at an airport involving deer. To resolve that request for assistance, WS implemented an integrated management program by dispersing 36 deer and employing lethal methods to take 47 deer in FY 2006 by shooting.

Similar to the previous two fiscal years, WS received requests for assistance to reduce threats to human safety and aircraft in FY 2007. WS received three requests for assistance to reduce threats to human safety, primarily from threats associated with deer being struck by aircraft. As part of an integrated management program implemented for those assistance requests, 17 deer were dispersed and 24 deer were lethally removed by shooting to resolve requests for assistance in FY 2007.

In FY 2008, WS received seven requests for assistance in North Carolina in order to reduce threats to property and to reduce threats to human safety at airports associated with the potential for deer to be struck by aircraft. As part of an integrated management program implemented for those assistance requests, 18 deer were dispersed and 19 deer were lethally removed by shooting to resolve requests for assistance in FY 2008.

WS continued to provide both technical and operational assistance in FY 2009 to those persons requesting assistance. Requests for assistance were received from several airports in North Carolina to assist with reducing the threats associated with deer on airport property.

Technical assistance was provided to cooperators through the dissemination of information regarding damage management techniques, methods demonstrations, assistance with wildlife hazard identification, and site visits. Through technical assistance, WS made recommendations on the appropriate methods available for use that a requester can employ to resolve damage or reduce threats without WS' direct involvement. All technical assistance projects in FY 2009 were conducted to reduce threats of wildlife strikes at airports in North Carolina.

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

As directed by the selected alternative, WS continued to apply multiple methods as part of an integrated damage management program to resolve requests for assistance in FY 2009. WS received six requests for assistance in North Carolina during FY 2009 to reduce threats to property and to reduce threats to human safety at airports associated with the potential for deer to be struck by aircraft. As part of an integrated management program implemented for those assistance requests, 82 deer were lethally removed by shooting to resolve requests for assistance in FY 2009.

In FY 2010, WS received seven requests for assistance to reduce threats of aircraft striking deer at airports in North Carolina. To resolve those requests for assistance, WS dispersed 44 deer and employed firearms to remove 86 deer that were identified as posing a threat to aircraft at eight different airports.

VIII. 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 relating to the reduction of wildlife damage were raised during the scoping process for WS' programmatic FEIS (USDA 1997) and were considered in the preparation of the EA. Issues related to managing damage and threats associated with deer in the State were developed by WS in consultation with the NCWRC. In addition, the EA was made available to the public to identify additional issues.

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

- Issue 1 - Effects on White-tailed Deer Populations
- Issue 2 - Effects on Plants and other Wildlife Species, including Threatened and Endangered Species
- Issue 3 - Effects on Human Health and Safety
- Issue 4 - Humaneness of methods to be used
- Issue 5 - Effects on Aesthetic Values
- Issue 6 - Effects on Regulated White-tailed Deer Hunting

Based on those damage management activities conducted previously by WS since the 2005 Decision and FONSI were signed and in consultation with the NCWRC, no additional issues have been identified that require detailed analyses. Those major issues identified during the development of the EA remain applicable and appropriate to resolve damage and threats of damage associated with deer in the State.

IX. ISSUES ADDRESSED BUT NOT IN DETAIL WITH RATIONALE

In addition to the identified issues considered in detail, two other issues were considered in Section 2.3 of the EA, but were not analyzed in detail with rationale provided in the EA (USDA 2005). WS has reviewed those 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.

X. 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). In addition, Chapter 4 of the EA analyzes the environmental consequences of each alternative as those alternatives relate to the issues identified (USDA 2005).

Appendix B of the EA provides a description of the methods that could be used or recommended by WS under each of the alternatives (USDA 2005). The EA describes five alternatives that were developed to address the issues identified above. Alternatives analyzed in detail include:

Alternative 1 – No Deer Damage Management by WS
Alternative 2 – Technical Assistance Only
Alternative 3 – Lethal Deer Damage Management only by WS
Alternative 4 – Non-lethal Deer Damage Management only by WS
Alternative 5 – Integrated Deer Damage Management Program: No Action (Preferred Alternative)

XI. ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Additional alternatives were considered but not analyzed in detail in Section 3.5 of the EA (USDA 2005). 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.

XII. WILDLIFE DAMAGE MANAGEMENT METHODS

This supplement to the EA also evaluates additional methods available to resolve deer damage that have become available since the completion of the EA. Since the completion of the EA, trap monitors, Forward Looking Infrared (FLIR) devices, night vision equipment, and a reproductive inhibitor have become available and could be used or recommended as part of an integrated damage management strategy to alleviate deer damage by WS. A description of the wildlife damage management methods that could be used or recommended by WS that were available during the development of the EA are provided in Appendix B of the EA (USDA 2005) and in Appendix J of WS' programmatic FEIS (USDA 1997).

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 an area. Trap monitors could be used as part of an integrated approach under the proposed supplement where appropriate.

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 deer at night. WS' personnel would most often use this technology to target deer in the act of causing damage or likely responsible for causing damage. The use of those methods would allow WS to conduct activities at night when human activities are minimal in an area which reduces risks to human safety.

Scientists with the National Wildlife Research Center (NWRC) have developed GonaCon™, a new single dose immunocontraceptive vaccine that shows great promise as a wildlife infertility agent. Recent studies have demonstrated the efficacy of this single-shot Gonadotropin-releasing hormone (GnRH) vaccine in several wildlife species. Infertility among treated female white-tailed deer was observed for up to two years without requiring a booster vaccination (Miller et al. 2000). This vaccine overcomes one of the major obstacles of previous two dose vaccines which is the need to only capture an animal once for vaccination. A single-injection vaccine is much more practical as a field delivery system for use on free-ranging animals.

GonaCon™ was officially registered by the EPA on September 29, 2009 for use to reduce fertility in female white-tailed deer under EPA registration number 56228-40. GonaCon™ is registered as a restricted-use pesticide available for use by WS' personnel and personnel of a state wildlife management agency or persons under their authority. In order for GonaCon™ to be used in any given State, it must also be registered with the State and approved for use by the state wildlife management agency. GonaCon™ is currently not registered for use in North Carolina. If GonaCon™ becomes registered for use in North Carolina, the EA would be reviewed and an additional supplement would be prepared to evaluate the potential impacts to the human environment from the use of the reproductive inhibitor to manage local deer populations.

XIII. STANDARD OPERATING PROCEDURES

The current WS program, nationwide and in North Carolina, uses many SOPs. SOPs are discussed in Chapter 3 of the EA (USDA 2005) and Chapter 5 of WS' programmatic FEIS (USDA 1997). The SOPs discussed in the EA remain appropriate for WS' deer damage management activities conducted in the State.

XIV. ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

Chapter 4 of the EA contains a detailed discussion and comparison of the identified alternatives and the major issues (USDA 2005). Chapter 4 analyzes the environmental consequences of each alternative in relation to the issues identified. The following resource values in the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, critical habitats (areas listed in threatened and endangered (T&E) 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 in the EA and those activities addressed in this supplement to the EA would have a negligible effect on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur as a result of any of the proposed alternatives. Those alternatives would meet the requirements of applicable laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

This section analyzes the environmental consequences of the selected alternative (Alternative 5) as that alternative relates to the issues to determine the extent of actual or potential impacts on those issues. Alternative 5, as described in the EA, addresses requests for deer damage management in the State using an integrated damage management approach by WS to reduce damage to agricultural resources, property, natural resources, and threats to human safety. Based on the analyses in the EA, the 2005 Decision determined the need for action and the issues identified in the EA were best addressed by selecting Alternative 5 and the implementation of the selected alternative would not significantly affect the quality of the human environment (USDA 2005). Between FY 2005 and FY 2010, WS has implemented a deer damage management program which responds to requests for assistance using an adaptive integrated methods approach as described under Alternative 5 in the EA. This supplement to the EA evaluates the implementation of Alternative 5 from FY 2005 through FY 2010 to ensure individual and cumulative activities conducted pursuant to Alternative 5 continue to be within the impact parameters evaluated in the EA based on currently available information and currently available methods.

Potential impacts of Alternatives 1, 2, 3, and 4 on the human environment related to the major issues have not changed from those described in the EA and thus do not require additional analyses in this supplement.

Issue 1 - Effects on White-tailed Deer Populations

A common issue when addressing damage caused by wildlife are the potential impacts of management actions on the population of target species. Methods used to resolve damage can involve altering the behavior of target species and may require the use of lethal methods when appropriate. Under the proposed action, WS provides technical and direct damage assistance using methods described in Appendix B of the EA in an integrated approach in which all or a combination of methods may be employed to resolve a request for assistance.

Non-lethal methods can disperse or otherwise make an area unattractive to deer causing damage or posing a threat of damage; thereby, reducing the presence of deer 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 (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 deer using non-lethal harassment methods, WS would not necessarily employ those methods again during direct operational assistance since those methods have 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 deer from the area resulting in a reduction in the presence of deer at the site where those methods were employed. However, deer 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.*, fawning locations, food sources) would be unavailable for extended durations or over a wide geographical scope that long-term adverse affects would occur to the deer population.

From FY 2005 through FY 2010, WS employed non-lethal methods to disperse 178 deer in the State primarily to alleviate threats of aircraft strikes at airports. No adverse affects to deer populations were observed or brought to WS' attention from dispersing those deer. Non-lethal methods are generally regarded as having minimal impacts on overall populations of wildlife since those species are unharmed. WS' previous and continued use of non-lethal methods would have no adverse impacts on deer populations in the State. The only non-lethal method currently available that if used could result in population reductions is GonaCon™. The use of a reproductive inhibitor could reduce local deer populations through attrition (*i.e.*, deer that die are not replaced through reproductive output leading to a decline in the number of deer); however, GonaCon™ is not currently registered for use in the State. If GonaCon™ becomes registered for use in the State, further evaluation of the use of the product would occur pursuant to the NEPA.

Of primary concern is the magnitude of take on a species' population from the use of lethal methods. Lethal methods are employed to remove an individual deer or those deer responsible for causing damage or the threat of damage and only after requests for such assistance are received by WS. The use of lethal methods would therefore result in local population reductions in the area where damage or threats were occurring. The number of deer 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 deer involved with the associated damage or threat, and the efficacy of methods employed. The EA evaluated a lethal take of up to 1,500 deer annually by WS in North Carolina to alleviate damage and threats. If requested by the NCWRC during a disease outbreak in the deer population, the EA evaluated the lethal take of up to 10,000 deer annually by WS (USDA 2005).

The analysis for magnitude of impact generally follows the process described in Chapter 4 of WS' programmatic FEIS (USDA 1997). Magnitude is described in WS' programmatic FEIS as "*...a measure*

of the number of animals killed in relation to their abundance." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS only conducts damage management on species whose population densities are high and usually only after those species have cause damage or threaten to cause damage.

When compared to other land mammals in North America, the white-tailed deer currently occupies the largest geographic range of any other mammal (Pagel et al. 1991). Rural areas containing a matrix of forest and agricultural crops can contain the highest deer densities (Roseberry and Woolf 1998). Biologists and resource managers in North Carolina have been challenged with managing escalating populations of deer in many urban/suburban areas and in some rural areas. As deer populations increase, there is an increasing occurrence of damage from white-tailed deer to agricultural crops (DeVault et al. 2007), increasing incidences of Lyme disease (Fernandez 2008), a rise in deer-vehicle collisions (Conover et al. 1995), and a disruption in forest health, regeneration, and forest dependent species (Tilghman 1989).

The population of deer in North Carolina in 2005 was estimated at 1.37 million deer while the 2009 statewide population was estimated at 1.35 million deer (E. Stanford, Deer Biologist, NCWRC pers. comm. 2010). Deer populations in the State likely fluctuate from year to year and are estimated annually by the NCWRC using a deer population model which includes harvest trend analyses and monitoring of vital statistics of the deer population (E. Stanford, Deer Biologist, NCWRC pers. comm. 2010). Based on the population model being employed by the NCWRC to estimate the statewide deer population, the deer population estimates are more accurate the further back in time you go as more deer are harvested and entered into the model (E. Stanford, Deer Biologist, NCWRC pers. comm. 2010). For example, the current population estimate is largely based on averages from previous years and the model adjusts values as new data are inputted (E. Stanford, Deer Biologist, NCWRC pers. comm. 2010).

The NCWRC, with management authority over resident wildlife species, including deer, manages deer populations in the State by adjusting the allowed number of deer to be harvested during a regulated hunting season. In 2005, an estimated 257,758 deer were harvested during the regulated season in North Carolina compared with 277,110 deer harvested during the 2009 harvest season (See Table 1). In addition to take of deer during the regulated season, the NCWRC also issues depredation permits for the take of deer that are causing damage to agricultural and other resources. As shown in Table 1, the take of deer under depredation permits has ranged from 389 deer taken in 2005 to a high of 3,189 deer in 2009. Mortality can also occur from vehicle collisions, dogs, illegal take, tangling in fences, disease, and other causes (Crum 2003). Annual deer mortality in North Carolina from other sources (*e.g.*, illegal take, disease, and predation) is currently unknown. From July 1, 2008 through June 30, 2009, State Farm Insurance (2009) estimated 42,126 deer-vehicle collisions occurred in North Carolina.

Since FY 2005, WS has used lethal methods to take a total of 273 deer in North Carolina to alleviate damage and threats with the highest level of take occurring in FY 2010 when 86 deer were taken (See Table 1). All take by WS has occurred after receiving a request for assistance with resolving damage caused by deer and after a permit and approval was issued by the NCWRC.

As shown in Table 1, the highest level of take by WS occurred in FY 2010 but no statewide deer population estimate is available. If the deer population has remained relatively stable since the 2009 estimate was determined, the take of 86 deer by WS would have represented 0.01% of the estimated population and would have represented 0.03% of the total known take. Since FY 2005, a total of 273 deer have been taken by WS, which represents 0.02% of the total mortality of deer in the State from 2005 through 2009.

Table 1 – Comparison of WS' take of deer with take from other known sources in North Carolina

	Year					
	2005	**2006**	**2007**	**2008**	**2009**	**2010**
Estimated Deer Population[1]	1.37	1.38	1.44	1.33	1.35	n/a[3]
Take during Harvest Season	257,758	241,895	313,842	287,561	277,110	n/a
Take by WS[2]	15	47	24	19	82	86
Depredation Permit Take	389	800	967	2,002	3,189	n/a
Total Deer Take	**258,162**	**242,742**	**314,833**	**289,582**	**280,381**	**n/a**
WS % Take of Total	0.01%	0.02%	0.01%	0.01%	0.03%	n/a
WS % Take of Population	0.001%	0.003%	0.002%	0.001%	0.01%	n/a

[1]Deer population estimate reported in millions provided by the NCWRC (E. Stanford, Deer Biologist, NCWRC pers. comm. 2010)
[2]Take by WS is reported by FY
[3]n/a= data is currently unavailable

WS' programmatic FEIS determined using qualitative information (population trend indicators and harvest data) that if WS' deer kill is less than or equal to 33% of the total harvest, the magnitude is considered low (USDA 1997). When take of deer has occurred by WS, the magnitude of take compared to the total known take from hunting and depredation permits has ranged from 0.01% to 0.03% between 2005 and 2009. Based on previous requests for assistance, the magnitude of WS' take of deer to resolve damage or threats has been low in North Carolina. The annual total known take of deer in the State (*i.e.*, harvest take, WS' take, and take under depredation permits) has ranged from 17.6% to 21.9% of the estimated annual statewide deer population. As stated previously, State Farm Insurance (2009) estimated that 42,126 deer-vehicle collisions occurred in the State during a single year. If those collisions involved the death of only one deer and if the number of deer struck has remained relatively stable (although the actually trend in unknown), the total known annual mortality of deer in the State would have ranged from 20.6% to 24.8% of the estimated deer population. For example, a total of 242,742 deer were taken in the State during the harvest season, by WS, and under depredation permits in 2006. If 42,126 deer were also struck and died during vehicle collisions in 2006, the total mortality would have represented 20.6% of the statewide deer population in 2006 estimated at 1.38 million deer.

Under a worst case scenario, a total of 10,000 deer could be taken by WS annually under the proposed action alternative (Alternative 5) to address disease outbreaks. Since the worst case scenario would represent the highest level of annual take, the cumulative analyses will evaluate a take of 10,00 deer to determine the maximum possible potential impact although take of 10,000 deer annually is unlikely. The take of up to 10,000 deer would only occur when requested by the NCWRC and only in the event of a disease outbreak. If WS had lethally taken a total of 10,000 deer each year from 2005 through 2009 and all other take that occurred from known sources remained the same, the total take of deer would have ranged from 21.4% to 25.5% of the estimated population of deer each year.

All take by WS would continue to be reported to the NCWRC to ensure WS' activities are incorporated into deer population objectives for the State. Since deer can be taken to alleviate damage through the issuance of depredation permits by the NCWRC, those deer taken by WS would likely be removed by those persons experiencing damage or threats since they could obtain permits for the lethal take of deer. WS' deer damage management activities are carried out under a depredation permit issued by the NCWRC to a property owner and/or manager or directly to WS to conducted deer damage management activities for a property owner and/or manager. Therefore, WS' activities are removing deer that the property owner and/or manager could remove themselves under depredation permits but has chosen to request assistance from WS. Even in the event of a disease threat, those deer that would be taken by WS would likely be taken whether WS was directly involved or not. Therefore, WS' activities under the proposed action alternative would not likely be additive to the mortality that already occurs under

depredation permits and that could occur during disease threats. The potential impacts to the statewide deer population under the proposed action alternative would likely be similar to the other alternatives given that WS' activities would not substantial increase the take that could occur in the absence of WS' direct involvement since take could occur when permitted by the NCWRC. The deer that could be taken by WS under the proposed action alternative are likely those deer that would be taken by other entities when permitted by the NCWRC in the absence of WS' direct involvement in the activities.

The magnitude of WS' activities to alleviate damage and threats associated with deer in the State would be low with the oversight and permitting of WS' activities occurring by the NCWRC. The permitting of all WS' take by the NCWRC ensures WS' take would meet the objectives established for the statewide deer population.

As described previously, since the completion of the EA, trap monitors, FLIR devices, and night vision equipment have become available for use while conducting deer 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 affects on the populations of deer from the use of those methods.

Issue 2 - Effects on Plants and other Wildlife Species, including T&E Species

The issue of non-target species effects, including effects on T&E species arises from the use of non-lethal and lethal methods identified in the alternatives. The use of non-lethal and lethal methods has the potential to inadvertently disperse, capture, or kill non-target wildlife. WS' SOPs are designed to reduce the effects of damage management activities on non-target species' populations. To reduce the risks of adverse affects to non-target wildlife, WS selects damage management methods that are as target-selective as possible or applies such methods in ways that reduces the likelihood of affecting non-target species. Before initiating management activities, WS also selects locations which are extensively used by the target species and employs baits or lures which are preferred by those species. Despite WS' best efforts to minimize non-target take during program activities, the potential for adverse affects to non-targets exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety.

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. Since FY 2005, no non-target wildlife has been taken by WS during deer damage management activities in North Carolina. No adverse affects to non-targets were observed or reported to WS during deer damage management activities. WS would continue to monitor annually the take of non-target species to ensure program activities or methodologies used in deer 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.

Those additional methods discussed in this supplement to the EA that are available to manage damage associated with deer 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 equipment 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.

Trap monitoring devices would be employed when applicable that indicate when a trap has been activated. Trap monitoring devices would allow personnel to prioritize trap checks and decrease the amount of time required to check traps which decreases the amount of time captured non-targets would be restrained. By reducing the amount of time non-targets are restrained, pain and stress can be minimized and non-targets can be addressed timely which could allow for non-targets to be released unharmed. Trap monitoring devices would be employed where applicable to facilitate monitoring of the status of traps in remote locations to ensure any captured wildlife is released promptly to minimize distress and to increase the likelihood non-targets can be released unharmed.

Controlling deer populations in most cases would have a beneficial effect to plant species. High densities of white-tailed deer have a detrimental effect on forest regeneration and species composition (Tilghman 1989). Loss of seedlings to browsing deer can lead to forests composed of less desirable tree species, resulting in a decrease in the diversity of wildlife foods available (Tilghman 1989), and a reduction in breeding bird habitat (DeCalesta 1994). High densities of white-tailed deer reduced intermediate canopy nesting birds by reducing the height of woody vegetation in a managed forest in Pennsylvania (DeCalesta 1994). McShea and Rappole (2000) found that a reduction in deer density increased the diversity and density of understory vegetation and led to a corresponding increase in bird numbers.

Deer can also damage property such as landscaping and ornamental plantings. As development expands into previously rural areas, deer habitat may actually be enhanced because fertilized lawns, gardens, and landscape plants serve as high quality sources of food (Swihart et al. 1995). Furthermore, deer are prolific and adaptable, characteristics which allow them to exploit and prosper in most suitable habitat near urban areas, including residential areas (Jones and Witham 1995). Although damage to landscaping and ornamental plants has not been quantified, deer can cause severe and very costly property damage to homeowners and in parks.

WS' activities were selective for target white-tailed deer from FY 2005 through FY 2010. No T&E species were taken or adversely affected by WS' actions. A review of T&E species listed by the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service showed that additional listings of T&E species in North Carolina have occurred since the completion of the EA in 2005. Appendix A of this supplement to the EA contains the current list of T&E species listed in the State. Since the completion of the EA, a review of T&E species listed by the USFWS showed that 10 additional listings of T&E species have occurred. Those species include pondberry (*Lindera melissifolia*), finback whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), right whale (*Balaena glacialis*), sperm whale (*Physeter catodon*), gray wolf (*Canis lupus*), tan riffleshell (*Epioblasma florentina walkeri*), American burying beetle (*Nicroporus americanus*), and the smalltooth sawfish (*Pristis pectinata*). Of those species, the American burying beetle, tan riffleshell, and the gray wolf are listed as threatened and endangered in North Carolina but no known populations currently occur in the State according to the USFWS. Based on the likely absence of those species from the State and since WS' deer damage management activities do not cause habitat destruction or modification, WS' activities to resolve damage caused by deer in North Carolina would have no effect on those T&E species listed after the development of the EA, including any designated critical habitats. Similarly, activities conducted to resolve deer damage would have no effect on the smalltooth sawfish, finback whale, humpback whale, right whale, and sperm whale in the State, including any designated critical habitat. Those species are found only in marine environments where deer damage management activities are not conducted. Deer damage management activities that would be conducted under any of the alternatives addressed in the EA would not result in take nor pose risks of water contamination. Pondberry is a deciduous shrub that can grow up to 6 feet tall and is found primarily in wetland habitats of bottomland hardwood forests, poorly drained depressions, and along the margins of limestone sinks. Isolated

populations of pondberry occur in North Carolina. When listed as an endangered species, the only isolated populations in North Carolina were known to occur in Bladen County, North Carolina. Since those activities discussed under the proposed action do not involve major ground disturbances or major habitat modifications, the proposed action alternative would have no effect on the status of pondberry in North Carolina. Based on the use patterns of those methods that have become available since the completion of EA, WS has determine the use of trap monitors, night vision equipment, and FLIR equipment would have no effect on any T&E species listed within in the State.

WS' determination that deer damage management activities conducted within the scope of the proposed action was not likely to adversely affect T&E species in North Carolina is still valid and appropriate for those T&E species addressed in the EA (USDA 2005).

Issue 3 - Effects on Human Health and Safety

The EA concluded that the effects of WS' deer damage management activities when conducted within the scope analyzed would have no adverse impact on human safety or pet safety. WS' implementation of the proposed action from FY 2005 through FY 2010 did not result in any adverse impacts to human or pet safety. The methods available for use to manage damage caused by deer in North Carolina remain as addressed in the EA. Therefore, the potential impacts of program activities on human health and safety have not changed from those analyzed in the EA. Impacts of the program on this issue are expected to remain insignificant.

As addressed previously, night vision equipment, FLIR equipment, and trap monitors are employed as components of other methods that when employed, allow those methods to be employed more efficiently and effectively. In addition, night vision equipment and FLIR equipment are most often employed with the use of a firearm which allows deer damage management activities to be conducted at night when human activity tends to be lowest; therefore, the use of night vision equipment and FLIR equipment would not adversely affect human safety but potentially could further reduce risks. Trap monitors are attached directly to traps and would not pose a threat to human safety.

In addition to the risks associated with methods used to resolve or prevent deer damage, concerns also arise from not conducting activities to resolve requests for assistance that involve human safety. There are numerous health risks associated with deer to both people and pets. Lyme disease is the most common zoonoses involving deer and is caused by the spirochete *Borrelia burgdorferi*. Research has shown a correlation between infected ticks, deer numbers, and Lyme disease cases (Magnarelli et al. 1984, Deblinger et al. 1993). Deer are an important reservoir for Lyme disease and are the primary host for the adult deer tick (Conover 1997).

Companion animals can become infected with Lyme disease and develop subclinical infections. In the northeast, infection rates can be as high as 85.2% in dogs and 47% in cats. Lyme disease in cats is currently poorly understood and little is known about disease manifestations (Companion Animal Parasite Council 2008). Chronic Lyme disease in dogs can lead to acute progressive renal failure and death.

In 1986, another serious tick-borne zoonosis, human ehrlichiosis, was discovered in the United States (McQuiston et al. 1999). Two distinct forms of the illness may affect humans: human monocytic ehrlichiosis (HME) and human granulocytic ehrlichiosis (HGE) (Lockhart et al. 1997, McQuiston et al. 1999). The bacterial agents that cause ehrlichiosis are transmitted to humans by infected ticks which acquire the agents from feeding on infected animal reservoirs (McQuiston et al. 1999). Ehrlichiosis in humans may result in fever, headache, myalgia, nausea, and occasionally death (Little et al. 1998, McQuiston et al. 1999). HME is the type of ehrlichiosis predominantly found in the southeastern, south-central, and mid-Atlantic United States. White-tailed deer are major hosts for *Amblyomma americanum*,

the tick which transmits HME, and deer have been identified as a reservoir for HME (Lockhart et al. 1997, Little et al. 1998).

Deer-vehicle collisions are a serious concern nationwide because of losses to property and the potential for human injury or even death (Conover et al. 1995, Romin and Bissonette 1996, Conover 1997). Conover et al. (1995) estimated that 1.5 million deer-vehicle collisions occur each year in the United States and that the average cost to repair the vehicle after a collision with a deer was $1,500. Conover et al. (1995) thus estimated that the total damage to vehicles in the United States each year from deer-vehicle collisions is greater than $1 billion. Additionally, Conover et al. (1995) estimated that deer-vehicle collisions in the United States result in 29,000 injuries and 211 human fatalities annually. Nationwide Insurance (1993) estimated that 120 people are killed annually in animal-vehicle accidents in the United States.

Wildlife collisions with aircraft are a serious economic and safety problem (Dolbeer et al. 2000). Cleary et al. (1999) estimated that between 1990 and 1998 wildlife strikes cost the United States civil aviation industry a minimum of 92,233 hours/year of aircraft down time, $50.6 million/year in direct monetary losses, and $26.59 million/year in associated costs. In a recent study which ranked the hazards to aviation for wildlife species commonly involved in aircraft strikes, deer were ranked as the most hazardous species group (Dolbeer et al. 2000). This study found that 87% of reported deer-aircraft collisions resulted in damage. This was the highest percent of reported damage occurrence of any species studied. Also, 53% of deer-aircraft strike reports noted an effect on the flight (*e.g*., aborted take-off, engine shutdown, precautionary landing) (Dolbeer et al. 2000).

The EA concluded that effects on this issue would be insignificant. Impacts of the program on this issue are expected to remain insignificant.

Issue 4 - Humaneness of Methods to be Used

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.

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 multitude of 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 those methods addressed 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 example, a cage trap is generally considered by most members of the public as "*humane*" since an animal is captured alive. 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 minimizes the stress and pain of the animal. WS' personnel are experienced and professional in their use of management methods. When employing methods to resolve damage to resources or threats to human safety, methods are applied as humanely as possible. Methods used in deer management activities in North Carolina since the completion of the EA and their potential impacts on humaneness and animal welfare have not changed from those analyzed in the EA. Between FY 2005 and FY 2010, WS has dispersed deer using non-lethal methods and employed firearms to lethally take deer. The American Veterinary Medical Association (AVMA) states "*...euthanasia is the act of inducing humane death in an animal*" and "*... the technique should minimize any stress and anxiety experienced by the animal prior to unconsciousness*" (Beaver et al. 2001). The AVMA also states that "*For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but terms such as killing, collecting, or harvesting, recognizing that a distress- free death may not be possible*" (Beaver et al. 2001). WS' personnel that employ firearms to address deer damage or threats to human safety were and would continue to be trained in the proper placement of shots to ensure a timely and quick death. Therefore, the analyses of the humaneness of methods used by WS to manage damage and threats caused by deer have not changed from those analyzed in the EA.

Trap monitoring devices would be employed when applicable that indicate when a trap as been activated. Trap monitoring devices would allow personnel to prioritize trap checks and decrease the amount of time required to check traps which decreases the amount of time captured deer are restrained. By reducing the amount of time deer are restrained, pain and stress can be minimized which would reduce the distress of captured deer. Therefore, the use of trap monitoring devices proposed under the supplement would likely result in traps being used more humanely. Additionally, the use of FLIR and night vision equipment to remove deer may improve the perceived humanness of killing deer using firearms since those components would aid in identifying target species and allowing for more accurate shot placements when using firearms.

Issue 5 - Effects on Aesthetic Values

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. There is evidence that dogs and cats were domesticated around 3,000 B.C. (History World 2007). The American public is no exception and today a large percentage of households have pets. However, some people may consider individual wild animals as "*pets*" or exhibit affection toward those animals, especially people who enjoy coming in contact with wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to reduce conflicts/problems between humans and wildlife.

There is some concern that the proposed action or the alternatives would result in the loss of aesthetic benefits to the public, resource owners, or neighboring residents. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature, dependent on what an observer regards as beautiful.

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 deer to resolve damage and threats. In some instances where deer are dispersed or removed, the ability of interested persons to observe and enjoy deer would likely temporarily decline. However, the deer populations in localized areas would likely increase

upon cessation of damage management activities.

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

The use of lethal methods could result in temporary declines in local deer populations resulting from the removal of those deer causing damage or posing a threat of damage. WS' goal is to respond to requests for assistance and to manage those deer responsible for the resulting damage or identified as posing a threat of damage. Therefore, the ability to view and enjoy deer in North Carolina would still remain if a reasonable effort is made to locate deer outside the area in which damage management activities occurred.

The EA concluded the effects on aesthetics would be variable depending on the damage situation, stakeholders' values towards deer, and their compassion for those who are experiencing damage from deer. The WS program in North Carolina 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.

Program activities and their potential impacts on aesthetics have not changed from those analyzed in the EA. Activities conducted by WS from FY 2005 through FY 2010 to alleviate threats posed by deer occurred at the request of airports in the State. Airports are generally restricted areas with perimeter fencing which prevents public access to those areas. As discussed under Issue 1, when compared to the estimated deer population in North Carolina and when compared to the total known deer taken, WS' take has been minimal with the magnitude of take being low. Deer populations remain high and deer are readily available for viewing if a reasonable effort is made to locate deer in North Carolina. WS' take of deer in North Carolina has not adversely affected the aesthetic value of deer.

Those methods that have become available since the EA was developed are methods that are employed as components of other methods. Therefore, the aesthetics of deer would not be directly impacted by those methods. However, night vision and FLIR equipment allow WS to address deer at night or during low light conditions when deer are the most active which allows WS to more specifically identify those deer causing damage or posing a threat of damage. If the ability of WS to identify those deer causing damage or posing a threat of damage is enhanced through the use of night vision and FLIR equipment, the number of deer addressed by WS to resolve requests for assistance is likely to be lower which further reduces concerns about the potential impacts of deer removal on aesthetics.

Issue 6 - Effects on Regulated White-tailed Deer Hunting

The EA concluded that the effects of WS' deer damage management activities on this issue would be insignificant. As noted in Table 1, WS' annual take of deer has not exceeded 0.01% of the estimated deer population in North Carolina in any given year nor has WS' take exceeded 0.03% of the deer harvested in North Carolina from FY 2005 through FY 2010. WS' activities are coordinated with the NCWRC to ensure WS' annual take does not exceed a level where a decline in the deer population would occur due to cumulative impacts from harvest, damage management activities, and other sources of mortality. WS' limited take of deer in North Carolina is not occurring at a magnitude that would adversely affect the ability of those interested to harvest deer in the State. Program activities and their potential impacts on statewide deer populations have not changed from those analyzed in the EA. The effects on this issue are expected to remain insignificant.

XV. CUMULATIVE IMPACTS

Cumulative impacts, as defined by 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 entities may conduct similar activities in the State as permitted by the NCWRC. Through ongoing coordination with the NCWRC, 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 as a result of WS' program activities over time or as a result 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 T&E 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 as a result 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 White-tailed deer Populations

Evaluation of WS' activities relative to deer populations in the State indicated that program activities would have no cumulative adverse affects on populations in North Carolina. 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 deer
- Mortality of deer from vehicle collisions, aircraft strikes, and illegal take
- Human-induced mortality of deer through private damage management activities
- Human-induced harvest during the regulated hunting season
- Human and naturally induced alterations of wildlife habitat
- Annual and perennial cycles in population densities

All of those factors play a role in the dynamics of deer populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate deer populations 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 1997, USDA 2005). 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 deer damage in the State

No cumulative adverse affects have been identified for deer as a result 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 deer 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 impact the populations of any native wildlife species.

With management authority over deer in North Carolina, the NCWRC can adjust take levels, including the take of WS, to ensure population objectives for deer are achieved. Consultation and reporting of take by WS would ensure the NCWRC considers any activities conducted by WS.

Since the completion of the EA, the population of deer continues to show a relatively stable trend in the State which provides some indication that WS' activities are not cumulatively impacting populations. From FY 2005 through FY 2010, 273 deer have been taken by WS since the completion of the EA to alleviate damage in the State. From 2005 through 2009, hunters have harvested nearly 1.4 million deer during the regulated hunting season in the State. In addition, deer may be taken to alleviate agricultural damage and to meet management objectives of landowners in the State. A total of 7,347 deer have been lethally taken in the State from 2005 through 2009 under depredation permits issued by the NCWRC. WS' annual take of deer has averaged 0.02% of the reported annual harvest of deer in State with the highest level occurring in 2010 which represented 0.03% of the reported harvest in 2009.

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

SOPs built into WS' program

SOPs and WS' Directives are designed to reduce the potential negative effects of WS' actions on deer populations, and are tailored to respond to changes in deer populations which 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 1997, USDA 2005).

Current status of deer populations in the State

Natural and human-induced mortality patterns for deer are expected to remain essentially unchanged in the State despite WS' activities. As a result, no cumulative adverse affects are expected from repetitive damage management programs over time in the fairly static set of conditions currently affecting deer in

the North Carolina.

Issue 2 - Effects on Plants and other Wildlife Species, including T&E Species

Potential effects on non-target species from conducting deer 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 deer 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 or fawning sites. 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 followed by euthanasia also have the potential to impact 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 deer 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 NCWRC. With all live-capture devices, non-target wildlife captured 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 impact non-target species.

The methods described in Appendix B of the EA all have a high level of selectivity and can be employed using SOPs to ensure minimal impacts to non-targets species. No non-targets were taken by WS during deer damage management activities from FY 2005 through FY 2010. Based on the methods available to resolve deer 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 impact the populations of non-target species. WS has reviewed the T&E species listed by the USFWS and the National Marine Fisheries Service and has determined that deer damage management activities proposed by WS in this supplement would have no effect on T&E species. WS has also determined that deer damage management activities proposed in this supplement would have no effect on T&E species and species of concern that are listed by the NCWRC. 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 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 warnings 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. A formal risk assessment conducted by APHIS determined that WS' non-chemical methods, when used as intended, pose a low risk to human safety (USDA 1997). Firearms used to alleviate or prevent damage, though hazards do exist, are employed to ensure the safety of employees and the public.

WS has received no reports or documented any adverse affects to human safety from WS' deer damage management activities conducted from FY 2005 through FY 2010. 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 impact human safety.

Questions have arisen about the deposition of lead into the environment from ammunition used in firearms to lethally remove deer. As described in Appendix B of the EA, the lethal removal of deer with firearms by WS to alleviate damage or threats would occur using a 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 may pose a risk of lead exposure to scavengers from ingestion of lead fragments in the carcass.

Take of deer by WS in North Carolina occurs primarily from the use of rifles. To reduce risks to human safety and property damage from bullets passing through deer, the use of firearms is applied in such a way (*e.g.*, caliber, bullet weight, distance) to ensure the bullet does not pass through deer. Since deer that are removed using firearms would occur within areas that are fenced and/or areas with restricted access, retrieval of all deer 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 deer 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 a deer, if misses occur, or if the deer 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, concerns occur 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 to reduce deer damage 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.

Since depredation permits that include the allowed method of lethal removal are issued by the NCWRC directly to entities experiencing damage or threats of damage, WS' assistance with removing deer would not be additive to the environmental status quo since those deer removed by WS using firearms could be lethally removed by the 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 deer damage management activities due to efforts by WS to ensure projectiles do no pass through but are contained within the deer carcass which limits the amount of lead potentially deposited into soil from projectiles passing through the carcass. The proficiency training received by WS' employees in firearm use and accuracy increases the likelihood that deer are lethally removed humanely 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 deer carcasses lethally removed using firearms would be retrieved and disposed of properly to limit the availability of lead in the environment and ensures deer carcass are removed from the environment to prevent the ingestion of lead in carcasses 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 deer 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). 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 jabstick, 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 euthanizing drug described in Appendix B of the EA (USDA 2005). Euthanasia drugs would only be administered after the deer has been properly restrained

and immobilized and would occur through direct injection. WS' personnel are required to attend training courses and 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 deer from areas of application must be registered with the Environmental Protection Agency according to 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 affects to human safety are expected.

No adverse affects have been reported to or identified by WS from the use of chemical methods during deer damage management conducted by WS from FY 2005 through FY 2010. When chemical methods are applied as intended and when safety guidelines are followed, no adverse affects 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 - Humaneness of Methods to be Used

WS continues to seek new methods and ways to improve current technology to improve the humaneness of methods used to manage damage caused by wildlife. 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 humane methods.

All methods not requiring direct supervision during employment (*e.g.*, live traps) would be checked and monitored at least every 12 hours to ensure any deer confined or restrained are addressed in a timely manner to minimize distress of the animal. Live-captured deer would be immobilized to minimize stress of handling. All euthanasia methods used for live-captured deer would be applied according to WS Directive 2.505. Shooting would occur in limited situations and personnel would be trained in the proper use of firearms to minimize pain and suffering of deer taken by this method.

WS employs methods as humanely as possible by applying measures to minimize pain and that allow wildlife captured to be addressed in a timely manner to minimize distress. Through the establishment of WS Directives and SOPs that guide WS in the use of methods to address damage and threats associated with deer in the State, the cumulative impacts on the issue of method humaneness are minimal. All methods would be evaluated annually to ensure measures and SOPs are adequate to ensure those methods continue to be used to minimize suffering and that wildlife captured are addressed in a timely manner to minimize distress.

Issue 5 – Effects on Aesthetic Values

The activities of WS would result in the removal of deer from those areas where damage or threats were occurring. Therefore, the aesthetic value of deer 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 deer densities, including the return of native wildlife and plant species that may be suppressed or displaced by high deer densities.

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 deer 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 deer.

Deer population objectives are established and enforced by the NCWRC through the regulating of deer take during the statewide hunting season and through the issuance of depredation permits after consideration of other known mortality factors. Therefore, WS has no direct impact on the status of the deer population since all take by WS occurs at the discretion of the NCWRC. Since those persons seeking assistance could remove deer from areas where damage is occurring through depredation permits issued by the NCWRC, WS' involvement would have no effect on the aesthetic value of deer in the area where damage was occurring. When a depredation permit has been issued by the NCWRC to a property owner and/or manager that is experiencing damage caused by deer, the removal of deer under that permit would likely occur whether WS was involved with taking the deer or not.

Therefore, the activities of WS are not expected to have any cumulative adverse affects 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 NCWRC who are responsible for regulating a resident wildlife species, like deer.

Issue 6 - Effects on Regulated White-tailed Deer Hunting

The magnitude of WS' deer take for damage management purposes from FY 2005 through FY 2010 was low when compared to the total take of deer and when compared to the estimated statewide population. Since all take of deer is regulated by the NCWRC, the take of deer by WS that would occur annually and cumulatively would occur pursuant to deer population objectives established in the State. WS' take of up to 1,500 deer annually to alleviate damage would be a minor component to the known take that occurs annually from other known mortality factors. If requested by the NCWRC during a disease outbreak in the deer population, the EA evaluated the lethal take of up to 10,000 deer annually by WS (USDA 2005). With oversight of deer take, the NCWRC maintains the ability to regulate take by WS to meet management objectives for deer in the State, including those taken by WS during a disease outbreak. Therefore, the cumulative take of deer is considered as part of the objectives established by the NCWRC for deer populations in the State.

XVI. SUMMARY OF CUMULATIVE IMPACTS

No significant cumulative environmental impacts are expected from any of the five alternatives, including the proposed action. Under the proposed action, the lethal removal of deer by WS would not have significant impacts on statewide deer populations. No risk to public safety is expected when activities are provided and accepted by requesting individuals in Alternative 2, Alternative 3, Alternative 4, and Alternative 5 since only trained and experienced personnel would conduct and recommend damage management activities. There is a slight increased risk to public safety when persons who reject assistance and recommendations conduct their own activities, and when no assistance is provided in

Alternative 1. In all Alternatives, however, risk to public safety would not be increased to the point that the impacts would be significant. Although some persons would likely be opposed to deer damage management activities in the State, the analysis in this EA indicates that an integrated approach to managing damage and threats caused by deer would not result in significant cumulative adverse impacts on the quality of the human environment.

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APPENDIX A
FEDERALLY LISTED T&E SPECIES IN NORTH CAROLINA

Listings and occurrences for North Carolina

Notes:

- **This report shows the listed species associated in some way with this state.**
- **This list does not include experimental populations and similarity of appearance listings.**
- **This list includes non-nesting sea turtles and whales in State/Territory coastal waters.**
- **This list includes species or populations under the sole jurisdiction of the National Marine Fisheries Service.**

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

Status	Species
E	Bat, Indiana (*Myotis sodalis*)
E	Bat, Virginia big-eared (*Corynorhinus (=Plecotus) townsendii virginianus*)
E	Butterfly, Saint Francis' satyr (*Neonympha mitchellii francisci*)
T	Chub, spotfin Entire (*Erimonax monachus*)
E	Elktoe, Appalachian (*Alasmidonta raveneliana*)
E	Heelsplitter, Carolina (*Lasmigona decorata*)
E	Manatee, West Indian (*Trichechus manatus*)
E	Pearlymussel, littlewing (*Pegias fabula*)
T	Plover, piping except Great Lakes watershed (*Charadrius melodus*)
E	Sawfish, smalltooth (*Pristis pectinata*)
T	Sea turtle, green except where endangered (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Shiner, Cape Fear (*Notropis mekistocholas*)
T	Silverside, Waccamaw (*Menidia extensa*)
T	Snail, noonday (*Mesodon clarki nantahala*)
E	Spider, spruce-fir moss (*Microhexura montivaga*)
E	Spinymussel, Tar River (*Elliptio steinstansana*)
E	Squirrel, Carolina northern flying (*Glaucomys sabrinus coloratus*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate northeast U.S. nesting pop. (*Sterna dougallii dougallii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
E	Whale, sperm (*Physeter catodon (=macrocephalus)*)
E	Woodpecker, red-cockaded (*Picoides borealis*)

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

Status	Species
E	Beetle, American burying (*Nicrophorus americanus*)
E	Mussel, oyster Entire Range; Except where listed as Experimental Populations (*Epioblasma capsaeformis*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Riffleshell, tan (*Epioblasma florentina walkeri (=E. walkeri)*)
E	Wolf, gray Lower 48 States, except MN and where EXPN. Mexico. (*Canis lupus*)

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

Status	Species
E	Bat, gray (*Myotis grisescens*)
E	Bean, Cumberland (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Villosa trabalis*)
E	Spinymussel, James (*Pleurobema collina*)
E	Stork, wood AL, FL, GA, SC (*Mycteria americana*)
T	Tern, roseate Western Hemisphere except NE U.S. (*Sterna dougallii dougallii*)
E	Wolf, red except where EXPN (*Canis rufus*)

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

Status	Species
T	Amaranth, seabeach (*Amaranthus pumilus*)
E	Arrowhead, bunched (*Sagittaria fasciculata*)
E	Avens, spreading (*Geum radiatum*)
E	Bittercress, small-anthered (*Cardamine micranthera*)
T	Blazingstar, Heller's (*Liatris helleri*)
E	Bluet, Roan Mountain (*Hedyotis purpurea var. montana*)
E	Chaffseed, American (*Schwalbea americana*)
E	Coneflower, smooth (*Echinacea laevigata*)
E	Dropwort, Canby's (*Oxypolis canbyi*)
T	Goldenrod, Blue Ridge (*Solidago spithamaea*)
E	Harperella (*Ptilimnium nodosum*)
T	Heartleaf, dwarf-flowered (*Hexastylis naniflora*)
T	Heather, mountain golden (*Hudsonia montana*)
E	Irisette, white (*Sisyrinchium dichotomum*)
T	Joint-vetch, sensitive (*Aeschynomene virginica*)
E	Lichen, rock gnome (*Gymnoderma lineare*)
E	Loosestrife, rough-leaved (*Lysimachia asperulaefolia*)
E	Meadowrue, Cooley's (*Thalictrum cooleyi*)

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

Status	Species
T	Pink, swamp (*Helonias bullata*)
E	Pitcher-plant, green (*Sarracenia oreophila*)
E	Pitcher-plant, mountain sweet (*Sarracenia rubra ssp. jonesii*)
T	Pogonia, small whorled (*Isotria medeoloides*)
E	Pondberry (*Lindera melissifolia*)
E	Sedge, golden (*Carex lutea*)
T	Spiraea, Virginia (*Spiraea virginiana*)
E	Sumac, Michaux's (*Rhus michauxii*)
E	Sunflower, Schweinitz's (*Helianthus schweinitzii*)