ENVIRONMENTAL ASSESSMENT

MANAGEMENT OF CROW DAMAGE IN THE STATE OF MARYLAND

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ACRONYMS

APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
BBS	Breeding Bird Surveys
BO	Biological Opinion
CBC	Christmas Bird Counts
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
FR	Federal Register
FY	Federal Fiscal Year
LD_{50}	Acute Lethal Dose
MBTA	Migratory Bird Treaty Act
MD	Maryland
MDNR	Maryland Department of Natural Resources
MOU	Memorandum of Understanding
NAS	National Audubon Society
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NWRC	National Wildlife Research Center
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Department of Interior, Fish and Wildlife Service
WS	Wildlife Services

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 PURPOSE

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS)[1] program in Maryland continues to receive requests for assistance to resolve or prevent damage occurring to agricultural resources, natural resources, and property, including threats to human safety, associated with American crows (*Corvus brachyrhynchos*) and the fish crows (*Corvus ossifragus*). American crows and fish crows are collectively referred to as crows in this environmental assessment (EA) because of the difficulty of visually distinguishing the two species. These species occupy the same general range in Maryland, although fish crows are less abundant in the western part of the State. Also, both species have similar nesting, feeding, and roosting habits (Robbins and Blom 1996). Normally, individual wildlife damage management actions conducted by the WS program could be categorically excluded from further National Environmental Policy Act (NEPA) analysis, in accordance with APHIS implementing regulations for NEPA (7 CFR 372.5(c), 60 FR 6000-6003).

WS is preparing this EA to: 1) facilitate planning, 2) promote interagency coordination, 3) streamline program management, 4) clearly communicate to the public the analysis of individual and cumulative impacts of program activities; and 5) evaluate and determine if there are any potentially significant or cumulative adverse affects from the proposed program. The analyses contained in this EA are based on information derived from WS' Management Information System, published documents (Appendix A), interagency consultations, public involvement, and the analyses in WS' programmatic Final Environmental Impact Statement (FEIS)[2] (USDA 1997).

The EA evaluates the need for action to manage damage associated with crows in the State, the potential issues associated with crow damage management, and the environmental consequences of conducting different alternatives to address the need for action and the identified issues. The issues and alternatives were initially developed by WS and the United States Fish and Wildlife Service (USFWS) in consultation with the Maryland Department of Natural Resources (MDNR). To assist with the identification of additional issues and alternatives to managing damage associated with crows in Maryland, the pre-decisional EA will be available to the public for review and comment prior to the issuance of a Decision[3].

1.2 NEED FOR ACTION

Some species of wildlife have adapted to and thrive in human altered habitats. Those species, in particular, are often responsible for the majority of conflicts between humans and wildlife that lead to requests for assistance to reduce damage to resources and to lessen the threat to human safety. WS' programmatic FEIS summarizes the relationship of wildlife values and wildlife damage in this way (USDA 1997):

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[1]The WS program is authorized to protect agriculture and other resources from damage caused by wildlife through the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c). WS' mission, developed through its strategic planning process, is to provide leadership in wildlife damage management in the protection of agricultural, industrial and natural resources and to safeguard public health and safety. WS' activities are conducted to prevent or reduce wildlife damage to agricultural resources, natural resources, property, and threats to public health and safety on private and public lands in cooperation with governmental entities and local agencies, private organizations, and individuals (See Appendix B for more detail).

[2]WS' has prepared a programmatic FEIS that further addresses WS' activities to manage damage associated with wildlife, including detailed discussion of program activities, risk assessment of methods, and discussion of issues (USDA 1997). Information from WS' programmatic FEIS has been incorporated by reference into this EA. WS' FEIS may be obtained by contacting USDA/APHIS/WS, Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

[3]After the development of the EA by WS, the USFWS and consulting agencies and after public involvement in identifying new issues and alternatives, WS and the USFWS will issue a Decision. Based on the analyses in the EA after public involvement, a decision will be made to either publish a Notice of Intent to prepare an Environmental Impact Statement or a Finding of No Significant Impact will be noticed to the public in accordance to NEPA and the Council of Environmental Quality regulations.

"*Wildlife has either positive or negative values, depending on varying human perspectives and circumstances...Wildlife is generally regarded as providing economic, recreational and aesthetic benefits...and the mere knowledge that wildlife exists is a positive benefit to many people. However... the activities of some wildlife may result in economic losses to agriculture and damage to property...Sensitivity to varying perspectives and values are required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well*".

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

The alleviation of damage or other problems caused by or related to the behavior of wildlife is termed wildlife damage management and is recognized as an integral component of wildlife management (The Wildlife Society 1992). Wildlife damage management is not based on punishing offending animals, but is a means to reduce future damage. The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated and the need for damage management is derived from the specific threats to resources. Those species have no intent to do harm. They utilize habitats (*e.g.,* reproduce, walk, forage, deposit feces) 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 (Loker et al. 1999).

Wildlife management is often based on balancing wildlife populations and human perceptions, in a struggle to preserve rare species, regulate species populations, oversee consumptive uses of wildlife, and conserve the environment that provides habitat for wildlife resources. Increasingly, cities, towns, parks, airports, and private properties have become sites of some of the greatest challenges for wildlife management (Adams et al. 2006). When the presence of a prolific, adaptable species is combined with human expansion, land management conflicts often develop. Birds are generally regarded as providing ecological, educational, economic, recreational, and aesthetic benefits (Decker and Goff 1987), and there is enjoyment in knowing wildlife exists and contributes to natural ecosystems (Decker et al. 2001).

Birds add an aesthetic component to the environment, sometimes provide opportunities for recreational hunting, and like all wildlife, provide people with valued close contact with nature. Many people, even those experiencing damage, consider those species of birds addressed in this EA to be a charismatic and valuable component of their environment; however, tolerance differs among individuals (Smith et al. 1999). Because of their prolific nature, site tenacity, longevity, size, and tolerance of human activity, many bird species are often associated with situations where damage or threats can occur. For example, crows are extremely adaptable and may use the resources provided by humans in urban landscapes for

nesting, raising young, molting, feeding, and loafing.

Damage caused by birds can be difficult to manage because they are highly mobile, able to exploit a variety of habitat types within a given area, and cannot be permanently excluded from large areas. It is rarely desirable or possible to remove or disperse all problem birds from an area, but with a proper management scheme, the number of nuisance birds and associated problems may be reduced to a level that can be tolerated. Additionally, management of bird-related problems often exceeds the capabilities of individual people to reduce damage to tolerable levels. In Maryland, problem situations associated with birds typically involve, but are not limited to, unacceptable accumulations of feces in public-use areas, damage to agricultural and natural resources, and unacceptable safety hazards for vehicles (airplanes). Those problems frequently occur on private properties, in residential communities, apartment/condominium complexes, municipal parks, schools, hospitals, natural/habitat restoration sites, corporate and industrial sites, office complexes, roadways, airports, and other areas (USDA 1997).

The need for action to manage damage associated with crows in Maryland arises from requests for assistance received to reduce and prevent damage from occurring to four major categories. Those four major categories include agricultural resources, natural resources, property, and threats to human safety. In Maryland, WS continues to receive requests for assistance[4] from governmental and private entities to manage damage and threats associated with crows in the State.

WS continues to receive requests for assistance from governmental and private entities to manage damage and threats associated with crows in the State. Damage and threats caused by crows in Maryland occurs primarily to property and human safety but damages also occur to agricultural resources and natural resources. Accumulations of fecal dropping from crows and threats of aircraft strikes are the primary cause of property damage requiring constant repair and clean-up and can be aesthetically displeasing. WS often receives requests regarding the aesthetically displeasing sight and odor of large accumulation of fecal droppings that occur under crow roosts. Crows often form large winter communal crow roosts that can exceed 10,000 crows. The number of crows in a roost location varies but has been reported from a few hundred crows to more than 500,000 crows at some roosts in the United States (Gorenzel and Salmon 1992). However, most communal crow roosts in Maryland are thought to be less than 1,000 birds. Damage and threats can also occur to natural resources when crows predate on other native wildlife species. Threats to human safety also occur from risks associated with disease transmission in areas where the public is likely to encounter accumulations of droppings. Threats can also occur to property and human safety from the potential for aircraft to strike crows at airports. Agricultural damage occurs when crows consume crops and defecate on stored grain which can lead to economic losses to agricultural producers.

WS has received and responded to 405 technical assistance requests in the Commonwealth from the federal fiscal year[5] (FY) 2001 through FY 2008. Technical assistance is provided by WS to those requesting assistance with resolving damage or the threat of damage by providing information and recommendations on crow damage management activities that can be conducted by the requestor without WS' direct involvement in managing or prevent the damage. WS' technical assistance activities will be discussed further in Chapter 3 of this EA.

The technical assistance projects conducted by WS are representative of the damage and threats that are caused by crows in the State. Many of those projects involved crow damage or threats of damage to

[4]WS only conducts bird damage management after receiving a request for assistance. Before initiating bird damage 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 will allow to be used on property they own and/or manage.

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

multiple resources. Since FY 2001, WS has provided information on resolving damage to agricultural resources during four technical assistance projects in the State. Damage to agricultural resources occurs from birds directly consuming crops, damages that occur from consuming the crop (*e.g.*, disease introduction to damaged areas of the plant), feeding on livestock feed, defecating in livestock feed and water, and the risk of disease transmission. A total of 75 technical assistance projects have been conducted involving crow damage to property since FY 2001 in the State with 77 projects conducted involving human health and safety concerns. Requests for WS' assistance are often received to reduce the threat of disease transmission and the threat of aircraft striking crows at airports. Most requests for assistance received by WS involving threats to human safety arise from the risks associated with disease transmission from fecal droppings left by crows in public areas where the public may encounter feces. Aircraft striking birds can cause catastrophic failure of the aircraft which has the potential to threaten passenger safety if the aircraft is unable to make a safe landing. WS has also conducted eight technical assistance projects since FY 2001 involving damage or the threat of damage to threatened and endangered (T&E) species in the State. In addition, the WS program in the Maryland has conducted 241 technical assistance projects since FY 2001 involving crows where no resource conflict was indicated but general information or assistance was provided with concerns about dead crows relating to the West Nile Virus, injured crows, and general information regarding crow biology and behavior.

As stated previously, the need for action arises from requests received from State, federal, and private entities to provide assistance with resolving damage or threats of damage to four main categories of resources in Maryland that include agricultural resources, natural resources, property, and human safety. More specific information regarding crow damage to those main categories are discussed in the following subsections of the EA:

Need to Resolve Crow Damage to Agricultural Resources

Besser (1985) estimated damage to agricultural crops associated with birds exceeded $100 million annually in the United States. Bird damage to agricultural crops occurs primarily from consumption (loss of the crop and revenue), damage to fruits associated with feeding, and fecal contamination.

Fruit and nut crops can be damaged by crows from direct consumption, from damage associated with pecking, and damage from fruit falling from trees and bushes during feeding. Besser (1985) estimated bird damage, including crow damage, to grapes, cherries, and blueberries exceed $1 million dollars annually in the United States.

Damage to apples occurs from beak punctures which makes the apples unmarketable (Besser 1985). Crows have been documented as causing damage to apples (Mitterling 1965). Damage is infrequently reported in apples since harvest of the crop typically occurs before apples reach a stage when damage is likely with damage being greatest during periods of drought (Mitterling 1965). Bird damage to apples is likely localized in Maryland and infrequently reported.

Bird damage to sweet corn can also result in economic losses to producers with damage often amplified since damage to sweet corn caused by birds makes the ear of corn unmarketable since damage is unsightly to the consumer (Besser 1985). Damage occurs when birds rip or pull back the husk exposing the ear for consumption. Most bird damage occurs during the development stage known as the milk and dough stage when the kernels are soft and filled with a milky liquid which the birds puncture to ingest the contents. Once punctured, the area of the ear damage often discolors and is susceptible to disease introduction into the ear (Besser 1985). Damage usually begins at the tip of the ear as the husk is ripped and pulled back but can occur anywhere on the ear (Besser 1985). Damage can also occur to sprouting corn as crows pull out the sprout or dig the sprout up to feed on the seed kernel (Stone and Mott 1973, Besser 1985).

Economic damage can also occur from crows feeding on livestock feed, from birds feeding on livestock, and from the increased risks of disease transmission associated with large concentrations of birds. Although individual or small groups of crows can cause economic damage to livestock producers, most economic damage occurs from crows that congregate in large flocks at livestock operations.

Although damage and disease threats to livestock operations can occur throughout the year, damage is highest during those periods when birds are concentrated into large flocks such as migration periods and during winter months when food sources are limited. The flocking behavior of crows either from roosting and/or nesting behavior can lead to economic losses to agricultural producers from the consumption of livestock feed and the from the increased risks associated with the transmission of diseases from fecal matter being deposited in feeding areas and in water used by livestock.

Need to Resolve Crow Damage Occurring to Property

Property damage associated with crows can occur in a variety of ways and can result in costly repairs and clean-up. Crows are gregarious (form large flocks) especially during the fall and spring migration periods. Although damage and threats can occur throughout the year, damage is highest during those periods when crows are concentrated into large flocks such as migration periods and during winter months when food sources are limited. The flocking behavior of crows during migration periods can pose increased risks when flocks of crows occur near or on airport properties. Aircraft striking multiple crows can increase the damage occurring to the aircraft but also increases the risk that a catastrophic failure of the aircraft might occur, especially if multiple crows are ingested into aircraft engines.

Crows often roost in large numbers. Fecal droppings often accumulate under areas where crows roost and loaf. Concerns are often raised about disease transmission to people that encounter fecal droppings on their property. The odor and aesthetically displeasing presence of fecal droppings at roost sites can also be a concern. The reoccurring presence of fecal dropping under crow roosts can lead to constant cleaning costs for property owners. Damage can also occur to property from crows pulling and tearing trim and rubber material on buildings and pulling on and tearing windshield wiper blades on vehicles.

Accumulated bird droppings can reduce the functional life of some building roofs by 50% (Weber 1979). Corrosion damage to metal structures and painted finishes, including those on automobiles, can occur because of uric acid from bird droppings. Electrical utility companies frequently have problems with birds and bird droppings causing power outages by shorting out transformers and substations.

Need to Resolve Threats that Birds Pose to Human Safety

Crows can be closely associated with human habitation and often exhibit gregarious roosting behavior. The close association of crows with human activity can pose threats to human safety from disease transmission, threaten the safety of air passengers if crows are struck by aircraft, excessive droppings can be aesthetically displeasing, and aggressive behavior can pose risks to human safety.

Birds can play an important role in the transmission of zoonotic diseases where humans may come into contact with fecal droppings of those birds. Few studies are available on the occurrence and transmission of zoonotic diseases in wild birds. Study of this issue is complicated by the fact that some disease-causing agents associated with birds may also be contracted from other sources. The risk of disease transmission from birds to humans is likely very low. However, human exposure to fecal droppings through direct contact or through the disturbance of accumulations of fecal droppings where disease organisms are known to occur increases the likelihood of disease transmission. The gregarious behavior of crows leads to accumulations of fecal droppings that can be considered a threat to human health and

safety due to the close association of those species of birds with human activity. Accumulations of bird droppings in public areas are aesthetically displeasing and are often in areas where humans may come in direct contact with fecal droppings.

Birds can play an important role in the transmission of zoonotic diseases to humans such as encephalitis, West Nile Virus, psittacosis, and histoplasmosis. Public health officials and residents at such sites express concerns for human health related to the potential for disease transmission where fecal droppings accumulate. Fecal droppings that accumulate from large communal bird roosts can facilitate the growth of disease organisms which grow in soils enriched by bird excrement, such as *Histoplasma capsulatum* (Weeks and Stickley 1984, Lenhart et al. 1997).

While transmission of disease or parasites from birds to humans has not been well documented, the potential exists (Luechtefeld et al. 1980, Wobeser and Brand 1982, Hill and Grimes 1984, Pacha et al. 1988, Blandespoor and Reimink 1991, Graczyk et al. 1997, Saltoun et al. 2000). In worst case scenarios, infections may even be life threatening for immunocompromised and immunosuppressed people (Roffe 1987, Graczyk et al. 1998). Even though many people are concerned about disease transmission from feces, the probability of contracting disease from feces is believed to be small. Financial costs related to human health threats involving crows may include cleaning and sanitizing public-use areas, contacting and obtaining assistance from public health officials, and implementing non-lethal and lethal methods of wildlife damage management. WS recognizes and defers to the authority and expertise of local and state health officials in determining what does or does not constitute a threat to public health.

In addition to threats of zoonotic diseases, crows also pose a threat to human safety from being struck by aircraft. Crows struck by aircraft, especially when ingested into engines, can lead to structural damage to the aircraft and lead to catastrophic engine failure. The civil and military aviation communities have acknowledged that the threat to human health and safety from aircraft collisions with wildlife is increasing (Dolbeer et al. 2000, MacKinnon et al. 2001). Collisions between aircraft and wildlife are a concern throughout the world because they 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. From 1990 through 2008, there have been 236 reported strikes with American crows in the United States resulting in 5,562 hours of aircraft down time and nearly $1.3 million in reported repair costs (Dolbeer et al. 2009). In addition, there have been 218 reported strikes with an unidentified crow species involving 905 hours of aircraft down time and approximately $144,000 in aircraft damages (Dolbeer et al. 2009). Since 1990, 13 strikes have been reported in Maryland involving aircraft striking crows in the State (Federal Aviation Administration 2009).

When in large flocks or flight lines entering or exiting a roost at or near airports or when present in large flocks foraging, crows can present a safety threat to aviation. Generally, bird collisions occur when aircraft are near the ground during take-off and approach to the runway. From 1990-2007, approximately 60% of reported bird strikes to United States civil aviation occurred when the aircraft was at an altitude of 100 feet above ground level or less. Additionally, 73% occurred less than 500 feet above ground level and approximately 92% occurred under 3,000 feet above ground level (Dolbeer and Wright 2008).

Other impacts of crows on human health and safety result from the aggressive behavior exhibited by crows during the nesting season. Crows can aggressively defend their nests, nesting areas, and young, and may attack or threaten pets, children, and adults. Additionally, slipping hazards can be created by the buildup of feces from crows in public-use areas.

Need to Resolve Crow Damage Occurring to Natural Resources

Crows are considered omnivorous, consuming a variety of invertebrates, amphibians, reptiles, mammals, and small birds, including birds' eggs, nestlings, and fledglings as well as grain crops, seeds, fruits, carrion, and discarded human food (Verbeek and Caffrey 2002). With crows, the primary concern to natural resources occurs from predation on T&E species. In Maryland, crows have been documented feeding on piping plover (*Charadrius melodus*) eggs and nestlings. Piping plovers are currently considered a threatened species by the USFWS and an endangered species in the State by the MDNR. Although WS has not been requested previously to conduct crow damage management activities to reduce predation by crows on T&E species, WS could be requested to provide assistance in the future.

Large accumulations of fecal droppings under crow roost could have a detrimental impact on desirable vegetation. A study conducted in Oklahoma found fewer annual and perennial plants in locations where crows roosted over several years (Hicks 1979).

Examples of Crow Damage in Maryland

In 2002, the management of an apartment complex contacted WS regarding several hundred crows loafing on buildings and roosting in trees on apartment property. Fecal droppings from the nightly roosting and daily loafing of crows at the complex on the building structure, windows, sidewalks, and vehicles in the parking lots required constant cleaning and was aesthetically displeasing to management and residents. The management of the complex attempted to disperse the roosting using harassment methods prior to contacting WS with no success. WS provided technical assistance with identifying additional harassment methods and effective ways on implementing non-lethal methods to discourage crows from roosting in the area.

In 2003, a business owner contacted WS regarding a flock of an estimated 2,000 crows that would stage on and around the building nightly and roost in a woodlot adjacent to the building property. Fecal droppings from the crows on the building, windows, sidewalks, and vehicles in the parking lot required constant cleaning and were aesthetically displeasing to the owner and to the public using the business. Prior use of harassment methods to disperse crows by the business owner was unsuccessful. WS provided the business owner with technical assistance and demonstrated the use of pyrotechnics and lasers as additional harassment methods to discourage crows from loafing and roosting in the area.

WS was contacted by a municipality in 2006 about crows staging in stands of trees and roosting in pine trees on several properties within the city. A survey of the site estimated 8,000 to 10,000 crows were roosting nightly in the city. Similar to previous examples, fecal droppings from the staging and roosting crows were causing accumulations of droppings on buildings, vehicles, windows, sidewalks, and trees which was aesthetically displeasing to many residents, business owners and patrons and required constant cleaning. Complaints were also received about the ammonia odor emanating from the accumulations of fecal droppings at the roost locations. City personnel had attempted to disperse the crows using pyrotechnics over several years with no success. WS provided technical assistance and demonstrated the use of a laser to harass the crows. WS also provided direct operational assistance through the direct use of pyrotechnics, propane cannons, lights, and lasers in an attempt to disperse the roosts. Despite five nights of intense harassment with non-lethal methods, the crows did not disperse.

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Actions Analyzed

This EA evaluates the need for crow damage management to reduce threats to human safety and to

resolve damage to property, natural resources, and agricultural resources on federal, state, tribal, municipal, and private land within the State of Maryland wherever such management is requested by a cooperator. This EA discusses the issues associated with conducting crow damage management in the State to meet the need for action and evaluates different alternatives to meeting that need while addressing those issues.

Native American Lands and Tribes

Currently, WS does not have a Memorandum of Understanding (MOU) or signed cooperative service agreements with any Native American tribe in Maryland. If WS enters into an agreement with a tribe for crow damage management, this EA would be reviewed and supplemented, if appropriate, to insure compliance with the NEPA.

Period for which this EA is Valid

If the analyses in this EA indicates an Environmental Impact Statement (EIS) is not warranted, this EA will remain valid until WS in consultation with the USFWS and the MDNR determines that new needs for action, changed conditions, new issues, or new alternatives having different environmental impacts must be analyzed. At that time, this analysis and document will be reviewed and supplemented pursuant to the NEPA. Review of the EA will be conducted each year to ensure that the EA is sufficient. This process ensures the EA is complete and still appropriate to the scope of crow damage management activities conducted by WS in Maryland.

Site Specificity

This EA analyzes the potential impacts of crow damage management and addresses activities on all private and public lands in Maryland under MOU, cooperative service agreement, and in cooperation with the appropriate public land management agencies. It also addresses the impacts of crow damage management on areas 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 crow damage management efforts could occur. Thus, this EA anticipates the potential expansion and analyzes the impacts of such efforts as part of the program.

Planning for the management of crow damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will 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 crow damage will occur can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. This EA emphasizes major issues as they relate to specific areas whenever possible; however, many issues apply wherever crow damage and resulting management occurs, and are treated as such. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in Maryland.

The analyses in this EA are intended to apply to any action that may occur *in any locale* and at *any time* within Maryland. 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.

Summary of Public Involvement

Issues related to crow damage management as conducted by WS in Maryland were initially developed by WS in consultation with the USFWS and the MDNR. Issues were defined and preliminary alternatives were identified through the scoping process. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS' NEPA implementing regulations, this document is being noticed to the public through legal notices published in local print media, through direct mailings to parties that have requested to be notified or have been identified to have an interest in the reduction of threats and damage associated with crows in the State, and by posting the pre-decisional EA on the APHIS website at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml.

WS will provide for a minimum of a 30-day comment period for the public and interested parties to provide new issues, concerns, and/or alternatives. Through the public involvement process, WS will clearly communicate to the public and interested parties the analyses of potential environmental impacts on the quality of the human environment. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA should be revisited and, if appropriate, revised prior to issuance of a final Decision or publication of a notice of intent to prepare an EIS. New issues or alternatives identified from the public involvement process will be fully considered.

1.4 DECISION TO BE MADE

Based on agency relationships, MOUs, and legislative authorities, WS is the lead agency for this EA, and therefore, responsible for the scope, content, and decisions made. Management of migratory birds, including crows, is the responsibility of the USFWS. As the authority for the management of crow populations in the State, the USFWS was involved in the development of the EA and provided input throughout the EA preparation process to ensure an interdisciplinary approach according to the NEPA and agency mandates, policies, and regulations. The MDNR is responsible for managing wildlife in the State of Maryland, including crows. The MDNR establishes and enforces regulated hunting seasons in the State, including a season that allows the take of crows in the State. WS' activities to reduce and/or prevent crow damage in the State will be coordinated with the MDNR which ensure WS' actions are incorporated into population objectives established by the MDNR for crows in the State.

Based on the scope of this EA, the decisions to be made are: 1) should WS conduct crow damage management to alleviate damage to agriculture, property, natural resources, and threats to human safety, 2) should WS conduct disease surveillance and monitoring in the crow population when requested by the MDNR and the USFWS, 3) should WS implement an integrated wildlife damage management strategy, including technical assistance and direct operation assistance, to meet the need for crow damage management in Maryland, 4) if not, should WS attempt to implement one of the alternatives to an integrated damage management strategy as described in the EA, and 5) would the proposed action result in adverse impacts to the environment requiring the preparation of an EIS.

1.5 RELATIONSHIP OF THIS DOCUMENT TO OTHER ENVIRONMENTAL DOCUMENTS

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.

Environmental Assessment: Wildlife Damage Management at Baltimore/Washington International Airport, Maryland - The EA evaluated potential impacts to the quality of the human environment from

the implementation of a damage management program to address threats of property damage and threats to human safety associated with wildlife at the Baltimore/Washington International Thurgood Marshall Airport (BWI Marshall) and surrounding areas in Maryland (USDA 2003)[6]. The EA evaluated the need for damage management and the relative effectiveness of alternatives to meet that proposed need, while accounting for the potential environmental effects of those activities. WS' proposed action in the EA implements an integrated damage management program on airport property and adjacent properties (within 2 miles of airport property) to fully address the need for reducing threats associated with wildlife while minimizing impacts to the human environment. After consideration of the analysis contained in the pre-decisional EA and review of public comments, a Decision and Finding of No Significant Impact (FONSI) for the EA was signed on October 7, 2003. Based on a changing need for action, a supplement to the EA was prepared and a new FONSI for the supplement was signed on June 2, 2008.

1.6 AUTHORITY OF FEDERAL AND STATE AGENCIES

WS' Legislative Authority

The primary statutory authorities for WS' program are the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c)

U.S. Fish and Wildlife Service Authority

The USFWS is responsible for managing and regulating take of bird species that are listed as migratory under the Migratory Bird Treaty Act (MBTA), and those that are listed as threatened or endangered under the Endangered Species Act (ESA). The USFWS authority for action is based on the MBTA of 1918 (as amended), which implements treaties with the United States, Great Britain (for Canada), the United Mexican States, Japan, and the former Soviet Union. Section 3 of this Act authorized the Secretary of Agriculture:

"From time to time, having due regard to the zones of temperature and distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, to determine when, to what extent, if at all, and by what means, it is compatible with the terms of the convention to allow hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any such bird, or any part, nest, or egg thereof, and to adopt suitable regulations permitting and governing the same, in accordance with such determinations, which regulations shall become effective when approved by the President."

The authority of the Secretary of Agriculture, with respect to the Migratory Bird Treaty, was transferred to the Secretary of the Interior in 1939 pursuant to Reorganization Plan No. II. Section 4(f), 4 FR 2731, 53 Stat. 1433. The USFWS is also responsible for the protection and management of those populations, species, and subspecies that are considered threatened or endangered under the ESA.

United States Environmental Protection Agency (EPA)

The EPA is responsible for implementing and enforcing the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) which regulates the registration and use of pesticides, including avicides available for use to lethally take crows.

[6]Copies of the EA and the associated Decision/Finding of No Significant Impact are available for review by sending a request to State Director, USDA-APHIS-WS, 1568 Whitehall Road, Annapolis, MD 21409 or by visiting the APHIS website at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml.

Maryland Department of Natural Resources Legislative Authority

The MDNR, with the guidance of the Wildlife Advisory Commission, is specifically charged by the General Assembly with the management of the state's wildlife resources (Annotated Code of Maryland, Title 10, Subtitle 2). The primary statutory authorities include the protection, reproduction, care, management, survival, and regulation of wild animal populations regardless of whether the wild animals are present on public or private property in Maryland (Annotated Code of Maryland, Title 10, Subtitle 2, 10-202 through 10-212). The MDNR Wildlife and Heritage Service shall administer this article. Crows are classified as an upland game bird (Annotated Code of Maryland, Title 10, Subtitle 1, 10-101). Annotated Code of Maryland, Title 10, Subtitle 4, 10-405 authorizes the Department to authorize hunting seasons for upland game birds, including crows.

As the agency responsible for managing the wildlife resources of the State, the MDNR has the authority to reduce wildlife populations in any county, election district, or other identifiable area of the State, when thorough investigation reveals that such populations are seriously injurious to agricultural or other interests in the affected area (Annotated Code of Maryland, Title 10, subtitle 2, 10-206). Furthermore, Annotated Code of Maryland, Title 10, subtitle 4, 10-405, requires the Department to adopt the maximum hunting season for crows allowed by federal regulation and to adopt state regulations that allow control of nuisance crows as permitted by federal law. The regulations allowing control of nuisance and depredating crows can be found in the Code of Maryland Regulations 08.03.05.05.

Maryland Department of Agriculture Authority

The Pesticide Regulation Section of the Maryland Department of Agriculture enforces State laws pertaining to the use and application of pesticides. Under the Maryland Pesticide Applicators Law this Section monitors the use of pesticides in a variety of pest management situations. It also licenses private and commercial pesticide applicators and pesticide contractors. Under the Maryland Pesticide Applicators Law the Section licenses restricted use pesticide dealers and registers all pesticides for sale and distribution in the State of Maryland.

1.7 COMPLIANCE WITH LAWS AND STATUTES

National Environmental Policy Act

All federal actions are subject to the NEPA (Public Law 9-190, 42 U.S.C. 4321 et seq.). WS follows CEQ regulations implementing the NEPA (40 CFR 1500 et seq.), USDA (7 CFR 1b), and APHIS Implementing Guidelines (7 CFR 372) as part of the decision-making process. Those laws, regulations, and guidelines generally outline five broad types of activities to be accomplished as part of any project: public involvement, analysis, documentation, implementation, and monitoring. The NEPA also sets forth the requirement that all major federal actions be evaluated in terms of their potential to significantly affect the quality of the human environment for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts. Federal activities affecting the physical and biological environment are regulated in part by CEQ through regulations in 40 CFR, Parts 1500-1508. In accordance with CEQ and USDA regulations, APHIS guidelines concerning Implementation of NEPA Procedures, as published in the Federal Register (44 CFR 50381-50384) provide guidance to APHIS regarding the NEPA process.

Pursuant to the NEPA and CEQ regulations, this EA documents the analyses resulting from federal actions, informs decision-makers, and the public of reasonable alternatives capable of avoiding or minimizing adverse impacts, and serves as a decision-aiding mechanism to ensure that the policies and goals of the NEPA are infused into federal agency actions. This EA was prepared by integrating as many of the natural and social sciences as warranted, based on the potential effects of the proposed action. The

direct, indirect, and cumulative impacts of the proposed action are analyzed.

Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755), as Amended

The MBTA provides the USFWS regulatory authority to protect families of migratory birds. The law prohibits any "*take*" of migratory bird species by any entities, except as permitted by the USFWS. Under permitting guidelines in the Act, the USFWS may issue depredation permits to requesters experiencing damage caused by bird species protected under the Act. All actions conducted in this EA will be in compliance with the regulations of the MBTA, as amended.

In addition to the issuance of depredation permits for the take of migratory birds, the Act allows for the establishment of depredation orders that allow migratory birds to be taken without a depredation permit when certain criteria are met.

Depredation Order for Blackbirds, Cowbirds, Grackles, Crows, and Magpies (50 CFR §21.43)

Pursuant to the MBTA under 50 CFR §21.43, a depredation permit is not required to lethal take crows, including American crows and fish crows, when those species are found committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance.

Endangered Species Act

Under the ESA, all federal agencies will seek to conserve T&E species and will utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the USFWS to use the expertise of the USFWS to ensure that "*any action authorized., funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency will use the best scientific and commercial data available*" (Sec.7 (a) (2)).

WS obtained a Biological Opinion (BO) on programmatic activities from the USFWS in 1992 describing potential effects on T&E species, and prescribing reasonable and prudent measures for avoiding jeopardy (see Appendix F in USDA 1997). As part of the development of this EA, WS has also consulted with the USFWS regarding T&E species in Maryland in regards to crow damage management activities proposed which will be discussed in Chapter 4 of this EA.

National Historic Preservation Act (NHPA) of 1966, as amended

The NHPA and its implementing regulations (36 CFR §800) require federal agencies to initiate the section 106 process if an agency determines that the agency's actions are undertakings as defined in Sec. 800.16(y) and, if so, whether it is a type of activity that has the potential to cause effects on historic properties. If the undertaking is a type of activity that does not have the potential to cause effects on historic properties, assuming such historic properties were present, the agency official has no further obligations under section 106. None of the crow damage management methods described in this EA that might be used operationally by WS causes major ground disturbance, any physical destruction or damage to property, any alterations of property, wildlife habitat, or landscapes, nor involves the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, the site-specific consultation as required by

Section 106 of the NHPA would be conducted as necessary.

Noise-making methods, such as firearms, that are used at or in close proximity to historic or cultural sites for the purposes of hazing or removing nuisance wildlife have the potential for audible effects on the use and enjoyment of historic property. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage problem, which means such use, would be to the benefit of the historic property. A built-in mitigating factor for this issue is that virtually all the methods involved would only have temporary effects on the audible nature of a site and can be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects. Site-specific consultation as required by the Section 106 of the NHPA would be conducted as necessary in those types of situations.

Environmental Justice - Executive Order 12898

Executive Order 12898, entitled "*Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*" promotes the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Environmental justice is a priority within APHIS and WS. Executive Order 12898 requires federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of federal programs, policies and activities on minorities and persons or populations of low income. APHIS implements Executive Order 12898 principally through its compliance with the NEPA. All WS' activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minorities and persons or populations of low income.

Protection of Children - Executive Order 13045

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their physical and mental status. Because WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, WS has considered the impacts that this proposal might have on children. The proposed crow damage management program would occur by using only legally available and approved methods where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action.

Responsibilities of Federal Agencies to Protect Migratory Birds - Executive Order 13186

Executive Order 13186 requires each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations, is directed to develop and implement, a MOU with the USFWS that shall promote the conservation of migratory bird populations. WS has developed a draft MOU with the USFWS as required by this EO and is currently waiting for USFWS approval. WS will abide by the MOU once it is finalized and signed by both parties.

The Native American Graves and Repatriation Act of 1990

The Native American Graves Protection and Repatriation Act requires federal agencies to notify the Secretary of the Department that manages the federal lands upon the discovery of Native American

cultural items on federal or tribal lands. Federal projects would discontinue work until a reasonable effort has been made to protect the items and the proper authority has been notified.

Federal Insecticide, Fungicide, and Rodenticide Act

The FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing the FIFRA. All chemical methods integrated into the WS' program in Maryland, including the use of or recommendation of repellents are registered with and regulated by the EPA and the Maryland Department of Agriculture, and used or recommended by WS in compliance with labeling procedures and requirements.

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 the State's Coastal Zone Management Program.

CHAPTER 2: AFFECTED ENVIRONMENT AND ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of mitigation measures and/or standard operating procedures (SOP), and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Additional descriptions of affected environments will be incorporated into the discussion of the environmental effects in Chapter 4.

2.1 AFFECTED ENVIRONMENT

Upon receiving a request for assistance, crow damage management activities could be conducted on federal, state, tribal, municipal, and private properties in Maryland. The areas of the proposed action could include areas in and around commercial, industrial, public, and private buildings, facilities and properties and at other sites where crows may roost, loaf, feed, nest, or otherwise occur. Examples of areas where crow damage management activities could be conducted are, but are not necessarily limited to: agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, aquaculture facilities, fish hatcheries, grain mills, grain handling areas, railroad yards, waste handling facilities, industrial sites, natural areas, government properties and facilities, private properties, corporate properties, schools, hospitals, parks, woodlots, recreation areas, communally-owned homeowner/property owner association properties, wildlife refuges, wildlife management areas, and airports.

Environmental Status Quo

As defined by the NEPA implementing regulations, the "*human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment*" (40 CFR §1508.14). Therefore, when a federal action agency analyzes its potential impacts on the "human environment," it is reasonable for that agency to compare not only the effects of the federal action, but also the potential impacts that occur or will occur in the absence of the federal action. This concept is applicable to situations involving federal assistance in managing damage associated with resident wildlife species managed by the State or unprotected wildlife species.

Wildlife species, such as most native species are protected under state or federal law. For crows, take during the hunting season is regulated pursuant to the MBTA by the USFWS through the issuance of frameworks of seasons, methods of take, and allowed take which are implemented by the MDNR. Under the blackbird depredation order (50 CFR §21.43), crows can be taken by any entity without a depredation permit when found committing or about to commit damage or posing a human safety threat. When a non-federal entity (*i.e.*, agricultural producers, health agencies, municipalities, counties, private companies, individuals, or any other non-federal entity) takes a crow damage management action, the action is not subject to the NEPA compliance due to the lack of federal involvement[7] in the action. Under such circumstances, the environmental baseline or status quo must be viewed as an environment that includes those resources as they are managed or impacted by non-federal entities in the absence of the federal action being proposed. Therefore, in those situations in which a non-federal entity has decided that a management action directed towards crows will occur and even the particular methods that will be used, WS' involvement in the action will not affect the environmental status quo if the requestor would have conducted the action in the absence of WS' involvement since take can occur without a permit and most methods for resolving damage are available to both WS and to other entities. WS' decision-making ability is restricted to one of two alternatives - either taking the action using the specific methods as decided upon by the non-federal entity, or taking no action at which point the non-federal entity will take the action anyway. Under these circumstances, WS would have virtually no ability to affect the environmental status quo since the action would likely occur in the absence of WS' direct involvement.

Therefore, based on the discussion above, in those situations where a non-federal entity conducts activities under the blackbird depredation order and has already made the decision to remove or otherwise manage crows to stop damage with or without WS' assistance, WS' participation in carrying out the action will not affect the environmental status quo. For crows, no state or federal permit is required to manage damage or threats. Therefore, those persons experiencing damage associated with crows could take action without any direct involvement by WS, the USFWS, or the MDNR.

In some situations, however, certain aspects of the human environment may actually benefit more from WS' involvement then from a decision not to assist. For example, if a cooperator believes WS has greater expertise to selectively remove crows than a non-WS entity; WS' management activities may have less of an impact on target and non-target species then if the non-federal entity conducted the action alone. The concern arises from those persons experiencing damage having no prior experience with managing damage or threats associated with crows. The lack of experience in crow behavior and damage management methods could lead to the continuation of damage which could threaten human safety or could lead to the use of inappropriate methods in an attempt to resolve damage. WS' personnel are trained in the use of methods which increases the likelihood that damage management methods are employed appropriately with regards to effectiveness, humaneness, minimizing non-target take, and reducing threats to human safety from those methods. WS' mission is to provide leadership in resolving

[7] If a federal permit is required to conduct damage management activities, the issuing federal agency would be responsible for compliance with the NEPA for issuing the permit.

and preventing damage to resources and to reduce threats to human safety caused by wildlife, including crows in Maryland. Thus, in those situations, WS' involvement may actually have a beneficial effect on the human environment when compared to the environmental status quo in the absence of such involvement.

2.2 ISSUES ADDRESSED IN THE ANALYSIS OF THE ALTERNATIVES

Issues are concerns of the public and/or professional community raised regarding potential adverse affects 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 this EA. Those issues are fully evaluated within WS' FEIS which analyzed specific data relevant to WS' programmatic activities at the time of preparation. Issues related to managing damage associated with crows in Maryland were developed by WS and the USFWS in consultation with the MDNR. The pre-decisional EA will also be made available to the public for review and comment to identify additional issues.

The issues as related to the possible implementation of the alternatives, including the proposed action, are discussed in detail in Chapter 4. The issues analyzed in detail in the EA are the following:

Issue 1 - Effects on Crow 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 or threats to human safety can involve altering the behavior of target species and may require the use of lethal methods when appropriate. Under the proposed action, WS would incorporate non-lethal and lethal methods described in Appendix B in an integrated approach in which all or a combination of methods may be employed to resolve a request for assistance. WS would recommend both non-lethal and lethal methods, as governed by federal, state, and local laws and regulations.

Non-lethal methods can disperse or otherwise make an area unattractive to target species causing damage reducing the presence of those species at the site and potentially the immediate area around the site where non-lethal methods are employed. Lethal methods would be employed to remove an individual or those individuals responsible for causing damage or threats to human safety. The use of lethal methods would therefore result in local population reductions in the area where damage or threats were occurring. The number of target species removed from the population using lethal methods under this alternative would be dependent on the number of requests for assistance received, the number of individuals involved with the associated damage or threat, and the efficacy of methods employed.

Crow species specifically addressed in this EA include the American crow and the fish crow. The analysis for magnitude of impact on populations from the use of lethal methods generally follows the process described in 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 they have caused damage. WS' take is monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (USDA 1997). All lethal take (killing) of crows by WS would occur at the requests of a cooperator seeking assistance.

Information on bird populations and trends are often derived from several sources including the Breeding Bird Survey (BBS), the Christmas Bird Count (CBC), the Partners in Flight Landbird Population database, published literature, and harvest data. Further information on those sources of information is provided below.

Breeding Bird Survey

Bird populations can be monitored by using trend data from the BBS which are conducted annually in the United States, across a large geographical area, under standardized survey guidelines. The BBS is a large-scale inventory of North American birds coordinated by the U.S. Geological Survey, Patuxent Wildlife Research Center (Sauer et al. 2008). The BBS is a combined set of over 3,700 roadside survey routes primarily covering the continental United States and southern Canada. The BBS was started in 1966 with routes surveyed in June by experienced birders. The primary objective of the BBS has been to generate an estimate of population change for all breeding birds. Populations of birds tend to fluctuate, especially locally, as a result of variable local habitat and climatic conditions. Trends can be determined using different population equations and statistically tested to determine if a trend is statistically significant.

Estimates of population trends from BBS data are derived primarily from route-regression analysis (Geissler and Sauer 1990) and are dependent upon a variety of assumptions (Link and Sauer 1998). The statistical significance of a trend for a given species is reflected in the calculated P-value (*i.e.*, the probability of obtaining the observed data or more extreme data given that a hypothesis of no change is true). The level of statistical significance (*e.g*, 0.01, 0.05, 0.10) can vary and is often set by those conducting the analysis. Often BBS or other geographically large survey data is not statistically significant at the local level because of relatively smaller sample size (*i.e.*, fewer routes surveyed), more routes with zero observations of a particular bird species which results in larger statistical variance, and low P-values set for statistical significance. The BBS has a statistical level of significance set at $P<0.01$.

Christmas Bird Count

The CBC is conducted in December and early January annually by numerous volunteers under the guidance of the National Audubon Society (NAS). The CBC reflects the number of birds frequenting a location during the winter months and is based on birds observed within a 15 mile diameter circle around a central point (177 mi^2). The CBC data does not provide a population estimate, but can be used as an indicator of trends in the population. Researchers have found that population trends reflected in CBC data tend to correlate well with those from censuses taken by more stringent means (NAS 2002).

Partners in Flight Landbird Population Estimate

The BBS data are intended for use in monitoring bird population trends, but it is also possible to use BBS data to develop a general estimate of the size of bird populations. Using relative abundances derived from the BBS, Rich et al. (2004) extrapolated population estimates for many bird species in North America as part of the Partners in Flight Landbird Population Estimate database. The Partners in Flight system involves extrapolating the number of birds in the 50 quarter-mile circles (total area/route = 10 mi^2) survey conducted during the BBS to an area of interest. The model used by Rich et al. (2004) makes assumptions on the detectability of birds, which can vary for each species. Some species of birds that are more conspicuous (visual and auditory) are more likely to be detected during bird surveys when compared to bird species that are more secretive and no not vocalize often. Information on the detectability of a species is combined to create a detectability factor which may be combined with relative abundance data from the BBS to yield a population estimate (Rich et al. 2004).

Annual Harvest Estimate

The populations of several migratory bird species are sufficient to allow for annual harvest seasons that typically occur during the fall migration periods of those species. Migratory bird hunting seasons are established under frameworks developed by the USFWS and implemented in the State by the MDNR. For crows, take can also occur under the blackbird depredation order established by the USFWS. Therefore, the take of crows can occur during annual hunting seasons and under the blackbird depredation order that allows crows to be taken to alleviate damage and to alleviate threats of damage. For many migratory bird species considered harvestable during a hunting season, the number of birds harvested during the season is reported by the USFWS and/or the MDNR in published reports.

WS' proposed action incorporates an adaptive approach to resolve damage and reduce threats to human safety by targeting individual crows or groups of crows using non-lethal and lethal methods after applying the WS' Decision Model (Slate et al. 1992, USDA 1997) to identify possible techniques. Lethal methods may be used to reinforce non-lethal methods to reduce damage to a level that is more acceptable to the requester. The effects on target crow populations in Maryland from implementation of the identified alternatives, including the proposed action, are analyzed in Chapter 4.

Ecology of Crows

Two species of crow are present in Maryland: the American crow and the fish crow. American Crows have a wide range and are extremely abundant, being found across the U.S. (Verbeek and Caffrey 2002). They are found in both urban and rural environments and in Maryland sometimes form large communal roosts in cities. In the U.S., some crow roosts may reach a half-million birds (Verbeek and Caffrey 2002). American crows are found throughout the State while fish crows are found throughout the State except in the mountainous regions of western Maryland (Robbins and Blom 1996).

Historically, crow populations have benefited from agricultural development because of grains available as a food supply. Crows typically roost in trees with the combination of food and tree availability being favored. In some areas where abundant food and roosting sites are available, large flocks of crows tend to concentrate. In the fall and winter, crows often form large roosting flocks in urban areas. These large flocks disperse to different feeding areas during the day. Crows will fly up to 6-12 miles from the roost to a feeding site each day (Johnson 1994). Large fall and winter crow roosts may cause serious problems in some areas particularly when located in towns or other sites near people. Such roosts are objectionable because of the odor of the bird droppings, health concerns, noise and damage to trees in the roost.

In Maryland, crows begin nesting in mid-March (Robbins and Blom 1996) and crow pairs remain together throughout the year (Johnson 1994). Nests are built 15-95 feet high in deciduous and coniferous trees (Kalmbach 1939, Robbins and Blom 1996) or on radio towers. Nests are constructed of twigs, sticks, and coarse stems and are lined with feathers, shredded bark, grass, cloth and string (Johnson 1994). Crows have one clutch per year of 3-7 eggs (Kalmbach 1939, Robbins and Blom 1996). Eggs hatch in about 18 days and young fledge four to five weeks after hatching (Johnson 1994, Robbins and Blom 1996). The life expectancy for a crow in the wild is 4-6 years; however, crows have been known to live up to 14 years in the wild and 20 years in captivity (Johnson 1994).

During the spring and summer, crows forage most intensively close to the nest with a maximum home range size of 1,000 meters^2 (0.621 miles^2) (Sullivan and Dinsmore 1990). After dispersing from the roost, crows begin foraging around sunrise each day (Knopf and Knopf 1983, Stouffer and Caccamise 1991). By late morning, the crows decrease foraging activity, and by mid-afternoon crows start forming larger groups (Knopf and Knopf 1983, Stouffer and Caccamise 1991). The larger groups, which forage in late afternoon, return to the roost at sunset.

Issue 2 - Effects on Non-target Wildlife Species Populations, 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. To reduce the risks of adverse affects to non-target wildlife, WS would select damage management methods that are as target-selective as possible or apply such methods in ways to reduce the likelihood of capturing non-target species. Before initiating management activities, WS would select locations which are extensively used by the target species. WS' will also use minimization measures and SOPs designed to reduce the effects on non-target species' populations. Minimization measures and SOPS are further discussed in Chapter 3. Methods available for use under the alternatives are described in Appendix B.

Concerns have also been raised about the potential for adverse affects to occur to non-target wildlife from the use of registered toxicants. Chemical methods being considered for use to manage damage and threats associated with crows in Maryland are further discussed in Appendix B. Chemical methods considered for use to manage damage or threat associated with crows includes the avicide DRC-1339 and repellents.

The ESA states that all federal agencies *"...shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act"* [Sec. 7(a)(1)]. WS conducts Section 7 consultations with the USFWS to ensure compliance with the ESA and to ensure that *"any action authorized, funded or carried out by such an agency...is not likely to jeopardize the continued existence of any endangered or threatened species…Each agency shall use the best scientific and commercial data available"* [Sec. 7(a)(2)].

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or minimization measures. WS has consulted with the USFWS on programmatic activities under Section 7 of the ESA concerning potential impacts of methods available for use by WS on T&E species. The USFWS issued a BO on WS' programmatic activities in 1992 (USDA 1997). As part of the scoping process and to facilitate interagency cooperation, WS consulted with the USFWS under Section 7 during the development of this EA which is further discussed in Chapter 4.

Issue 3 - Humaneness and Animal Welfare Concerns of Methods

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate damage management for societal benefits could be compatible with animal welfare concerns, if *"…the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."*

According to the American Veterinary Medical Association (AVMA) (1987), suffering is described as a *"…highly unpleasant emotional response usually associated with pain and distress."* However, suffering *"…can occur without pain…,"* and *"…pain can occur without suffering…"* Because suffering carries with it the implication of a time frame, a case could be made for *"…little or no suffering where death comes immediately…"* (California Department of Fish and Game 1991). Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals.

Defining pain as a component in humaneness appears to be a greater challenge than that of suffering.

Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain and identifying the causes that elicit pain responses in humans would "*…probably be causes for pain in other animals…*" (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to considerable pain (California Department of Fish and Game 1991).

The 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). Some people would prefer AVMA accepted methods of euthanasia to be used when killing all animals, including wild animals. The AVMA 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).

Pain and suffering, as it relates to methods available for use to manage crows has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since "*…neither medical nor veterinary curricula explicitly address suffering or its relief*" (California Department of Fish and Game 1991). Research suggests that some methods can cause "*stress*" (USDA 1997). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

The decision-making process involves trade-offs between the above aspects of pain and humaneness. Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and 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.

The issue of humanness and animal welfare concerns will be further discussed as it relates to the methods available for use under the alternatives in Chapter 4. Minimization and SOPs to alleviate pain and suffering are discussed in Chapter 3.

Issue 4 - Effects on the Aesthetic Values of Crows

One issue is the concern that the proposed action or the other alternatives would result in the loss of aesthetic benefits of target birds 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.

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public shares a similar bond with animals and/or wildlife in general and in modern societies a large percentage of households have indoor or outdoor pets. However, some people may consider individual wild animals and birds as "pets" or exhibit affection toward these animals, especially people who enjoy viewing 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 manage conflicts/problems between humans and wildlife.

Wildlife populations provide a wide range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive uses, indirect benefits derived from vicarious wildlife related experiences, and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (Bishop 1987). Direct benefits are derived from a

personal relationship with animals and may take the form of direct consumptive use (using parts of or the entire animal) or non-consumptive use (viewing the animal in nature or in a zoo, photographing) (Decker and Goff 1987).

Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

Public attitudes toward wildlife vary considerably. Some people believe that all wildlife should be captured and relocated to another area to alleviate damage or threats to protected resources. Some people directly affected by the problems caused by wildlife strongly support removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Some people totally opposed to wildlife damage management want agencies to teach tolerance for damage and threats caused by wildlife, and that wildlife should never be killed. Some of the people who oppose removal of wildlife do so because of human-affectionate bonds with individual wildlife. These human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

The effects on the aesthetic value of crows from implementation of the identified alternatives, including the proposed action, are analyzed in Chapter 4.

Issue 5 – Effects on the Aesthetic Value of Property

Those persons requesting assistance that are experiencing damage occurring from staging and roosting crows on or near their properties are often concerned about fecal dropping being aesthetically displeasing. Property owners are concerned that the accumulation of droppings crows that roost nightly can result in economic damage due to costs associated with cleaning droppings daily or routinely. In addition, fecal droppings can be aesthetically displeasing to potential customers that may avoid businesses whose property and equipment are covered with fecal droppings from roosting crows. The noxious odor that can emanate from large accumulation of droppings under crow roosts can also be displeasing to property owners and customers.

Issue 6 - Effects of Management Methods[8] on Human Health and Safety

An additional issue often raised is the potential risks associated with employing methods to manage damage caused by target species. Both chemical and non-chemical methods have the potential to have adverse affects on human safety. WS' employees use and recommend only those methods which are legally available, selective for target species, and effective to resolve the wildlife conflict. Still, some concerns exist regarding the safety of WS' methods despite their legality. As a result, WS will analyze the potential for proposed methods to pose a risk to members of the public or employees of WS.

In addition to the potential risks to the public associated with WS' methods, risks to employees are also an issue. WS' employees are potentially exposed to damage management methods as well as subject to workplace accidents. Selection of methods, as part of an integrated approach, includes consideration for

[8]A complete list of chemical and non-chemical methods available for use under the identified alternatives, except the alternative with no damage management (Alternative 1), can be found in Appendix B. However, listing methods neither implies that all methods will be used by WS to resolve requests for assistance nor does the listing of methods imply that all methods will be used to resolve every request for assistance.

public and employee safety.

Safety of Chemical Methods Employed

The issue of using chemicals methods as part of managing damage associated with wildlife relates to the potential for human exposure either through direct contact with the chemical or exposure to the chemical from wildlife that have been exposed. Under the alternatives identified, the use of chemical methods would include avicides and repellents. Avicides are those chemical methods used to lethally take birds. DRC-1339 is the only avicide currently being considered for use to manage damage in this assessment. Several avian repellents are commercially available with the most common ingredients being polybutene and methyl anthranilate. An additional repellent being considered for use in this assessment is mesurol which is intended for use to discourage crows from predating on eggs. Chemical methods are further discussed in Appendix B.

The use of chemical methods is regulated by the EPA through the FIFRA, the Maryland Department of Agriculture, Pesticide Regulation Section through the Maryland Pesticide Applicators Law, and by WS Directives. WS' use of chemical methods is further discussed in WS' programmatic FEIS (USDA 1997).

Safety of Non-Chemical Methods Employed

Non-chemical methods employed to reduce damage and threats to safety caused by crows, if misused, could potentially be hazardous to human safety. Non-chemical methods are also discussed in detail in Appendix B. The cooperator requesting assistance is made aware through a MOU, cooperative service agreement, or a similar document that those devices agreed upon could potentially be used on property owned or managed by the cooperator.

Effects of Not Employing Methods to Reduce Threats to Human Safety

An issue identified is the concern for human safety from not employing methods or not employing the most effective methods to reduce the threats that birds can pose. The risks to human safety from diseases associated with certain crow populations were addressed previously. The low risk of disease transmission from crows does not lessen the concerns of cooperators requesting assistance to reduce threats from zoonotic diseases. Increased public awareness of zoonotic events has only heightened the concern of direct or indirect exposure to zoonoses. Not adequately addressing the threats associated with potential zoonoses could lead to an increase in incidences of injury, illness, or loss of human life.

Additional concern is raised with inadequately addressing threats to human safety associated with aircraft striking birds at airports in the State. Birds have the potential to cause severe damage to aircraft and can threaten the safety of passengers. Limiting or preventing the use of certain methods to address the potential for aircraft striking birds could lead to higher risks to passenger safety. This issue will be fully evaluated in Chapter 4 in relationship to the alternatives.

Issue 7 - Effects on the Regulated Harvest of Crows

Another issue commonly identified is a concern that bird damage management activities conducted by WS would affect the ability of persons to harvest crows during the regulated hunting seasons by reducing local populations. Potential impacts could arise from the use of non-lethal or lethal damage management methods. Non-lethal methods used to reduce or alleviate damage caused by crows are used to reduce bird densities through dispersal in damage management areas. Similarly, lethal methods used to reduce damage associated with crows could lower densities in areas where damage is occurring resulting in a reduction in the availability of crows during the regulated harvest season. WS' bird damage management

activities would primarily be conducted on populations in areas where hunting access is restricted (*e.g.*, airports, urban areas) or has been ineffective. The use of non-lethal or lethal methods often disperses birds from areas where damage is occurring to areas outside the damage area which could serve to move crows from those less accessible areas to places accessible to hunters.

2.3 ISSUES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

Additional issues were also identified by WS and the USFWS during the scoping process of this EA that were considered but will not received detailed analyses for the reasons provided. The following issues were considered but will not be analyzed in detail:

Appropriateness of Preparing an EA (Instead of an EIS) For Such a Large Area

A concern was raised that an EA for an area as large as the State of Maryland would not meet the NEPA requirements for site specificity. Wildlife damage management falls within the category of federal or other regulatory agency actions in which the exact timing or location of individual activities cannot usually be predicted well enough ahead of time to accurately describe such locations or times in an EA or EIS. Although WS can predict some of the possible locations or types of situations and sites where some kinds of wildlife damage will occur, the program cannot predict the specific locations or times at which affected resource owners will 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 destruction of wild animal populations over broad areas at a much more intensive level then would be desired by most people, including WS and state agencies. Such broad scale population management would also be impractical or impossible to achieve within WS' policies and professional philosophies.

Lead agencies have the discretion to determine the geographic scope of their NEPA analyses (Kleppe v Sierra Club, 427 U.S. 390, 414 (1976), CEQ 1508.25). Ordinarily, according to APHIS procedures implementing the NEPA, WS' individual wildlife damage management actions may be categorically excluded (7 CFR §372.5(c)). The intent in developing this EA is to determine if the proposed action would potentially have significant individual and/or cumulative impacts on the quality of the human environment that would warrant the preparation of an EIS or a FONSI. This EA addresses impacts for managing damage and threats to human safety associated with crows in the State to analyze individual and cumulative impacts and to provide thorough analyses.

In terms of considering cumulative effects, one EA analyzing impacts for the entire State will provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. If a determination is made through this EA that the proposed action would have a significant impact on the quality of the human environment, then an EIS would be prepared. In addition, the WS program in Maryland has and based on previous requests for assistance, will continue to only conducted crow damage management in a very small area of the State where damage is occurring or likely to occur.

WS' Impact on Biodiversity

The WS program does not attempt to eradicate any species of native wildlife in the State. WS operates in accordance with international, federal, and state laws and regulations enacted to ensure species viability. Methods available are employed to target individual birds or groups of birds identified as causing damage or posing a threat of damage. Any reduction of a local population or group is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. WS operates on a small percentage of the land area of Maryland and only targets those crows identified as causing damage or posing a threat. Therefore, impacts on biodiversity associated with crow damage management

will not adversely affect biodiversity in the State.

A Loss Threshold Should Be Established Before Allowing Lethal Methods

One issue identified through WS' implementation of the NEPA processes is a concern that a threshold of loss should be established before employing lethal methods to resolve damage and that wildlife damage should be a cost of doing business. Some damage and economic loss can be tolerated by cooperators until the damage reaches a threshold where damage becomes an economic burden. The appropriate level of allowed tolerance or threshold before employing lethal methods would differ among cooperators and damage situations. Establishing a threshold would be difficult or inappropriate to apply to human health and safety situations.

In a ruling for Southern Utah Wilderness Alliance, et al. vs. Hugh Thompson, Forest Supervisor for the Dixie National Forest, et al., the United States District Court of Utah denied plaintiffs' motion for a preliminary injunction. In part, the court found that a forest supervisor needs only show that damage from wildlife is threatened, to establish a need for wildlife damage management (Civil No. 92-C-0052A January 20, 1993). Thus, there is judicial precedence indicating that it is not necessary to establish a criterion such as a percentage of loss of a particular resource to justify the need for wildlife damage management actions.

Bird Damage Management Should Not Occur at Taxpayer Expense

An issue identified through the development of WS' programmatic FEIS is the concern that wildlife damage management should not be provided at the expense of the taxpayer or that activities should be fee-based (USDA 1997). Funding for crow damage management activities is derived from federal appropriations and through cooperative funding. Activities conducted in the State for the management of damage and threats to human safety from crows will be funded through cooperative service agreements with individual property owners or associations.

Cost Effectiveness of Management Methods

The CEQ does not require a formal, monetized cost benefit analysis to comply with the NEPA. Consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. However, the methods determined to be most effective to reduce damage and threats to human safety caused by crows and that prove to be the most cost effective will receive the greatest application. As part of an integrated approach, evaluation of methods will continually occur to allow for those methods that are most effective at resolving damage or threats to be employed under similar circumstance where crows are causing damage or pose a threat. Additionally, management operations may be constrained by cooperator funding and/or objectives and needs. The cost effectiveness of methods and the effectiveness of methods are linked. The issue of cost effectiveness as it relates to the effectiveness of methods is discussed in the following issue.

Effectiveness of Bird Damage Management Methods

The effectiveness of any damage management program could be defined in terms of losses or risks potentially reduced or prevented, how accurately practitioner's diagnosis the problem, the species responsible for the damage, and how actions are implemented to correct or mitigate risks or damages. To determine that effectiveness, WS must be able to complete management actions expeditiously to minimize harm to non-target animals and the environment, while at the same time, using methods as humanely as possible within the limitations of current technology, funding, and workforce. The most effective approach to resolving any wildlife damage problem is to use an adaptive integrated approach

which may call for the use of several management methods simultaneously or sequentially (USDA 1997, Courchamp et al. 2003).

The purpose behind integrated management is to implement methods in the most effective manner while minimizing the potentially harmful effects on humans, target and non-target species, and the environment[9]. Efficacy is based on the types of methods employed, the application of the method, restrictions on the use of the method(s), the skill of the personnel using the method and, for WS' personnel, the guidance provided by WS Directives and policies.

The goal is to reduce damage, risks, and conflicts with wildlife as requested and not to necessarily reduce/eliminate populations. Localized population reduction could be short-term and new individuals may immigrate or be born to animals remaining at the site (Courchamp et al. 2003). The ability of an animal population to sustain a certain level of removal and to eventually return to pre-management levels, however, does not mean individual management actions are unsuccessful, but that periodic management may be necessary. The return of wildlife to pre-management levels also demonstrates that limited, localized damage management methods have minimal impacts on species' populations.

A common issue raised is that the use of lethal methods is ineffective because additional crows are likely to return to the area, either after removal occurs or the following year when birds returns to the area which creates a financial incentive to continue the use of only lethal methods. This assumes crows only return to an area where damage was occurring if lethal methods are used. However, the use of non-lethal methods is also often temporary which could result in crows returning to an area where damage was occurring once those methods are no longer used. The common factor when employing any method is that crows will return if suitable conditions continue to exist at the location where damage was occurring and crow densities are sufficient to occupy all available habitats to the extent that damage occurs. Therefore, any reduction or prevention of damage from the use of methods addressed in Appendix B will be temporary if habitat conditions continue to exist that attract crows to an area where damage occurs. In the case of crows, WS primarily receives requests to reduce or prevent damage caused by crows congregated at large roost sites in the State.

Therefore, any method that disperses or removes crows from areas will only be temporary if habitat containing preferred roost characteristics continues to exist the following year when crows return. Dispersing crows using non-lethal methods addressed in Appendix B often requires repeated application to discourage crows from returning to roosting location which increases costs, moves crows to other areas where they could cause damage, and are temporary if habitat conditions at the roost remain unchanged. Dispersing and the relocating of crows could be viewed as moving a problem from one area to another which would require addressing damage caused by those crows at another location which increases costs and could be perceived as creating a financial incentive to continue the use of those methods since crows will have to be addressed annually and at multiple locations. WS' recommendation of or use of techniques to modifying existing habitat or making areas unattractive to crows is discussed in Appendix B. WS' objective is to respond to request for assistance with the most effective methods and to provide for the long-term solution to the problem using WS' Decision Model to adapt methods in an integrated approach to managing crow damage that is agreed upon by the cooperator.

As part of an integrated approach to managing crow damage, WS would have the ability to adapt methods to damage situations to effectively reduce or prevent damage from occurring. Under the proposed integrated approach, all methods, individually or in combination, could be employed as deemed appropriate through WS' Decision Model to address requests for assistance. WS' objective when

[9]The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns.

receiving a request for assistance under the proposed action is to reduce damage and threats to human safety or to prevent damage from occurring using an integrated approach to managing crow damage. Therefore, under the proposed action, WS would employ methods adaptively to achieve that objective.

Managing damage caused by birds, including crows, can be divided into short-term redistribution approaches and long-term population and habitat management approaches (Cooper and Keefe 1997). Short-term approaches focus on redistribution and dispersal of crows to limit use of an area where damage or threats were occurring. Short-term redistribution approaches may include prohibiting feeding, pyrotechnics, propane cannons, effigies, and other adverse noise, erecting access barriers such as wire grids, and taste aversion chemicals (Cooper and Keefe 1997). Population reduction by limiting survival or reproduction, removing crows, and habitat modification are considered long-term solutions to managing damage associated with crows (Cooper and Keefe 1997).

Redistribution methods are often employed to provide immediate resolution to damage occurring until long-term approaches can be implemented or have had time to reach the desired result. Dispersing birds are often short-term solutions that move birds to other areas where damages or threats could occur (Smith et al. 1999, Gorenzel et al. 2000, Gorenzel et al. 2002, Avery et al. 2008, Chipman et al. 2008). Chipman et al. (2008) found that crows could be dispersed from roost locations using non-lethal methods but crows would return to the original roost site within 2 to 8 weeks. The re-application of non-lethal methods to disperse crow roosts was required every year to disperse crows from the original roost or from roosts that had formed in other areas where damages were occurring (Chipman et al. 2008). Some short-term methods may become less effective in resolving damage as a bird population increases, as birds become more acclimated to human activity, and as birds become habituated to harassment techniques (Smith et al. 1999, Chipman et al. 2008). Non-lethal methods often require a constant presence at roost locations when crows are present and must be repeated nightly until the desired results are achieved which can increase the costs associated with those activities. During a six-year project using only non-lethal methods to disperse crows in New York, the number of events required to disperse crows remained similar amongst years and at some locations, the number of events required to harass crows increased from the start of the project (Chipman et al. 2008). Long-term solutions to resolving bird damage often require management of the population (Smith et al. 1999) and identifying the habitat characteristics which attract crows to roost in a particular location (Gorenzel and Salmon 1995).

For example, Cooper (1991) reported that the removal of geese posing or likely to pose a hazard to air safety at airports considerably reduced the population of local geese, decreased the number of goose flights through airport operations airspace, and significantly reduced goose-aircraft collisions at Minneapolis-St. Paul International Airport. In addition, Dolbeer et al. (1993) demonstrated that an integrated approach (including removal of offending birds) reduced bird hazards at airports and substantially reduced bird collisions with aircraft by as much as 89%. Jensen (1996) also reported that an integrated approach that incorporated the removal of geese, reduced goose-aircraft collisions by 80% during a two year period. Boyd and Hall (1987) showed that a 25% reduction in a local crow roost resulted in reduced hazards to a nearby airport.

Based on the evaluation of the damage situation, the most effective methods will be employed individually or in combination based on the prior evaluations of methods or combinations of methods in other damage management situations. Once employed, methods will be further evaluated for effectiveness based on a continuous evaluation of activities by WS. Therefore, the effectiveness of methods is considered as part of the decision making-process under WS' use of the Decision Model described in Chapter 3 for each damage management request based on continual evaluation of methods and results.

Bird Damage Should Be Managed By Private Nuisance Wildlife Control Agents

Private nuisance wildlife control agents could be contacted to reduce crow damage for property owners. Some property owners would prefer to use a private nuisance wildlife control agent because the nuisance wildlife agent is located in closer proximity and thus could provide the service at less expense, or because they prefer to use a private business rather than a government agency. However, some property owners would prefer to contract with a government agency. In particular, large industrial businesses and cities and towns may prefer to use WS because of security and safety issues and reduced administrative burden.

Effects from the Use of Lead Ammunition in Firearms

Questions have arisen about the deposition of lead into the environment from ammunition used in firearms to lethally take birds. As described in Appendix B, the lethal removal of birds 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). To address lead exposure from the use of shotguns, the standard conditions of depredation permits issued by the USFWS pursuant to the MBTA for the lethal take of birds requires the use of non-toxic shot. To alleviate concerns associated with lead exposure in wildlife, WS will only use non-toxic shot as defined in 50 CFR §20.21(j) when using shotguns to take all birds.

Take of crows by WS in the State occurs primarily from the use of shotguns. However, the use of rifles could be employed to lethally take crows. To reduce risks to human safety and property damage from bullets passing through birds, the use of rifles is applied in such a way (*e.g.*, caliber, bullet weight, distance) to ensure the bullet does not pass through birds. Birds that are removed using rifles will occur within areas where retrieval of all bird carcasses for proper disposal is highly likely (*e.g.*, at roost sites). With risks of lead exposure occurring primarily from ingestion of shot and bullet fragments, the retrieval and proper disposal of bird carcasses will 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 a rifle, the projectile(s) pass through a bird, if misses occur, or if the bird carcass is not retrieved. 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 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). These studies suggest that, given the very low amount of lead being deposited and the concentrations that would occur from WS' activities to reduce bird damage using rifles, 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 crows can be taken under the blackbird depredation order without the need to obtain a depredation permit from the USFWS, WS' assistance with removing crows would not be additive to the environmental status quo since those crows removed by WS using firearms could be lethally removed by the entities experiencing damage 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 crow damage management activities due to efforts by WS to ensure projectiles do no pass through but are contained within the bird 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 birds 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 bird carcasses lethally removed using firearms will be retrieved and disposed of properly to limit the availability of lead in the environment and ensures bird 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 that are deposited into the environment from WS' activities due to misses, the bullet passing through the carcass, or from bird carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination of water. As stated previously, when using shotguns, only non-toxic shot would be used by WS.

Impacts of Dispersing a Crow Roost on People in Urban/Suburban Areas

Another issue often raised is that the dispersal of birds from a roost location to alleviate damage or conflicts at one site can result in new damage or conflicts at a new roost site. While the original complainant may see resolution to the bird problem when the roost is dispersed, the recipient of the bird roost may see the bird problem as imposed on them. Thus, on the whole, there is no resolution to the original bird problem (Mott and Timbrook 1988). Bird roosts usually are dispersed using a combination of harassment methods including pyrotechnics, propane cannons, and electronic distress calls (Booth 1994). A similar continuing conflict can develop when severe habitat alteration is used to disperse a bird roost. This concern is heightened in large metropolitan areas where the likelihood of a dispersed bird roost finding a new roost location and not coming into conflict is very low. WS has minimized the impact of dispersing bird roosts in urban/suburban areas by creating a management option to depopulate the crow roost creating the conflict problem.

In urban areas, WS often works with the community or municipal leaders to address crow damage involving large crow roosts that are likely affecting several people. Therefore, WS often consults not only with the property owner where roosts are located but with community leaders to allow for community-based decision-making on the best management approach. In addition, when seeking funding for crow damage management activities involving urban crow roosts, funding is often provided by the municipality where the roost is located which allows for crow damage management activities to occur within city limits where crow roosts occur. This allows for roosts that have been relocated and begin to cause damage or pose threats to be addressed effectively and often times, before roosts become well-

established. The community-based decision-making approach to crow damage management in urban areas is further discussed under the proposed action alternative in Chapter 3. Therefore, this issue was not analyzed further.

A Site Specific Analysis Should be Made for Every Location Where Crow Damage Management Could Occur

The underlying intent for preparing an EA is to determine if a proposed action might have a significant impact on the human environment. WS' EA development process is issue driven, meaning issues that were raised during the interdisciplinary process and through public involvement that were substantive, were used to drive the analysis and determine the significance of the environmental impacts of the proposed action and the alternatives. Therefore, the level of site specificity must be appropriate to the issues listed.

The analysis in this EA was driven by the issues raised during the scoping process during the development of the EA. In addition to the analysis contained in this EA, WS' personnel use the WS Decision Model (Slate et al. 1992, USDA 1997) described in Chapter 3 as a site specific tool to develop the most appropriate strategy at each location. The WS Decision Model is an analytical thought process used by WS' personnel for evaluating and responding to wildlife damage management requests.

As discussed previously, one EA analyzing impacts for the entire State will provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas and allows for a better cumulative impact analysis. If a determination is made through this EA that the proposed action would have a significant impact on the quality of the human environment, then an EIS would be prepared.

Relocation of Crows Causing Damage

Relocation of damaging birds to other areas following live-capture generally would not be effective or cost-effective. Relocation is generally ineffective because problem bird species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and relocation would most likely result in bird damage problems at the new location. Also, hundreds or thousands of crows would need to be captured and relocated to solve some damage problems; therefore, relocation would be unrealistic. Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats (Nielsen 1988).

CHAPTER 3: ALTERNATIVES

Chapter 3 contains a discussion of the alternatives which were developed to address the identified issues discussed in Chapter 2. Alternatives were developed for consideration based on the issues using the WS Decision model (Slate et al. 1992, USDA 1997). The alternatives will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences). Chapter 3 also discusses alternatives considered but not analyzed in detail, with rationale. Minimization measures and SOPs for crow damage management in Maryland are also discussed in Chapter 3.

3.1 DESCRIPTION OF THE ALTERNATIVES

The alternatives developed to address the issues identified in Chapter 2 include:

Alternative 1 – No Crow Damage Management Conducted by WS

This alternative precludes any and all activities by WS to reduce threats to human health and safety, and alleviate damage to agricultural resources, property, and natural resources. WS would not be involved with any aspect of crow damage management in the State. All requests for assistance received by WS to resolve damage caused by birds would be referred to the USFWS and/or the MDNR.

Despite no involvement by WS in resolving damage and threats associated with crows in the State, those persons experiencing damage caused by crows could continue to resolve damage by employing those methods legally available since the take of crows can occur at any time when found committing or about to commit damage or posing a human safety threat. All methods described in Appendix B would be available for use by those experiencing damage or threats except for the use of DRC-1339 and mesurol for crows which can only be used by WS.

Alternative 2 - Crow Damage Management by WS through Technical Assistance Only

Under this alternative, WS would provide those cooperators requesting assistance with managing damage and threats associated with crows with technical assistance only. Technical assistance would provide those cooperators experiencing damage or threats associated with crows with information, demonstrations, and recommendations on available and appropriate methods available. The implementation of methods and techniques to resolve or prevent damage is the responsibility of the requester with no direct involvement by WS. In some cases, WS may provide supplies or materials that are of limited availability for use by private entities. Technical assistance may be provided through a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on the level of risk, need, and the practicality of their application. In some instances, wildlife-related information provided to the requestor results in tolerance/acceptance of the situation. In other instances, management options are discussed and recommended. Only those methods legally available for use by the appropriate individual would be recommend or loaned by WS. Similar to Alternative 1, those methods described in Appendix B would be available to those experiencing damage or threats associated with crows in the State except for DRC-1339 and mesurol.

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

Alternative 3 - Continuing the Current Integrated Approach to Managing Crow Damage (Proposed Action/No Action)

The proposed action/no action alternative would continue the current implementation of an adaptive integrated approach utilizing non-lethal and lethal techniques, as deemed appropriate using the WS Decision Model, to reduce damage and threats caused by crows in Maryland. A major goal of the program would be to resolve and prevent crow damages and to reduce threats to human safety. To meet this goal, WS, in cooperation with the USFWS, and in consultation the MDNR, and the Maryland Department of Agriculture, would continue 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 crows 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. City/town managers, agricultural producers, property owners, and others requesting assistance would be provided information regarding the use of appropriate non-lethal and lethal techniques. WS will work with those persons experiencing crow damage in addressing those crows responsible for causing damage as expeditiously as possible. To be most effective, damage management activities should begin as soon as crows begin to cause damage or in the case of urban roosts, activities should be conducted as soon as a roost begins to form (Avery et al. 2008, Chipman et al 2008). Once formed, urban crow roosts can be difficult to address using available methods since crows are conditioned to and familiar with a particular location. Subsequently, making that area unattractive through the use of available methods can be difficult to achieve once the roost has been established. WS will work closely with those entities requesting assistance to identify situations where damage could occur and begin to implement damage management activities under this alternative as early as possible to increase the likelihood of those methods achieving the level of damage reduction requested by the cooperating entity.

Non-lethal methods include, but are not limited to: habitat/behavior modification, lure crops, visual deterrents, live traps, exclusionary devices, frightening devices, and chemical repellents (see Appendix B for a complete list and description of potential methods). Lethal methods considered by WS include: live-capture followed by euthanasia, nest/egg destruction, DRC-1339, and shooting. Euthanasia would occur through the use of cervical dislocation or carbon dioxide once crows are live-captured using other methods. Carbon dioxide is an acceptable form of euthanasia for birds while cervical dislocation is a conditionally acceptable[10] method of euthanasia (AVMA 2007).

Lethal and non-lethal methods are intended to be short-term attempts at reducing damage occurring at the time those methods are employed. Long-term solutions, especially when addressing crow roosts, would include habitat manipulations and changes in cultural practices which are addressed further below and in Appendix B.

Non-lethal methods can disperse or otherwise make an area unattractive to crows causing damage thereby, reducing the presence of crows 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. Non-lethal methods are used to excluded, harass, and disperse target wildlife from areas where damage or threats are occurring. When effective, non-lethal methods would disperse crows from the area resulting in a reduction in the presence of crows at the site where those methods were employed. The use of non-lethal methods in an integrated approach have proved effective in dispersing crows (Gorenzel et al. 2000, Chipman et al. 2008), including the use of crow effigies (Avery et al. 2008), lasers (Gorenzel et al. 2002), and electronic distress calls (Gorenzel and Salmon 1993). The use of non-lethal methods only often requires a long-term commitment of affected parties, including financial commitments, to achieve and maintain the desired result of reducing crow damage (Chipman et al. 2008). Crows responsible for causing damage or threats are moved to other areas with minimal impact on those species' populations. Non-lethal methods are generally regarded as having minimal impacts on overall populations of wildlife since those species are unharmed. The continued use of non-lethal methods often leads to habituation of those methods which can decrease the effectiveness of those methods (Avery et al. 2008, Chipman et al. 2008). For any management methods employed, the proper timing is essential in effectively dispersing crow roosts (Avery et al. 2008, Chipman et al. 2008). Employment of methods as birds arrive at roost location in mid-October increases the likelihood of achieving success in dispersing roosts. Therefore, coordination and timing of methods is necessary to be effective in achieving expedient resolution of crow damage (Avery et al. 2008, Chipman et al. 2008).

[10]The AVMA (2007) defines conditional acceptable as "...[methods] *that by the nature of the technique or because of greater potential for operator error or safety hazards might not consistently produce humane death or are methods not well documented in the scientific literature".*

Lethal methods would be employed to resolve damage associated with those crows identified by WS as responsible for causing damage or threats to human safety only after receiving a request for the use of those methods. The use of lethal methods would result in local population reductions in the area where damage or threats were occurring since birds would be removed from the population. Lethal methods are often employed to reinforce non-lethal methods and to remove birds that have been identified as causing damage or posing a threat to human safety. The use of lethal methods would result in local reductions of birds in the area where damage or threats were occurring. The number of birds 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 birds involved with the associated damage or threat, and the efficacy of methods employed. Under the proposed action, the lethal methods being considered are the use of the avicide DRC-1339, shooting crows with firearms, the live-capture of crows that are subsequently euthanized, and the recommendation of hunting as a population management tool.

Very little information is available on the effectiveness of using lethal methods to achieve a reduction in crow damage in the area where those methods are employed. Despite the lack of documented success in using lethal methods, the use of lethal methods has been successful in reducing damage (Boyd and Hall 1987, Gorenzel et al. 2000). Most lethal methods are intended to reduce the number of crows present at a location since a reduction in the number of crows at a location leads to a reduction in damage which is applicable whether using lethal or non-lethal methods. The intent of non-lethal methods is to harass, exclude, or otherwise make an area unattractive to crows which disperses crows to other areas which leads to a reduction in damage at the location where those crows were dispersed. The intent of using lethal methods is similar to the objective trying to be achieved when using non-lethal methods which is to reduce the number of crows in the area where damage is occurring which can lead to a reduction in the damage occurring at that location.

Although the use of firearms can reduce the number of crows using a location (similar to dispersing crows), the use of a firearm is most often used to supplement and reinforce the noise associated with non-lethal methods. The capture of crows using live-traps and subsequently euthanizing those crows is employed to reducing the number of crows using a particular area where damage is occurring. Similarly, the recommendation that crows be harvested during the regulated hunting season in the State is intended to manage crow populations in an area where damage is occurring.

The avicide DRC-1339 is also being proposed for use under the proposed action which would be applied as part of an integrated approach which could include non-lethal harassment methods. Similar to other lethal methods, very little information is available on the effectiveness of DRC-1339 to reduce crow damage. However, like other methods, including non-lethal methods, the intent in using DRC-1339 is to reduce the number of birds present at a location where damages or threats of damage are occurring. Reducing the number of crows at a location where damage or threats are occurring either through the use of non-lethal methods or lethal methods can lead to a reduction in damage. The dispersal of birds using non-lethal methods reduced the number of birds using a location which was correlated with a reduction in damage occurring at that location (Avery et al. 2008, Chipman et al. 2008). Similarly, the use of DRC-1339 is intended to reduce the number of crows using a location. Hall and Boyd (1987) found the use of DRC-1339 to reduce local roosts by up to 25% could lead to a reduction in damage associated with those crows.

Often of concern with the use of lethal methods is that crows that are lethally taken will only be replaced by other crows either during the application of those methods (either from other crows that immigrate or emigrate into the area) or by crows the following year (increase in reproduction that could result from less competition). As stated previously, the use of lethal methods are not intended to be used as population management tools (except for hunting) over broad areas. The use of lethal methods, including the use of DRC-1339, are intended to reduce the number of birds present at a location where damage is occurring by

targeting those birds causing damage or posing threats. Since the intent of lethal methods is to manage those birds causing damage and not to manage entire bird populations, those methods are not ineffective because birds return the following year.

Chipman et al. (2008) found that crows returned to roosts previously dispersed using non-lethal methods within 2 to 8 weeks. In addition, Chipman et al. (2008) found that the use of non-lethal methods had to be re-applied every year during a six-year project evaluating the use of only non-lethal methods. At some roost locations, Chipman et al. (2008) found the number of crows that returned each year to roosts over a six-year period actually increased despite the use of non-lethal methods each year. Despite the need to re-apply non-lethal methods yearly, the return of birds to roost locations previously dispersed, and the number of crows using roost locations increasing annually at some roost locations, Chipman et al. (2008) determined the use of non-lethal methods could be effective at dispersing urban crow roosts in New York. Similar results were found by Avery et al. (2008) during the use of crow effigies and other non-lethal methods to disperse urban crow roosts in Pennsylvania. Crows returned to roost locations in Pennsylvania annually despite the use of non-lethal methods and effigies (Avery et al. 2008). Gorenzel et al. (2002) found that crows returned to roost locations after the use of lasers. Therefore, the use of both lethal and non-lethal methods may require repeated use of those methods. The return of birds to areas where damage management methods were previously employed does not indicated previous use of those methods were ineffective since the intent of those methods are to reduce the number of birds present at a site where damage is occurring at the time those methods are employed.

Another concern when employing methods to resolve crow damage associated with crow roosts is the apparent success of methods being claimed when crows actually have dispersed from an area naturally. This could apply to both lethal and non-lethal methods. Crow migration periods vary during the spring and fall depending on the geographical region and other natural stimuli (Verbeek and Caffrey 2002). In Maryland, winter communal roosts typically begin to form in late October and begin to dissipate in mid-March. Many of the previous studies evaluating methodologies for alleviating crow damage occurred during periods of time when crows could have been dispersing naturally which must be considered when evaluating the success of methods in reducing damage. Boyd and Hall (1987) determined a reduction of the number of crows in roost by 25% using DRC-1339 could reduce damage occurring from crows using local roosts in Arkansas and Kentucky. However, work conducted using DRC-1339 occurring in January and February when roosts could have been breaking up naturally as crows disperse to breeding areas. Chipman et al. (2008) found the use of non-lethal methods could be effective in dispersing urban crow roosts in New York. However, hazing projects did not occur until after pre-treatment assessments of crow roosts were conducted from November through January during the six-year project (Chipman et al. 2008). Thus, similar to the work conducted by Boyd and Hall (1987), those non-lethal methods employed by Chipman et al. (2008) in New York occurred in January and could have occurred during the period of time when crows begin to disperse naturally. Avery et al (2008) noted that the use of effigies and other non-lethal methods at crow roosts in Pennsylvania during December 2005 were successful in breaking up the large roost into smaller roosts but the roosts didn't begin to disperse until January. Therefore, to effectively evaluate the future use of methods, in crow damage management activities, WS will consider the time of year those methods were employed in relationship to when crows may have dispersed naturally.

Most lethal and non-lethal methods currently available provide only short-term benefits when addressing crow damage. Those methods are intended to reduce damage occurring at the time those methods are employed but do not necessarily ensure crows will not return once those methods are discontinued or the following year when large flocks of crows return. Long-term solutions to resolving crow damage are often difficult to implement and can be costly. In some cases, long-term solutions involve exclusionary devices, such as wire grids, or other practices such as closing garbage cans. When addressing large urban crow roosts, long-term solutions generally involve modifying existing roost location to be less attractive

to crows but to ensure complete success, alternative roosting sites in areas where damage is not likely to occur are often times required. Similar to other roost dispersal techniques available, modifying a current roost site to be less attractive to crows will likely result in a dispersal of those crows to other areas where damage could occur or could cause roosts to break up into smaller roosts resulting in multiple occurrences of damage situations. Therefore, to be completely successful available roost sites must be modified to be unattractive to crows as they return to roost in urban situations and should include alternative roost sites that are attractive to crows but in areas where damage is not likely to occur.

However, little is known about roost site characteristics that are preferable to crows but likely involves many factors. One factor often noted when describing characteristics of crow roost sites is the presence of brightly illuminated sites (Gorenzel and Salmon 1995, Peh and Sodhi 2002, Johnson 2005, Avery et al. 2008). Crow roost trees were found to have greater height, trunk diameter, crown diameter, and crown volume compared to non-roost trees in California (Gorenzel and Salmon 1995). Roost trees were more often found over asphalt or concrete substrate in commercial areas than non-roost trees, including greater ambient light levels and interior canopy temperatures (in winter) (Gorenzel and Salmon 1995).

An understanding of preferred roost characteristics could allow city planners and managers to design areas that would discourage crows from roosting in those areas (Gorenzel and Salmon 1995). Understanding crow roost would also allow for alternative roost sites to be indentified to allow for crows to be harassed from undesired locations (as determined by affected parties) to designated areas that exhibit preferred roosts characteristics but are in areas where damages would likely not occur. Crows in those areas would not be disturbed and would be allowed to roost in those locations where damages were not likely to occur. Gorenzel and Salmon (1995) recommended that the planting of evergreen trees be avoided in areas with asphalt or concrete substrate to avoid winter roosts forming. In addition, Gorenzel and Salmon (1995) recommended trees growing more than 7.6 meters in California should be pruned or not planted in areas around parking lots and industrial sites to make them less attractive to crows.

WS will continue to work with communities and research staff to identify characteristics about current crow roosts in attempts to modify those attributes to make those areas less attractive to crows. In addition, WS will continue to work with other entities to identify alternative roosts sites where crows roosting in those areas are not likely to cause damage or pose threats of damage in attempts to create areas where crows can be disperse to. This approach will allow long-term solutions to be implemented when dealing with urban crow roosts.

WS may recommend crows be harvested during the regulated hunting season in an attempt to reduce the number of crows causing damage. Managing crow populations over broad areas could lead to a decrease in the number of crows causing damage. Establishing hunting seasons and the allowed take during those seasons is the responsibility of the MDNR under frameworks developed by the USFWS. WS does not have the authority to establish hunting seasons or to set allowed harvest numbers during those seasons.

Appendix B contains a thorough discussion of the methods available for use in an integrated wildlife damage management approach to address requests for assistance to manage damage or reduce threats to human safety. WS' programmatic FEIS contains additional discussion on adaptive management using an integrated approach to address damage to resources and threats to human safety (USDA 1997). As part of an integrated approach, WS may provide technical assistance and direct operational assistance to those experiencing damage associated with crows.

Technical Assistance Recommendations

Under the proposed action, WS would provide technical assistance to those persons requesting crow damage management as part of an integrated approach to managing damage. Technical assistance would

occur as described in Alternative 1 of this EA. Technical assistance is further discussed in WS' programmatic FEIS (USDA 1997).

The WS program in the State regularly provides technical assistance to individuals, organizations, and other federal, state, and local government agencies for managing bird damage. Technical assistance includes collecting information about the species involved, the nature and extent of the damage, and previous methods that the cooperator has attempted to resolve the problem. WS then provides information on appropriate methods that the cooperator may consider to resolve the damage themselves. Types of technical assistance projects may include a visit to the affected property, written communication, telephone conversations, or presentations to groups such as homeowner associations or civic leagues.

Since FY 2000, WS has conducted 405 technical assistance projects that involved crow damage to agricultural resources, property, natural resources, and threats to human safety.

Operational Damage Management Assistance

Operational damage management assistance includes damage management activities that are directly conducted by or supervised by personnel of WS. Operational damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone and there is a written agreement between WS and the entity requesting assistance. The initial investigation defines the nature, history, and extent of the problem; species responsible for the damage; and methods available to resolve the problem. The professional skills of WS' personnel are often required to effectively resolve problems, especially if restricted-use chemicals are necessary or if the problems are complex.

Educational Efforts

Education is an important element of activities because wildlife damage management is about finding balance and coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, WS provides lectures, courses, and demonstrations to producers, homeowners, state and county agents, colleges and universities, and other interested groups. Cooperating agencies frequently cooperate with other entities in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that other wildlife professionals and the public are periodically updated on recent developments in damage management technology, programs, laws and regulations, and agency policies.

Research and Development

The National Wildlife Research Center (NWRC) functions as the research arm of WS by providing scientific information and development of methods for wildlife damage management that are effective and environmentally responsible. NWRC research biologists work closely with wildlife managers, researchers, and others to develop and evaluate wildlife damage management techniques. For example, research biologists from the NWRC were involved with developing and evaluating mesurol for reducing crow predation on eggs. NWRC biologists have authored hundreds of scientific publications and reports, and are respected world-wide for their expertise in wildlife damage management.

WS' Decision Making Procedures

WS' personnel use a thought process for evaluating and responding to damage complaints which is depicted by the WS Decision Model (WS Directive 2.201) and described by Slate et al. (1992). WS'

programmatic FEIS provides further discussion and examples of how the Decision Model is used to address damage and threats associated with wildlife (USDA 1997). WS' personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate for effectively reducing damage. WS' personnel assess the problem and then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic, and social considerations. Following this evaluation, methods deemed to be practical for the situation are incorporated into a damage management strategy. After this strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model, most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions, including WS.

Community-based Decision Making

The WS program in Maryland follows the "co-managerial approach" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS provides technical assistance regarding the biology and ecology of crows and effective, practical, and reasonable methods available to the local decision-maker(s) to reduce damage or threats. This includes non-lethal and lethal methods. WS and other state and federal wildlife management agencies may facilitate discussions at local community meetings when resources are available. Resource owners and others directly affected by crow damage or conflicts in the State have direct input into the resolution of such problems. They may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

Under a community based decision-making process, WS would provide information, demonstration, and discussion on all available methods to the appropriate representatives of the community for which services were requested to ensure a community-based decision is made. By involving decision-makers in the process, damage management actions can be presented to allow for decisions on damage management to involve those individuals that the decision maker(s) represents. As addressed in the EA, WS would provide technical assistance to the appropriate decision-maker(s) to allow for information on damage management activities to be presented to those persons represented by the decision-maker(s), including demonstrations and presentation by WS at public meetings to allow for involvement of the community. Requests for assistance to manage crows often originate from the decision-maker(s) based on community feedback or from concerns about damage or threats to human safety. As representatives, the decision-maker(s) are able to provide the information to local interests either through technical assistance provided by WS or through demonstrations and presentation by WS on crow damage management activities. This process allows decisions on crow damage management activities to be made based on local input.

In the case of private property owners, the decision-maker is the individual that owns or manages the affected property. The decision-maker has the discretion to involve others as to what occurs or does not occur on property they own or manage. Due to privacy issues, WS can not disclose cooperator information to others. Therefore, in the case of an individual property owner or manager, the involvement of others and to what degree others are involved in the decision-making process is a decision made by that individual.

Community Decision-Makers

The decision-maker for the local community with a homeowner or civic association would be the

President or the Board's appointee. The President and Board are popularly elected residents of the local community who oversee the interests and business of the local community. This person would represent the local community's interest and make decisions for the local community or bring information back to a higher authority or the community for discussion and decision-making. If no homeowner or civic association represents the affected resource then WS will provide technical assistance to the self or locally appointed decision-maker. Identifying the decision-maker for local business communities is more complex because the lease may not indicate whether the business must manage wildlife damage themselves, or seek approval to manage wildlife from the property owner or manager, or from a governing Board. WS would provide technical assistance and make recommendations for damage reduction to the local community or local business community decision-maker(s). Direct control would be provided by WS only if requested by the local community decision-maker, funding is provided, and if the requested direct control was compatible with WS' recommendations.

Private Property Decision-Makers

The decision-maker for private property is usually the property owner. WS would provide technical assistance and recommendations to this person. Direct control would be provided by WS if requested, funding is provided, and the requested management was according to WS' recommendations.

Public Property Decision-Makers

The decision maker for local, state, or federal property would be the official responsible for or authorized to manage the public land to meet interests, goals, and legal mandates for the property. WS would provide technical assistance to this person and recommendations to reduce damage. Direct control would be provided by WS if requested, funding provided, and the requested actions were within the recommendations made by WS.

Criteria for Depopulating a Crow Roost

Under this alternative, WS would recommend an integrated approach using lethal and non-lethal methods to manage damage caused by crows when a request is received. When addressing damage associated with a communal crow roost, the most effective approach to resolving damage associated with the roost is often to disperse those crows using the roost to other areas where damage is not likely to occur. If the communal crow roost cannot be dispersed after the repeated use of non-lethal methods or if non-lethal methods cannot be employed (*e.g.*, city noise ordinance), a request is often received to use lethal methods to depopulate the roost. When a request is received to depopulate a communal winter roost using lethal methods, WS will consult with the MDNR and the USFWS. Winter communal roosts generally form from late October through mid-March in Maryland. When a request is received by WS to depopulate a crow roost, WS will: (1) make a site visit to the roost location to verify the damage occurring, (2) document the non-lethal methods or lethal methods which had previously been implemented to alleviate the damage, (3) evaluate other reasonable and practical non-lethal methods which may be implemented, and (4) evaluate the potential adverse affects of depopulating the roost. Based on those evaluations, WS will determine whether using available lethal methods are appropriate and practical for depopulating the roost. The use of lethal methods by WS to depopulate a roost location will only occur if requested by the appropriate decision-maker and only after a MOU, cooperative service agreement, or other comparable document has been signed between WS and the requesting entity and/or the appropriate property owner.

The following scenarios will be considered when identifying the appropriateness of using lethal methods (after non-lethal methods have been used and were unsuccessful or are not available) to depopulate a crow roost:

- In rural or agricultural areas, crow roosts would not be depopulated since other population management methods (*e.g.*, hunting) and non-lethal methods are available.
- At civil airports or military air bases where crows associated with a roost pose a strike risk with aircraft WS could apply those criteria described to determine the appropriateness and practicality of using methods to depopulate a crow roost when requested. This could include an actual communal roost, crows staging at an airport or base before entering a roost, or crows that form flight lines as they enter or exit a roost location.
- In urban/suburban areas where the dispersal of a crow roost is likely to result in the establishment of a new crow roost in another urban/suburban area, or when local ordinances prohibit the use of pyrotechnics, distress calls, and propane cannons to disperse a crow roost because of safety concerns, then WS would use those criteria described to determine the appropriateness of depopulating a crow roost when requested.

When damage or threats of damage are occurring from communal crow roosts, the most effective approach to resolving damage or threats is to disperse those crows to areas where damage will not occur. Since crows are no longer present at a location when a roost is effectively dispersed, crow damage ceases or is greatly reduced. However, harassment methods available are not always effective in dispersing crow roosts which may warrant the use of lethal methods to depopulate a crow roost (Boyd and Hall 1987). Depopulating a crow roost also involves reducing the number of crows using the roost. In some cases, reducing the number of crows using a roost site by 25% resulted in a reduction in damage associated with the crow roost (Boyd and Hall 1987). The use of lethal methods to reduce the number of crows at a roost location may be effective in dispersing the remaining crows from the roost. Crows often exhibit an aversion to areas where sick or dead crows occur at staging, feeding, or roosting locations which can cause crows to abandon the use of those areas (Boyd and Hall 1987).

Alternative 4 - Use of Non-lethal Methods Only

Under this alternative, WS would be required to implement non-lethal methods only to resolve damage caused by crows in Maryland. Only those methods discussed in Appendix B that are considered non-lethal would be employed by WS. No lethal take of crows would occur by WS. The use of lethal methods could continue to be used under this alternative by those experiencing damage by crows. Exclusionary devices can be effective in preventing access to resources in certain circumstances. The primary exclusionary methods are netting and over-head lines. Exclusion is most effective when applied to small areas to protect high value resources. However, exclusionary methods are neither feasible nor effective for protecting human safety, agriculture, or native wildlife species from crows across large areas. The nonlethal methods used or recommended by WS under this alternative would be identical to those identified in any of the alternatives.

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

Property owners or managers could conduct management using shooting or any non-lethal method that is legal. Property owners or managers might choose to implement WS' nonlethal recommendations, implement lethal methods, or request assistance from some private or public entity other than WS. Property owners/managers frustrated by lack of WS' assistance with the full range of crow damage management techniques may try methods not recommended by WS (*e.g.*, poisons). In some cases, property owners or managers may misuse some methods or use some methods in excess of what is

necessary.

3.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

Non-lethal Methods Implemented Before Lethal Methods

This alternative would require that all non-lethal methods or techniques described in Appendix B be applied to all requests for assistance to reduce damage and threats to safety from crows in the State. If the use of all non-lethal methods fails to resolve the damage situation or reduce threats to human safety at each damage situation, lethal methods would be employed to resolve the request. Non-lethal methods would be applied to every request for assistance regardless of severity or intensity of the damage or threat until deemed inadequate to resolve the request. This alternative would not prevent the use of lethal methods by those persons experiencing crow damage.

Those experiencing damage often employ non-lethal methods to reduce damage or threats prior to contacting WS. Verification of the methods used would be the responsibility of WS. No standard exists to determine requester diligence in applying those methods, nor are there any standards to determine how many non-lethal applications are necessary before the initiation of lethal methods. Thus, only the presence or absence of non-lethal methods can be evaluated. The proposed action described (Alternative 3) is similar to a non-lethal before lethal alternative because the use of non-lethal methods is considered before lethal methods by WS (WS Directive 2.101). Adding a non-lethal before lethal alternative and the associated analysis would not add additional information to the analyses in the EA.

Use of Lethal Methods Only

This alternative would require the use of lethal methods only to reduce threats and damage associated with birds. However, non-lethal methods can be effective in preventing damage in certain instances. Under WS Directive 2.101, WS must consider the use of non-lethal methods before lethal methods. Non-lethal methods have been effective in alleviating crow damage (Avery et al. 2008, Chipman et al. 2008). In those situations where damage could be alleviated using non-lethal methods deemed effective, those methods would be employed or recommended as determined by the WS Decision Model. Therefore, this alternative was not considered in detail.

Trap and Relocate Only

Under this alternative, all requests for assistance would be addressed using live-capture methods or the recommendation of live-capture methods. Birds would be live-captured using live-traps, cannon nets, rocket nets, bow nets, or mist nests. All birds live-captured through direct operational assistance by WS would be relocated. Relocation sites would be identified and have to be approved by the USFWS, MDNR, and/or the property owner where the relocated birds would be placed prior to live-capture and relocation. Live-capture and relocation could be conducted as part of the alternatives analyzed in detail. However, the relocation of wildlife could only occur under the authority of the USFWS and/or MDNR. Therefore, the relocation of birds by WS would only occur as directed by those agencies. When requested by the USFWS and/or the MDNR, WS could relocate birds under any of the alternatives analyzed in detail. Since WS does not have the authority to relocate birds in the State unless permitted by the USFWS and/or the MDNR, this alternative was not considered in detail since relocation of birds could occur under any of the alternatives analyzed in detail.

Reducing Damage by Managing Bird Populations through the Use of Reproductive Inhibitors

Under this alternative, the only method available to resolve requests for assistance would be the

recommendation and the use of reproductive inhibitors to reduce or prevent reproduction in birds responsible for causing damage. Reproductive inhibitors are often considered for use where wildlife populations are overabundant and where traditional hunting or lethal control programs are not publicly acceptable (Muller et. al. 1997). Use and effectiveness of reproductive control as a wildlife population management tool is limited by population dynamic characteristics (*e.g.*, longevity, age at onset of reproduction, population size and biological/cultural carrying capacity), habitat and environmental factors (*e.g.*, isolation of target population, cover types, and access to target individuals), socioeconomic, and other factors.

Reproductive control for wildlife could be accomplished either through sterilization (permanent) or contraception (reversible). Sterilization could be accomplished through: 1) surgical sterilization (vasectomy, castration, and tubal ligation), 2) chemosterilization, and 3) through gene therapy. Contraception could be accomplished through: 1) hormone implantation (synthetic steroids such as progestins), 2) immunocontraception (contraceptive vaccines), and 3) oral contraception (progestin administered daily).

Population modeling indicates that reproductive control is more efficient than lethal control only for some rodent and small bird species with high reproductive rates and low survival rates (Dolbeer 1998). Additionally, the need to treat a sufficiently large number of target animals, multiple treatments, and population dynamics of free-ranging populations place considerable logistic and economic constraints on the adoption of reproduction control technologies as a wildlife management tool for some species. Currently, no reproductive inhibitors are available for use to manage crow populations. Given the costs associated with live-capturing and performing sterilization procedures on birds and the lack of availability of chemical reproductive inhibitors for the management of crow populations, this alternative was not evaluated in detail. If a reproductive inhibits becomes available to manage crow populations and has proven effective in reducing crow populations, the use of the inhibitor could be evaluated under the proposed action as a method available that could be used in an integrated approach to managing damage. This EA would be reviewed and supplement to the degree necessary to evaluate the use of the reproductive inhibitor as part of an integrated approach described under the proposed action.

Compensation for Bird Damage

The compensation alternative would require WS and the USFWS to establish a system to reimburse persons impacted by bird damage. Under such an alternative, WS and/or the USWS would continue to provide technical assistance to those persons seeking assistance with managing damage. In addition, WS and/or the USFWS would conduct sites visits to verify damage. Analysis of this alternative in WS' programmatic FEIS indicated that a compensation only alternative had many drawbacks. Compensation would: 1) require large expenditures of money and labor to investigate and validate all damage claims, and to determine and administer appropriate compensation, 2) most likely be below full market value, 3) give little incentive to resource owners to limit damage through improved cultural or other practices and management strategies, and 4) not be practical for reducing threats to human health and safety.

3.3 MINIMIZATION AND SOPs FOR CROW DAMAGE MANAGEMENT TECHNIQUES

Minimization measures are any features of an action that serves to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current WS program, nationwide and in the State of Maryland, uses many such minimization measures and these are discussed in detail in Chapter 5 of WS' programmatic FEIS (USDA 1997). These minimization measures will be incorporated into activities conducted by WS when addressing crow damage and threats in the State.

Some key minimizing measures pertinent to the proposed action and alternatives include the following:

- The WS Decision Model, which is designed to identify effective wildlife damage management strategies and their impacts, is consistently used and applied when addressing bird damage.

- EPA-approved label directions are followed for all pesticide use. The registration process for chemical pesticides is intended to assure minimal adverse effects to the environment when chemicals are used in accordance with label directions.

- Non-target animals captured in traps are released unless it is determined that the animal will not survive and/or that the animal cannot be released safely.

- The presence of non-target species is monitored before using DRC-1339 to reduce the risk of mortality of non-target species populations.

- Reasonable and prudent alternatives and measures are established through consultation with the USFWS and implemented to avoid adverse impacts to T&E species.

- All personnel who use chemicals are trained and certified to use such substances or are supervised by trained or certified personnel.

- All personnel who use firearms are trained according to WS' Directives.

- The use of non-lethal methods is considered prior to the use of lethal methods when managing crow damage.

3.4 ADDITIONAL MINIMIZATION MEASURES SPECIFIC TO THE ISSUES

Issue 1 - Effects on Crow Populations

- Lethal take of crows by WS will be reported and monitored by WS and by the USFWS to evaluate population trends and the magnitude of WS' take of crows in the State.

- WS will only target those individuals or groups of target species identified as causing damage or posing a threat to human safety.

- The WS' Decision Model, designed to identify the most appropriate damage management strategies and their impacts, will be used to determine crow damage management strategies.

- WS will annually monitor crow damage management activities to ensure activities do not adversely affect crow populations in the State.

- Preference is given to non-lethal methods, when practical and effective. If practical and effective non-lethal control methods are not available and if lethal control methods are available and appropriate for WS to implement, WS may implement lethal methods.

Issue 2 - Effects on Non-target Wildlife Species Populations, Including T&E Species

- When conducting removal operations via shooting, identification of the target will occur prior to application.

- As appropriate, suppressed firearms will be used to minimize noise impacts.

- Personnel will use lures, trap placements, and capture devices that are strategically placed at locations likely to capture a target animal and minimize the potential of non-target animal captures.

- Any non-target animals captured in cage traps, nets, or any other restraining device will be released whenever it is possible and safe to do so.

- Personnel will be present during the use of all live-capture methods to ensure non-target species are released immediately or are prevented from being captured.

- WS would retrieve all dead crows to the extent possible, following treatment with DRC-1339.

- WS has consulted with the USFWS and the MDNR to evaluate activities to resolve crow damage and threats to ensure the protection of T&E species.

- WS will annually monitor activities conducted under the selected alternative, if activities are determined to have no significant impact on the environment and an EIS is not required, to ensure those activities do not negatively impact non-target species

Issue 3 - Humaneness and Animal Welfare Concerns of Methods

- Personnel will be well trained in the latest and most humane devices/methods for removing problem crows.

- WS' use of euthanasia methods will follow those recommended by WS' directives (WS Directive 2.430) and the AVMA (AVMA 2007).

- The NWRC is continually conducting research to improve the selectivity and humaneness of wildlife damage management devices used by personnel in the field.

Issue 4 - Effects on the Aesthetic Values of Crows

- Management actions to reduce or prevent damage caused by crows would be directed toward specific individuals identified as responsible for the damage, identified as posing a threat to human safety, or identified as posing a threat of damage.

- All methods or techniques applied to resolve damage or threats to human safety would be agreed upon by entering into a cooperative service agreement, MOU, or comparable document prior to the implementation of those methods.

- Preference is given to non-lethal methods, when practical and effective. If practical and effective non-lethal control methods are not available and if lethal control methods are available and appropriate for WS to implement, WS may implement lethal methods.

Issue 5 – Effects on the Aesthetic Value of Property

- WS will target those crows identified as causing damage

Issue 6 - Effects of Management Methods on Human Health and Safety

- Damage management activities will be conducted professionally and in the safest manner possible. Most live-trapping will be conducted away from areas of high human activity. If this is not possible, then live-trapping will be conducted during periods when human activity is low (*e.g.*, early morning).

- Damage management via shooting will be conducted professionally and in the safest manner possible. Shooting will be conducted during time periods when public activity and access to the control areas are restricted. Personnel involved in shooting operations will be fully trained in the proper and safe application of this method.

- All personnel employing chemical methods will be properly trained and certified in the use of those chemicals. All chemicals used by WS will be securely stored and properly monitored to ensure the safety of the public. WS' use of chemicals and training requirements to use those chemicals are outlined in WS Directive 2.430.

- All chemical methods used by WS or recommended by WS will be registered with the EPA, and the Maryland Department of Agriculture.

Issue 7 - Effects on the Regulated Harvests of Crows

- Management actions to reduce or prevent damage caused by crows in the State would be directed toward specific individuals identified as responsible for the damage, identified as posing a threat to human safety, or identified as posing a threat of damage.

- WS' activities to manage damage and threats caused by crows will be coordinated with the USFWS and the MDNR.

- WS' lethal take (killing) of crows will be reported to and monitored by the USFWS and/or the MDNR to ensure WS' take is considered as part of management objectives for crows in the State.

- WS will annually monitor crow damage management activities to ensure activities do not adversely affect crow populations in the State.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative to address the need for action described in Chapter 1 and the issues described in Chapter 2. This chapter 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 T&E species recovery plans), visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

This section analyzes the environmental consequences of each alternative in comparison to determine the

extent of actual or potential impacts on the issues. Therefore, the proposed action/no action alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The analysis also takes into consideration mandates, directives, and the procedures of WS, the MDNR, the USFWS, and the Maryland Department of Agriculture.

Issue 1 – Effects on Crow Populations

A common issue is whether damage management actions will adversely affect the populations of target bird species, especially when lethal methods are employed. WS maintains ongoing contact with USFWS and the MDNR to ensure activities are within management objectives for those species. WS submits annual bird damage management activity reports to the USFWS and the MDNR. The USFWS monitors the total take of birds from all sources and factors in survival rates from predation, disease, and other mortality data. Ongoing contact with USFWS and the MDNR assures local, state, and regional knowledge of wildlife population trends are considered. While local populations of crows may be reduced, compliance with applicable state and federal laws and regulations authorizing take of birds and their nest and eggs will ensure that the regional and statewide population will not be adversely affected.

As discussed previously, the analysis for magnitude of impact from lethal take can 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 trend data. Information on bird populations and trends are often derived from several sources including the BBS, the CBC, the Partners in Flight Landbird Population database, published literature, and harvest data.

The alternatives discussed in Chapter 3 were developed in response to the issues identified in Chapter 2. The issue of the potential impacts of conducting the alternatives on the populations of crows is analyzed for each alternative below.

Alternative 1 – No Bird Damage Management Conducted by WS

Under this alternative, WS would not conduct crow damage management activities in the State. WS would have no direct involvement with any aspect of addressing damage caused by crows and would provide no technical assistance. No take of crows by WS would occur in the State. Crows could continue to be lethally taken to resolve damage and/or threats occurring under the blackbird depredation order. Take of crows during a regulated harvest would continue to occur. Management actions taken by non-federal entities would be considered the *environmental status quo*.

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

Since crows would still be taken under the blackbird depredation order and since crows would continue to be harvested during the regulated season at the discretion of the USFWS and the MDNR, the potential effects on crow populations in the State would be similar among all the alternatives for this issue. WS' involvement would not be additive to take that could occur since the cooperator requesting WS' assistance could conduct bird damage management activities without WS' direct involvement under the blackbird depredation order. Therefore, any actions to resolve damage or reduce threats associated with crows could occur by other entities despite WS' lack of involvement under this alternative.

Alternative 2 - Crow Damage Management by WS through Technical Assistance Only

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

Under a technical assistance only alternative, those persons experiencing threats or damage associated with crows in the State could lethally take crows despite WS' lack of direct involvement in the management action. Therefore, under this alternative the number of crows lethally taken would likely be similar to the other alternatives since take could occur under the blackbird depredation order and during the harvest season. WS' participation in a management action would not be additive to an action that could occur in the absence of WS' participation.

With the oversight of the USFWS and the MDNR, it is unlikely that crow populations would be adversely impacted by implementation of this alternative. Under this alternative, WS would not be directly involved with damage management actions and therefore, direct operational assistance could be provided by other entities, such as the MDNR, the USFWS, private entities, and/or municipal authorities. If direct operational assistance is not available from WS or other entities, it is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal take, which could lead to real but unknown effects on other wildlife populations. People have resorted to the illegal use of chemicals and methods to resolve wildlife damage issues (White et al. 1989, USDA 1997, USFWS 2001, Food and Drug Administration 2003).

Alternative 3 - Continuing the Current Integrated Approach to Managing Crow Damage (Proposed Action/No Action)

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

The issue of the effects on target crow species arises from the use of non-lethal and lethal methods to address the need for reducing damage and threats. Methods employed in an integrated approach to reduce damage and threats are categorized into non-lethal and lethal methods. As part of an integrated approach to managing damage and threats, WS could apply both lethal and non-lethal methods when requested by those persons experiencing damage.

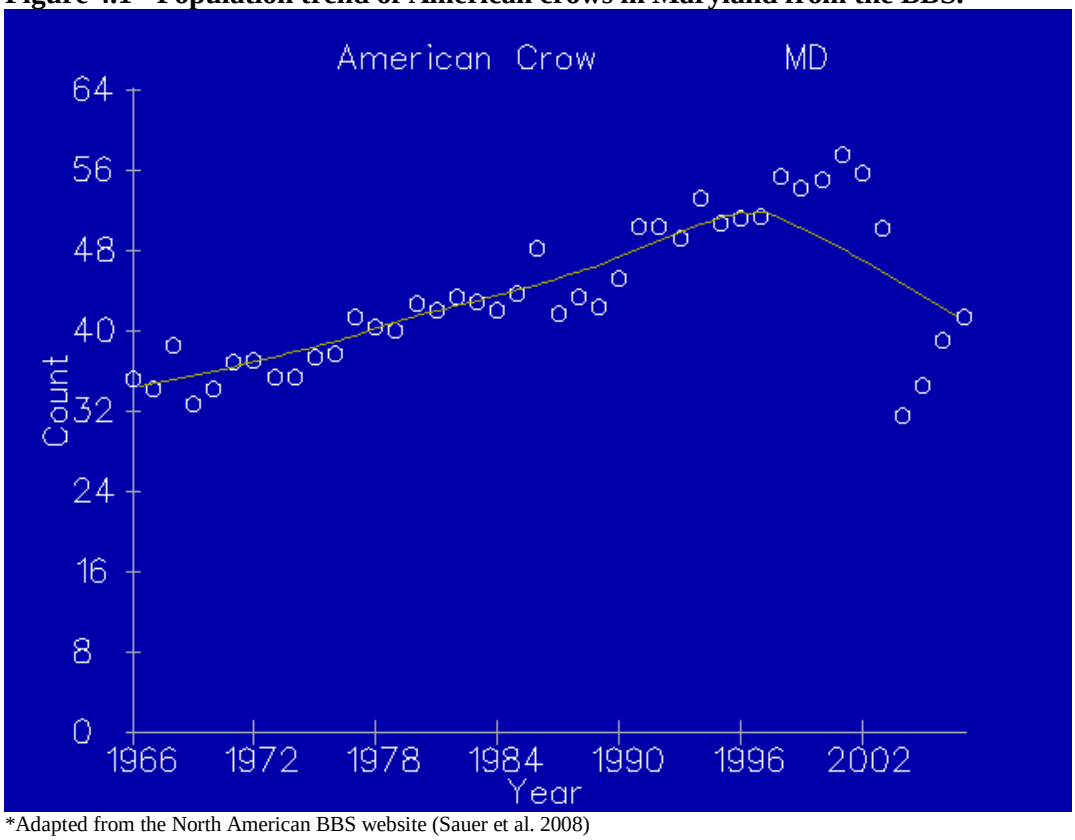
Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage. WS' take is monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (USDA 1997). The potential impacts on the populations of American crows and fish crows from the implementation of the proposed action are analyzed for each species below.

Crow Densities in Maryland

The MDNR provided hunter harvest data, but was unable to provide any definitive estimates of population sizes for purposes of the following analyses on impacts to the population. Therefore, WS used the best available information to produce reasonable estimates.

The Partners in Flight landbird population database estimated the American crow population to be 160,000 individuals based on BBS survey data collected in Maryland (Rich et al. 2004). As shown in Figure 4.1, BBS trend data suggests American crow populations are increasing in the State. Since 1966, the number of American crows observed in the State during the BBS has increased annually at an estimated 0.8%, which is statistically significant (Sauer et al. 2008). Regionally, crows are also showing a statistically significant upward trend estimated at 0.7% annually since 1966 with a similar statistically significant trend observed for breeding crows across the United States annually (Sauer et al. 2008). Wintering crow populations are showing a cyclical pattern in Maryland with a general stable trend with a increasing trend observed from the early 1970s through the mid-1990s based on CBC data since 1966 (NAS 2002).

Figure 4.1 - Population trend of American crows in Maryland from the BBS.

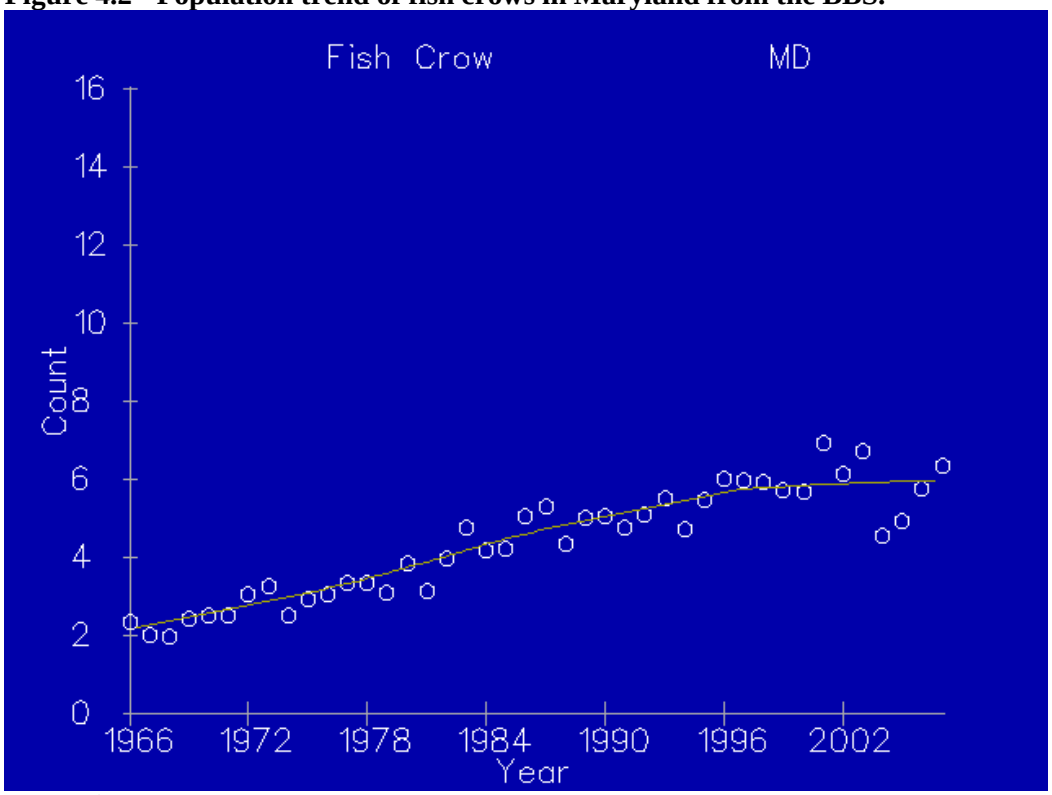


*Adapted from the North American BBS website (Sauer et al. 2008)

Similar to American crows, the number of fish crows observed during the BBS conducted in Maryland has also increased since 1966 estimated at 3.0% annually, which is also statistically significant (see Figure 4.2; Sauer et al. 2008). In the northeast region of the United States, including Maryland, the number of fish crows observed during the BBS have shown a statistically significant increase estimated at 2.7% since 1966 (Sauer et al. 2008). In the United States, fish crows observed on all BBS routes are showing an increasing trend estimated at 0.4% annually since 1966 (Sauer et al. 2008). Like American crows, the number of fish crows observed during winter surveys has been cyclical since 1966 but show a

general increasing trend beginning in the late-1970s with more stable trends observed since the late-1980s (NAS 2002). The Partners in Flight population database estimated the population of fish crows to be 16,000 crows in Maryland based on BBS data (Rich et al. 2004).

Figure 4.2 - Population trend of fish crows in Maryland from the BBS.



*Adapted from the North American BBS website (Sauer et al. 2008)

Crow Population Impact Analysis

As discussed previously, crows can be taken with a depredation permit issued by the USFWS when committing or about to commit damage or posing a threat to human safety under a blackbird depredation order. In addition, crows can be harvested in the State during a regulated season that allows an unlimited number of crows to be harvested. Since take of crows can occur without a permit from the USFWS or the MDNR under the blackbird depredation order, there are no reporting requirements for the take of crows to reduce damage or reduce threats. Therefore, the number of crows taken in the State under the depredation order to alleviate damage or reduce threats is unknown. Similarly, hunters harvesting crows during the regulated hunting season are not required to report their take to the USFWS or the MDNR. No take of crows has occurred under depredation permits in the State.

However, the MDNR has estimated the annual take of crows during the regulated harvest season since 2004. The harvest of crows during the annual hunting season in the State since 2004 has been estimated to range from 13,208 crows in 2006 to a high of 41,975 crows in 2008 with an average of 25,101 crows harvested annually (see Table 4.3). WS has taken 59 crows in the State since FY 2004 under the blackbird depredation order to alleviate damage or to reduce threats associated with crows. The number of crows taken by WS has ranged from no crows taken by WS in FY 2004 to a high of 25 crows taken in FY 2007.

An estimated 125,509 crows have been harvested in the State since 2004 during the regulated hunting

season. WS' highest level of take of American crows occurred in FY 2007 which represented 0.14% of the total take of crows during the harvest season and by WS. Since 2004, WS' take of American crows in the State to alleviate damage or reduce threats has represented 0.05% of the total take of crows. As discussed previously, the American crow population in the State has been estimated at 160,000 crows (Rich et al. 2004). If American crow populations have been stable since 2004, the average total take of American crows in the State of 25,113 crows would represent 15.7% of estimated statewide population of crows.

Table 4.3 – Take of American crows in Maryland during the hunting season and WS by year

Year[1]	Hunter Harvest[2,3]	WS' Take[4]	Total Take	% WS' Take
2004	18,186	0	**18,186**	0
2005	34,658	3	**34,661**	0.01%
2006	13,208	15	**13,223**	0.11%
2007	17,482	25	**17,507**	0.14%
2008	41,975	16	**41,991**	0.04%
TOTALS	**125,509**	**59**	**125,568**	**0.05%**

[1]Data provided by hunting season

[2]Data provided by the MDNR

[3]Combined crow take, take of each species is unknown

[4]WS' take is reported by federal fiscal year

Based on previous requests for assistance and a reasonable anticipation of an increase in requests for assistance, primarily to alleviate damage and threats associated with urban crow roosts, take of up to 8,000 crows (combined take of American crows and fish crows) annually could occur by WS in Maryland of which less than 500 fish crows will be taken. Crows often form mixed species roosts which can contain both American crows and fish crows. Fish crows are often confused with American crows with the only reliable distinction between the two species being vocal (Mcgowan 2001). Given the similar physical appearance of the two species, estimating the number of individual fish crows or American crows in a roost or flock of crows based on visual cues can be difficult. Isolating and distinguishing the vocalizations of an individual crow for species identification in a mixed species flock of crows can also be difficult.

Fish crows are primarily a coastal species usually found near water (Mcgowan 2001). Although common along the coastal areas of the State, fish crows are not as abundant as American crows. American crows can be found throughout the State while fish crows are most commonly found in the coastal areas of Maryland. From 1996 through 2007, the BBS estimates the relative abundance of American crows in the State at 43.29 crows observed per BBS route compared with 4.21 fish crows observed per BBS route in the State (Sauer et al. 2008). Although fish crows and American crows form mixed species flocks, most flocks of crows or crow roosts encountered is the State consist primarily of American crows. As stated previously, based on previous requests for assistance and an anticipation of requests to disperse urban crow roosts up to 8,000 crows could be taken by WS under the proposed action. Although not as abundant in the State, fish crows could be present in flocks of crows addressed by WS. However, given the relative abundance of fish crows in the State, WS' anticipates that less than 500 fish crows will be taken annually under the proposed action.

Based on a population estimated at 160,000 American crows and a stable population trend, WS' proposed take of up to 8,000 crows annually, if all crows taken were American crows, would represent 5% of the estimated statewide American crow population. If up to 500 fish crows are taken annually by WS, WS' take would represent 3% of the estimated population of fish crows in the State based on a stable population. The number of American crows and the number of fish crows observed in the State during

the BBS have shown increasing trends since 1966 (Sauer et al. 2008).

The annual take of crows in the State during the regulated season has averaged 25,101 crows (combined take) since 2004. The number of each crow species taken during the regulated harvest season is unknown but are combined when take is estimated. If the average number of crows taken annually since 2004 is representative of the number of crows taken in the State, the cumulative take of crows from the harvest season and from WS' take would be estimated at 33,101 crows annually. If all crows taken during the harvest season and if all crows taken by WS were American crows, an annually harvest of 33,101 crows would represent 20.7% of the estimated American crow population in the State. Although some take of fish crows during the hunting season likely occurs, the actual number taken is unknown but is likely a small percentage of the number of crows taken.

If the population ratio of American crows to fish crows in the State is an indication of the number of fish crows taken annually in the State during the regulated harvest season, an estimated 2,501 fish crows are harvested annually in the State. If up to 500 fish crows were taken annually and if 2,501 fish crows were harvested annually, the cumulative take would represent 18.8% of the estimated fish crow population.

The number of crows taken annually under the blackbird depredation order in the State by entities other than WS for damage management purposes is unknown. The reporting of take under the depredation order is not currently required. However, the take of crows under the depredation order by other entities is likely to be a small contributor to the cumulative take of crows annually. Although some take is likely to occur, take is not expected to reach a high magnitude.

Given that the number of American crows and fish crows observed during statewide surveys are showing increasing trends (NAS 2002, Sauer et al. 2008), the populations of those crow species have not declined since those population estimated were calculated and have likely remained at least stable. WS' take is monitored by comparing numbers of birds killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (USDA 1997). Magnitude is defined as a measure of the number of animals killed in relation to their abundance. In this analysis, magnitude is evaluated first in terms of total harvest or population trend, then in terms of WS' proposed annual take of crows. Magnitude is determined either quantitatively or qualitatively. The quantitative method is more rigorous and used when allowable harvest, state population level, and harvest data is available. Qualitative methods are based on state population trends and harvest data or regional population trends and population modeling.

The use of population trends as an index of magnitude is based on the assumption that annual harvests do not exceed allowable harvest levels. State wildlife management agencies act to avoid over-harvests by restricting take (either through hunting season regulation and/or permitted take) to ensure that annual harvests are within allowable harvest levels. The criteria for determining total harvest magnitude on the basis of animal population trends have been defined in WS' programmatic FEIS (USDA 1997) as: 1) if the population is increasing, the magnitude of is low; 2) if the population is stable, the magnitude of take is moderate; and 3) if the population is decreasing, the magnitude is high. Since trend data indicates that American crow populations and fish crow populations are showing increasing trends, the magnitude of take that has occurred has been low (which allows the population to increase). From 2004 through 2008, the average annual cumulative take (harvest take and WS' take) of crows, if all crows taken were American crows, represent 15.7% of the statewide population. Under the proposed action, the proposed take of crows by WS when combined with the average annual harvest take of crows, if all crows taken were American crows, would represent 20.7% of the estimated statewide population. Therefore, under the proposed action, the take of American crows annually would increase approximately 5.0% compared to the previous levels of take. If fish crows are included in the take, the percentage of take of American

crows would likely be lower.

In addition, the magnitude ratings for the proposed program are based on the following criteria: 1) if the proposed take is less than or equal to 33% of the total harvest of a species, the magnitude of take would be considered low, 2) if the proposed take is greater than 33% but less than or equal to 66% of the total harvest of species, the magnitude is considered moderate if the total harvest rating is high or low if the total harvest rating is moderate, and 3) if the proposed take is greater than 66% of the total harvest, the magnitude is considered equivalent to the total harvest rating (USDA 1997). If 8,000 American crows are taken annually by WS under the proposed action, WS' take would represent 24.1% of the total harvest based on the average take of crows annually during the harvest season. Therefore, WS' take, if 8,000 American crows were taken, would be of low magnitude.

If up to 500 fish crows were taken annually by WS under the proposed action, WS' take would represent 16.7% of the total harvest based on the average take of fish crows in the State during the regulated season if the population ratio of American crows to fish crows is reflective of the ratio of species harvest. Since the take of fish crows, based on the best available information, is below 33% of the total harvest, WS' proposed take would be of low magnitude.

The magnitude of the proposed take of American crows and fish crows could be considered to be low when compared to the estimated populations of those species, the annual harvest of those species, and when considered as part of the current increasing trends for those species. WS will continue to monitor the annual take of crows in Maryland to ensure take levels do not reach a magnitude that would cause adverse affects on those species populations.

Alternative 4 - Use of Non-lethal Methods Only

Under this alternative, WS would not take any target species because no lethal methods would be used. The take of crows under this alternative could continue under the blackbird depredation order to alleviate damage or reduce threats. The harvest of crows during the regulated season would also continue to occur. The take of crows under this alternative, in the absence of WS' direct involvement, could be lower than the proposed action if those experiencing damage are not capable or are unwilling to employ those methods. However, those persons seeking assistance from WS that would allow for the use of lethal methods if WS was directly involved, are likely those persons that would employ those lethal methods available themselves or employ other persons to employ those methods. Therefore, the take of crows could be similar to the proposed action under this alternative if those persons experiencing damage or threats associated with crows employ lethal methods.

The magnitude of take under this alternative would likely be similar to take occurring under any alternatives since lethal take of crows could continue under this alternative despite WS' inability to use those methods. For the same reasons shown in the population effects analysis under the proposed action it is unlikely that target bird populations would be adversely impacted by implementation of this alternative. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal use of other chemicals which could lead to real but unknown effects on target bird populations.

Issue 2 - Effects on Non-target Wildlife Species Populations, Including T&E Species

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

Alternative 1 – No Crow Damage Management Conducted by WS

Under this alternative, WS would not be directly involved with crow damage management activities in the State. Therefore, no direct impacts to non-targets or T&E species would occur by WS under this alternative. Birds would continue to be taken during the regulated harvest season and under the depredation order for blackbirds. Risks to non-targets and T&E species would continue to occur from those who implement crow damage management activities on their own or through recommendations by the other federal, state, and private entities. Although some risks occur from those that implement crow damage management in the absence of any involvement by WS, those risks are likely low and are similar to those under the other alternatives.

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

Alternative 2 - Crow Damage Management by WS through Technical Assistance Only

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

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

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

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

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

The ability to reduce negative impacts caused by crows to wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing damage management actions. It would be expected that this alternative would have a greater chance of reducing damage than Alternative 1 since WS would be available to provide information and advice.

Alternative 3 - Continuing the Current Integrated Approach to Managing Crow Damage (Proposed Action/No Action)

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

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

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

Other non-lethal methods available for use under this alternative include live traps, nets, and repellents. Live traps and nets restrain wildlife once captured and are considered live-capture methods. Live traps have the potential to capture non-target species. Trap and net placement in areas where target species are active and the use of target-specific attractants will likely minimize the capture of non-targets. If traps and nets are attended to appropriately, any non-targets captured can be released on site unharmed.

Only those repellents registered with the EPA pursuant to the FIFRA would be recommended and used by WS under this alternative. Therefore, the use and recommendation of repellents would not have negative impacts on non-target species when used according to label requirements. Most repellents for crows, except for mesurol, are derived from natural ingredients that pose a very low risk to non-targets when exposed to or when ingested.

Crows could still be lethally taken during the regulated harvest season and through the blackbird depredation order under this alternative. Impacts to non-targets from the use of non-lethal methods would be similar to the use of non-lethal methods under any of the alternatives. Non-targets would generally be unharmed from the use of non-lethal methods under any of the alternatives since no lethal take would occur. Non-lethal methods would be available under all the alternatives analyzed. WS' involvement in

the use of or recommendation of non-lethal methods would ensure non-target impacts are considered under WS' Decision Model. Impacts to non-targets under this alternative from the use of and/or the recommendation of non-lethal methods are likely to be low.

WS would also employ and/or recommend lethal methods under the proposed action alternative to alleviate damage. Lethal methods available for use to manage damage caused by crows under this alternative would include shooting and DRC-1339. In addition, crows could also be euthanized once live-captured by other methods. Lethal take of live-captured crows could occur from the use of cervical dislocation or by carbon dioxide. Available methods and the application of those methods to resolve crow damage is further discussed in Appendix B.

The use of firearms is essentially selective for target species since animals are identified prior to application; therefore, no adverse impacts are anticipated from use of this method. A common concern regarding with the use of DRC-1339 is the potential non-target risks. All label requirements of DRC-1339 will be followed to minimize non-target hazards. As required by the label, all potential bait sites are pre-baited and monitored for non-target use as outlined in the pre-treatment observations section of the label. If non-targets are observed feeding on the pre-bait, the plots are abandoned and no baiting would occur at those locations. Treated bait is mixed with untreated bait per label requirements when applied to bait sites to minimize the likelihood of non-targets finding and consuming bait that has been treated. The bait type selected can also limited the likelihood that non-target species will consume treated bait since some bait types are not preferred by non-target species.

Once sites are baited, sites are monitored daily to further observe for non-target feeding activity. If birds are observed feeding on bait, those sites are abandoned. By acclimating target bird species to a feeding schedule, baiting can occur at specific times to ensure bait placed is quickly consumed by target bird species, especially when large flocks of target species are present. The acclimation period allows for treated bait to be present only when birds are conditioned to be present at the site and provides a higher likelihood that treated bait is consumed by the target species which makes it unavailable to non-targets. In addition, with many blackbird species, including crows, when present in large numbers, tend to exclude non-targets from a feeding area due to their aggressive behavior and by the large number of conspecifics present at the location. Therefore, risks to non-target species from consuming treated bait only occurs when treated bait is present at a bait location. WS will retrieve all dead crows to the extent possible, following treatment with DRC-1339 to minimize secondary hazards associated with scavengers feeding on crow carcasses.

DRC-1339 Primary Hazard Profile - DRC-1339 was selected for reducing crow damage because of its high toxicity to blackbirds (DeCino et al. 1966, West et al. 1967, Schafer 1972) and low toxicity to most mammals, sparrows, and finches (Schafer and Cunningham 1966, Apostolou 1969, Schafer 1972, Schafer et al. 1977, Matteson 1978, Cunningham et al. 1979, Cummings et al. 1992, Sterner et al. 1992). The likelihood of a non-target bird obtaining a lethal dose is dependent on: (1) frequency of encountering the bait, (2) length of feeding bout, (3) the bait dilution rate, (4) the bird's propensity to select against the treated bait, and 5) the susceptibility of the non-target species to the toxicant. Birds that ingest DRC-1339 probably die because of irreversible necrosis of the kidney and subsequent inability to excrete uric acid (*i.e.*, uremic poisoning) (DeCino et al. 1966, Felsenstein et al. 1974, Knittle et al. 1990). Birds ingesting a lethal dose of DRC-1339 usually die in one to three days.

The median acute lethal dose (LD_{50})[11] values for starlings, blackbirds, and magpies (Corvidae) range from one to five mg/kg (Eisemann et al. 2003). For American crows, the median acute lethal dose has been estimated at 1.33 mg/kg (DeCino et al. 1966). The acute oral toxicity (LD_{50}) of DRC-1339 has been

[11] An LD_{50} is the dosage in milligrams of material per kilogram of body weight required to cause death in 50% of a test population of a species.

estimated for over 55 species of birds (Eisemann et al. 2003). DRC-1339 is toxic to mourning doves (*Zenaidura macroura*), pigeons, quails (*Coturnix coturnix*), chickens and ducks (*Anas* spp.) at ≥5.6 mg/kg (DeCino et al. 1966). In cage trials, Cummings et al. (1992) found that 2% DRC-1339-treated rice did not kill savannah sparrows (*Passerculus sandwichensis*). Gallinaceous birds and waterfowl may be more resistant to DRC-1339 than blackbirds, and their large size may reduce the chances of ingesting a lethal dose of poison (DeCino et al. 1966). Avian reproduction does not appear to be affected from ingestion of DRC-1339 treated baits until levels are ingested where toxicity is expressed (USDA 2001).

There have been concerns expressed about the study designs used to derived acute lethal doses of DRC-1339 for some bird species (Gamble et al. 2003). The appropriateness of study designs used to determine acute toxicity to pesticides has many views (Lipnick et al. 1995). The use of small sample sizes was the preferred method of screening for toxicity beginning as early as 1948 to minimize the number of animals involved (Dixon and Mood 1948). In 1982, the EPA established standardized methods for testing for acute toxicity that favored larger sample sizes (EPA 1982). More recently, regulatory agencies have again begun to debate the appropriate level of sample sizes in determining acute toxicity based on a growing public concern for the number of animals used for scientific purposes.

Based on those concerns, the Ecological Committee on FIFRA Risk Assessment (ECOFRAM) was established by EPA to provide guidance on ecological risk assessment methods (EPA 1999). The committee report recommended to the EPA that only one definitive LD_{50} be used in toxicity screening either on the mallard or northern bobwhite and recommended further testing be conducted using the up-and-down method (EPA 1999). Many of the screening methods used for DRC-1339 prior to the establishment of EPA guidelines in 1982 used the up-and-down method of screening (Eisemann et al. 2003).

A review of the literature shows that LD_{50} research using smaller sample sizes conducted prior to EPA established guidelines are good indicators of LD_{50} derived from more rigorous designs (Bruce 1985, Bruce 1987, Lipnick et al. 1995). Therefore, acute and chronic toxicity data gathered prior to EPA guidance remain valid and to ignore the data would be inappropriate and wasteful of animal life (Eisemann et al. 2003).

DRC-1339 Secondary Hazards -Secondary poisoning has not been observed with DRC-1339 treated baits. During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1979). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost non-existent.

DRC-1339 is rapidly metabolized and excreted and does not bio-cumulate which probably accounts for its low secondary hazard profile (Schafer 1991, USDA 1997). For example, cats, owls and magpies would be at risk only after exclusively eating DRC-1339-poisoned starlings for 30 continuous days (Cunningham et al. 1979). Studies using the American kestrel (*Falco sparverius*) as a surrogate species show that secondary hazards to raptors are small, and these birds are not put at risk by DRC-1339 baiting (USDA 1997). The risk to mammalian predators from feeding on birds killed with DRC-1339 appears to be low (Johnston et al. 1999).

The risks associated with non-target animal exposure to DRC-1339 baits have been evaluated in rice fields in Louisiana (Glahn et al. 1990, Cummings et al. 1992, Glahn and Wilson 1992), poultry and cattle feedlots in several western states (Besser 1964, Ford 1967, Royall et al. 1967), ripening sunflower fields in North Dakota (Linz et al. 2000), and around blackbird staging areas in east-central South Dakota

(Knutsen 1998, Linz et al.1999, Smith 1999). Smith (1999) used field personnel and pointing and retrieving dogs to search for dead nontarget animals and found no nontarget carcasses that exhibited histological signs consistent with DRC-1339 poisoning. The other studies also failed to detect any nontarget birds that had succumbed to DRC-1339. However, DRC-1339 is a slow-acting avicide and thus, some birds could move to areas not searched by the study participants before dying.

DRC-1339 Environmental Degradation - DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation and has a half-life of less than two days (USDA 1997). DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. The chemical tightly binds to soil and has low mobility. The half life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (*i.e.*, degradation chemicals) have low toxicity. Aquatic and invertebrate toxicity is low (USDA 1997). WS' programmatic FEIS contains a thorough risk assessment of DRC-1339 and the reader is referred to that source for a more complete discussion (USDA 1997). That risk assessment concluded that no adverse effects are expected from use of DRC-1339.

Additional concerns have been raised regarding the risks to non-target wildlife associated with crows caching bait treated with DRC-1339. Crows are known to cache surplus food usually by making a small hole in the soil using the bill, by pushing the food item under the substrate, or covering items with debris (Verbeek and Caffrey 2002). Distances traveled from where the food items were gathered to where the item is cached varies but some studies suggests crows can travel up to 100 meters (Kilham 1989) and up to 2 kilometers (Cristol 2001, Cristol 2005). Caching activities appear to occur throughout the year but may increase when food supplies are low. Therefore, the potential for treated baits to be carried from a bait site to surrounding areas exists as part of the food cache behavior exhibited by crows.

Several mitigating factors must be overcome for non-target risks to occur from bait cached by a crow. Those factors being: (1) the non-target wildlife species would have to locate the cached bait, (2) the bait-type used to target crows would have to be palatable or selected for by the non-target wildlife, (3) the non-target wildlife species consuming the treated bait would have to consume a lethal dose from a single bait, and (4) if a lethal dose is not achieved by eating a single treated cached bait, the non-target wildlife would have to ingest several treated baits (either from cached bait or from the bait site) to obtain a lethal dose which could vary by the species.

DRC-1339 is typically very unstable in the environment and degrades quickly when exposed to sunlight, heat, and ultraviolet radiation. The half-life of DRC-1339 in biologically active soil was estimated at 25 hours with the identified metabolites having a low toxicity (EPA 1995). DRC-1339 is also highly soluble in water, does not hydrolyze, and photodegrades quickly in water with a half-life estimated at 6.3 hours in summer, 9.2 hours in spring sunlight, and 41 hours during winter (EPA 1995). DRC-1339 binds tightly with soil and is considered to have low mobility (EPA 1995). Given the best environmental fate information available and the unlikelihood of a non-target locating enough treated bait(s) sufficient to produce lethal effects, the risks to non-target from crows caching treated bait would be low. When baiting, treated baits are mixed with untreated bait to minimize non-target hazards directly at the bait site and to minimize the likelihood of target species developing bait aversion. Since treated bait is diluted, often times up to 1 treated bait for every 25 untreated baits, the likelihood of a crow selecting treated bait and then caching the bait is further reduced.

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 crows, the use of such methods can result in the incidental take of unintended species. Those occurrences are rare and should not affect the overall populations of any species under the current program. WS' take of non-target species during activities to reduce damage or threats to human safety associated with crows in Maryland is expected to

be extremely low to non-existent. No non-targets have been taken by WS during prior crow damage management activities in the State. WS will monitor annually the take of non-target species to ensure program activities or methodologies used in crow damage management do not adversely impact non-targets. Methods available to resolve and prevent crow damage or threats when employed by trained, knowledgeable personnel are selective for target species. WS will annually report to the USFWS and/or the MDNR any non-target take to ensure take by WS is considered as part of management objectives established. The potential impacts to non-targets are similar to the other alternatives and are considered to be minimal to non-existent.

The proposed crow damage management could benefit many other wildlife species that are impacted by their predation or competition for habitat. Crows are generally very aggressive nesting area colonizers and will force other species such from prime nesting areas. American crows and fish crows often feed on the eggs, nestlings, and fledglings of other bird species. Fish crows are known to feed heavily on colonial waterbird eggs (Mcgowan 2001). This alternative has the greatest possibility of successfully reducing crow damage and conflicts to wildlife species since all available methods could possibly be implemented or recommended by WS.

T&E Species Effects

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

Federally Listed Species **-** The current list of species designated as threatened and endangered in Maryland as determined by the USFWS and the National Marine Fisheries Services was obtained and reviewed during the development of this EA. Appendix C contains the list of species currently listed in the State along with common and scientific names. Consultation with the USFWS under Section 7 of the ESA concerning potential impacts of WS' programmatic activities on T&E species was conducted as part of the development of WS' programmatic FEIS (USDA 1997). WS obtained a BO from the USFWS addressing WS' programmatic activities. For the full context of the BO, see Appendix F of WS' programmatic FEIS (USDA 1997).

Based on a review of those T&E species listed in the State during the development of the EA, WS determined that activities conducted pursuant to the proposed action will not likely adversely affect those species listed in the State by the USFWS and the National Marine Fisheries Services nor their critical habitats. As part of the development of the EA, WS consulted with the USFWS under Section 7 of the ESA. The USFWS concurred with WS' determination that activities conducted pursuant to the proposed action would not likely adversely affect those species currently listed in the State or their critical habitats (D. Murphy, USFWS, pers. comm. 2009).

State Listed Species **–** The current list of State listed species as endangered or threatened by the State as determined by the MDNR was obtained and reviewed during the development of the EA. Based on the review of species listed in the State, WS has determined that the proposed activities will not adversely affect those species currently listed by the State.

Alternative 4 - Use of Non-lethal Methods Only

Under this alternative, WS' take of non-target animals would probably be less than that of the proposed action because no lethal control actions would be taken by WS. However, non-target take could still occur under this alternative if wildlife captured alive sustained injuries determined to prevent survival if released. Non-lethal methods that use auditory and visual stimuli to reduce or prevent damage are

intended to elicit fright responses in wildlife. When employing those methods to disperse or harass target species, any non-targets in the vicinity of those methods when employed are also likely dispersed from the area. Similarly, any exclusionary device constructed to prevent access by target species also excludes access to non-target species. The persistent use of non-lethal methods will likely result in the dispersal or abandonment of those areas where non-lethal methods are employed of both target and non-target species. Therefore, any use of non-lethal methods has similar results on both non-target and target species. Though non-lethal methods do not result in lethal take of non-targets, the use of non-lethal methods can restrict or prevent access of non-targets to beneficial resources. Overall, potential impacts to non-targets from the use of non-lethal methods only would not adversely impact populations since those methods are often temporary.

If non-lethal methods employed by WS under this alternative were deemed ineffective by those requesting assistance, lethal methods could still be employed by those experiencing damage. Those requesting assistance are those likely to use lethal methods since a damage threshold has been met for that individual requestor that has triggered seeking assistance to reduce damage. The potential impacts on non-targets by those experiencing damage would be highly variable. People whose crow damage problems were not effectively resolved by non-lethal control methods would likely resort to other means of legal or illegal lethal control. This could result in less experienced persons implementing control methods and could lead to greater take of non-target wildlife than the proposed action. When those experiencing damage caused by wildlife reach a level where assistance does not adequately reduce damage or where no assistance is available, people have resorted to using chemical toxicants that are illegal for use on the intended target species that often results in loss of both target and non-target wildlife (USDA 1997, White et al. 1989, USFWS 2001, Food and Drug Administration 2003). The use of illegal toxicants by those frustrated with the lack of assistance or assistance that inadequately reduces damage to an acceptable level can often result in the indiscriminate take of wildlife species.

This alternative could reduce negative impacts caused by crows to wildlife species and their habitats, including T&E species, if non-lethal methods were effective in reducing such damage to acceptable levels. If non-lethal methods were ineffective at reducing damage to acceptable levels, WS would not be available to conduct or provide advice on any other types of control methods. In those situations it would be expected that crow damage to wildlife species and their habitats would likely remain the same or possibly increase dependent upon actions taken by the affected resource or landowner.

Issue 3 - Humaneness and Animal Welfare Concerns of Methods

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

Alternative 1 – No Crow Damage Management Conducted by WS

Under this alternative, WS would have no involvement in any aspect of crow damage management in Maryland. Those experiencing damage or threats associated with crows could continue to use those methods legally available. Those methods would likely be considered inhumane by those persons who would consider methods proposed under any alternative as inhumane. The issue of humaneness would likely be directly linked to the methods legally available to the general public since methods are often labeled as inhumane by segments of society no matter the entity employing those methods.

The humaneness of methods would be based on the skill and knowledge of the person employing those methods. A lack of understanding of the target species or methods used could lead to an increase in situations perceived as being inhumane to wildlife despite the method used. Despite the lack of

involvement by WS under this alternative, those methods perceived as inhumane by certain individuals and groups would still be available to the general public to use to resolve damage and threats caused by crows.

Alternative 2 - Crow Damage Management by WS through Technical Assistance Only

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

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

Alternative 3 - Continuing the Current Integrated Approach to Managing Crow Damage (Proposed Action/No Action)

Under the proposed action, WS would integrate methods using WS' Decision Model as part of technical assistance and direct operational assistance. Methods available under the proposed action could include non-lethal and lethal methods integrated into direct operational assistance conducted by WS. Under this alternative, non-lethal methods would be used by WS which are generally regarded as humane. Non-lethal methods would include resource management methods (*e.g.*, crop selection, limited habitat modification, modification of human behavior), exclusion devices, frightening devices, cage traps, nets, and repellents.

As discussed previously, 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.

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 and the varying perspectives on the most effective way to address damage and threats in a humane manner, agencies are 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 will continue to evaluate methods and activities to minimize the pain and suffering of methods addressed when attempting to resolve requests for assistance.

Some methods have been stereotyped as “humane” or “inhumane”. However, many “humane” methods can be inhumane if not used appropriately. For instance, a cage trap is generally considered by most members of the public as “humane”. Yet, without proper care, live-captured wildlife in a cage trap can be treated inhumanely if not attended to appropriately.

Therefore, the goal is to effectively address requests for assistance using methods in the most humane way possible that minimizes the stress and pain to the animal. Overall, the use of resource management methods, harassment methods, and exclusion devices are regarded as humane when used appropriately. Although some concern arises from the use of live-capture methods, the stress of animals is likely temporary.

Although some issues of humaneness could occur from the use of cage traps, nets, and repellents, those methods, when used appropriately and by trained personnel, would not result in the inhumane treatment of wildlife. Concerns from the use of those non-lethal methods are from injuries to animals while restrained and from the stress of the animal while being restrained or during the application of the method. Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals.

If birds are to be live-captured by WS, WS’ personnel would be present on-site during capture events or methods would be checked frequently to ensure birds captured are addressed timely and to prevent injury. Although stress could occur from being restrained, timely attention to live-captured wildlife would alleviate suffering. Stress would likely be temporary.

Under the proposed action, lethal methods could also be employed to resolve requests for assistance to resolve or prevent crow damage and threats. Lethal methods would include shooting, DRC-1339, and euthanasia after crows are live-captured. WS’ use of euthanasia methods under the proposed action would follow those required by WS’ directives (WS Directive 2.430) and recommended by the AVMA for use on free-ranging wildlife under field conditions (AVMA 2007).

The euthanasia methods being considered for use under the proposed action for live-captured crows are cervical dislocation and carbon dioxide. The AVMA guideline on euthanasia lists cervical dislocation and carbon dioxide as an acceptable method of euthanasia for free-ranging birds which can lead to a humane death (AVMA 2007). The use of cervical dislocation or carbon dioxide for euthanasia would occur after the animal has been live-captured and away from public view. Although the AVMA guideline also lists gunshot as a conditionally acceptable method of euthanasia for free-ranging wildlife, there is greater potential the method may not consistently produce a humane death (AVMA 2007). WS’ personnel that employ firearms to address crow damage or threats to human safety will be trained in the proper placement of shots to ensure a timely and quick death.

Although the mode of action of DRC-1339 is not well understood, it appears to cause death primarily by nephrotoxicity in susceptible species and by central nervous system depression in non-susceptible species (Decino et al. 1966, Westberg 1969, Schafer 1984). DRC-1339 causes irreversible necrosis of the kidney and the affected bird is subsequently unable to excrete uric acid with death occurring from uremic poisoning and congestion of major organs (Decino et al. 1966, Knittle et al. 1990). The external appearances and behavior of starlings that ingested DRC-1339 slightly approve the LD_{50} for starlings appeared normal for 20 to 30 hours, but water consumption doubled after 4 to 8 hours and decreased thereafter. Food consumption remained fairly constant until about 4 hours before death, at which time starlings refused food and water and became listless and inactive. The birds perched with feathers fluffed as in cold weather and appeared to doze, but were responsive to external stimuli. As death nears,

breathing increased slightly in rate and became more difficult; the birds no longer responded to external stimuli and became comatose. Death followed shortly thereafter without convulsions or spasms (DeCino et al. 1966). Birds ingesting a lethal dose of DRC-1339 become listless and lethargic, and a quiet death normally occurs in 24 to 72 hours following ingestion. This method appears to result in a less stressful death than which probably occurs by most natural causes, which are primarily disease, starvation, and predation. In non-sensitive birds and mammals, central nervous system depression and the attendant cardiac or pulmonary arrest is the cause of death (Felsenstein et al. 1974). DRC-1339 is the only lethal method that would not be available to other entities under the other alternatives. DRC-1339 to manage damage caused by crows is only available to WS' personnel for use.

Research and development by WS has improved the selectivity and humaneness of management techniques. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some methods are used in situations where non-lethal damage management methods are not practical or effective. Personnel from WS are experienced and professional in their use of management methods. Consequently, management methods are implemented in the most humane manner possible under the constraints of current technology. Those methods discussed in Appendix B to alleviate crow damage and/or threats in the State, except for DRC-1339 and mesurol, could be used under any of the alternatives by those experiencing damage regardless of WS' direct involvement. Therefore, the issue of humanness associated with methods would be similar across any of the alternatives since those methods could be employed. Those persons who view a particular method as humane or inhumane would likely continue to view those methods as humane or inhumane under any of the alternatives. Minimization measures and SOPs that would be incorporated into WS' activities to ensure methods are used by WS as humanely as possible are listed in Chapter 3.

Alternative 4 - Use of Non-lethal Methods Only

Under this alternative, only non-lethal methods would be used by WS which are generally regarded as humane. Non-lethal methods would include resource management methods (*e.g.*, crop selection, minor habitat modification, modification of human behavior), exclusion devices, frightening devices, live traps, nets, and repellents.

Although some issues of humaneness could occur from the use of cage traps, nets, and repellents, those methods, when used appropriately and by trained personnel, would not result in the inhumane treatment of wildlife. Concerns from the use of those non-lethal methods are from injuries to animals while restrained and from the stress of the animal while being restrained or during the application of the method. Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals.

The applicability of cage traps, nets, repellents, minor habitat modifications, and exclusion for resolving crow damage or threats would be limited under this alternative. Overall, the use of resource management methods, harassment methods, live-capture methods, and exclusion devices are regarded as humane when used appropriately. Although some concern arises from the use of live-capture methods, the stress of animals is likely temporary and would cease once the animal was released.

Issue 4 - Effects on the Aesthetic Values of Crows

Another concern often raised is the potential impact the proposed action will have on the aesthetic value that people often regard for crows. The effects of the alternatives on this issue are analyzed below by alternative.

Alternative 1 – No Crow Damage Management Conducted by WS

Under the no crow damage management by WS alternative, the actions of WS would have no impact on the aesthetic value of crows in the State. Those experiencing damage or threats from crows would be responsible for researching, obtaining, and using all methods as permitted by federal, state, and local laws and regulations. Crows would continue to be dispersed and lethally taken under this alternative in the State. Lethal take would continue to occur during the regulated harvest season and through the blackbird depredation order.

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

Those experiencing damage or threats would continue to use those methods they feel appropriate to resolve crow damage or threats, including lethal take. WS' involvement in crow damage management is therefore, not additive to the crows already taken in the State. The impacts to the aesthetic value of crows would be similar to the other alternatives.

Alternative 2 - Crow Damage Management by WS through Technical Assistance Only

If those persons seeking assistance from WS were those persons likely to conduct crow damage management activities in the absence of WS' involvement, then technical assistance provided by WS would not adversely affect the aesthetic value of crows in the State similar to Alternative 1. Crows could be lethally taken under this alternative by those entities experiencing crow damage or threats which would result in localized reductions in the presence of crow at the location where damage was occurring. The presence of crows where damage was occurring would be reduced where damage management activities are conducted under any of the alternatives. Even the recommendation of non-lethal methods is likely to result in the dispersal of crows from the area if those non-lethal methods recommended by WS are employed by those receiving technical assistance. Therefore, technical assistance provided by WS would not prevent the aesthetic enjoyment of crows since any activities conducted to alleviate crow damage could occur in the absence of WS' participation in the action, either directly or indirectly.

Alternative 3 - Continuing the Current Integrated Approach to Managing Crow Damage (Proposed Action/No Action)

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

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

The use of lethal methods would result in temporary declines in local populations resulting from the removal of crows to address or prevent damage and threats. The goal under the proposed action is to respond to requests for assistance and to manage those crows responsible for the resulting damage.

Therefore, the ability to view and enjoy crows will still remain if a reasonable effort is made to locate crows outside the area in which damage management activities occurred. Those crows removed by WS are those that could be removed by the person experiencing damage.

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

Since those crows removed by WS under this alternative could be removed without a depredation permit under the blackbird depredation order, WS' involvement in taking crows would not likely be additive to the number of crows that could be taken in the absence of WS' involvement.

WS' take of crows from FY 2004 through FY 2008 has been of low magnitude compared to the total mortality. WS' activities are not likely additive to the crows that would be taken in the absence of WS' involvement. Although crows removed by WS are no longer present for viewing or enjoying, those crows would likely be taken by the property owner or manager under the depredation order. Given the limited take proposed by WS under this alternative when compared to the known sources of mortality of crows, WS' crow damage management activities conducted pursuant to the proposed action would not adversely affect the aesthetic value of crows. The impact on the aesthetic value of crows and the ability of the public to view and enjoy crows under the proposed action would be similar to the other alternatives and is likely low.

Alternative 4 - Use of Non-lethal Methods Only

Under this alternative, the potential impacts on human affectionate-bonds and aesthetic values of crows would be similar to those described in the other alternatives. Crows would be dispersed and harassed from areas where damage was occurring. Therefore, the ability of those interested in viewing or enjoying crows would likely be diminished. However, as mentioned previously, non-lethal methods are often temporary with wildlife returning after ceasing the use of those methods. In the case of exclusionary methods, crows would be prevented from accessing resources, which would also likely disperse them to other areas where resources are more vulnerable. Therefore, the ability to view crows in areas where exclusionary devices are constructed is similarly diminished. Crows would continue to present in the State and could be view if a reasonable effort is made to locate crows.

Issue 5 – Effects on the Aesthetic Value of Property

Another issue often voiced when addressing crow damage is how the negative appearance and odor of fecal droppings associated with crow roosts can negatively impact the aesthetic value of property. The potential for resolving the negative appearance of fecal droppings and odor on the value of property is evaluated below by each of the alternatives. Since fecal droppings will occur under roosts location, the only effective way to resolve damage associated with fecal droppings is to disperse crows from roosts to areas where damages are not likely to occur. Therefore, the only effective method in resolving damage or the displeasing appearance of droppings on property is to disperse the roost or to continually clean to affected area which, in some cases, could require daily cleaning and sanitizing. Continually cleaning an area, especially large areas, can be financially burdensome to businesses that must address fecal dropping on their properties continuously since crows often roost in the same location nightly. To lessen the economic burden of cleaning fecal droppings, in some cases daily, roost dispersal is the most long-term, cost effective approach.

Alternative 1 – No Crow Damage Management Conducted by WS

Under this alternative, WS would not be involved with any aspect of crow damage management activities in the State. All requests for assistance would be referred to the USFWS, the MDNR, and/or to other private/governmental entities. Under this alternative, the aesthetically displeasing appearance and odor of fecal droppings on property could continue to adversely affect property owners if they were not successful in dispersing crows.

Under this alternative, the only methods that would not be available for use would be the avicide DRC-1339 and the chemical repellent mesurol since those methods can only be used by WS. Mesurol is a repellent that is formulated on egg baits to prevent crow predation on eggs; therefore, the use of mesurol would not be used in urban settings where fecal droppings were causing property damage or were aesthetically displeasing.

If the affected person is able to achieve success in dispersing crow and resolving damage, then the potential impacts from this alternative would be similar to the other alternatives. If persons experiencing damage are unable to achieve success in dispersing crows, then the negative appearance of fecal droppings and the noxious odor often associated with roosts would continue which could lead to an increase in the potential for economic damage or at a minimum, a reoccurring cost associated with cleaning and sanitizing areas where fecal droppings accumulate. Under this alternative, the majority of methods available would be harassment methods designed to disperse crows from roosting areas. The only lethal methods available under this alternative would be shooting or the use of the hunting season to reduce local crow populations.

The success of methods would be based on the skill and knowledge of the person employing those methods. A lack of understanding of the target species or methods used could lead to failure to disperse roosts. However, if methods are applied correctly and with consideration for the target species, those persons experiencing crow damage could achieve success. Therefore, the ability of property owners to resolve damage using available methods would be similar to the other alternatives only if WS was not able to achieve the same level of success than those persons using methods in the absence of WS' involvement. However, WS' expertise in the use of methods available and the availability of additional methods under some of the alternatives could increase the likelihood that crow roosts are dispersed.

Under Alternative 2, WS would provide technical assistance to those persons seeking assistance which would provide those persons with information on available, could include method demonstration, and would include information on the most effective ways to achieve success in dispersing roosts. If those persons apply the recommended methods using the information provided by WS, then it is reasonable to anticipate that those persons would have a greater likelihood of success in dispersing roosting crows. If those persons do not apply methods recommend by WS, apply methods incorrectly, or using methods not recommended by WS, then success could still be achieved but the likelihood of success could be diminished.

Under the proposed action, WS would continue to provide technical assistance which would not be available under this alternative and would have available those methods described in Appendix B, including the option of managing the number of crows using a roost through the use of DRC-1339. With WS able to provide technical assistance and direct operational assistance under the proposed action, the likelihood of successfully dispersing crow roosts would be higher when compared to an alternative where WS had no involvement. The ability of WS' to apply wildlife damage management methodologies effectively and the availability of additional methods under the proposed action would increase the likelihood that WS' involvement, either through technical or operation assistance, would lead to successfully dispersing crow roosts when compared to this alternative.

For those reasons discussed for Alternative 2 and the proposed action, WS' ability to provide technical assistance and direct operation assistance (using only non-lethal methods) under Alternative 4 would increase the likelihood that success could be achieved in dispersing roosts.

Overall, success in dispersing roosts could be achieved under this alternative by those persons experiencing crow damage using those methods available. However, the likelihood of achieving the successful dispersal of a crow roost would increase by varying degrees under the other alternatives.

Alternative 2 - Crow Damage Management by WS through Technical Assistance Only

Under a technical assistance only alternative, WS would be limited to providing information on crow behavior and available methods for dispersing crow roosts when requested. WS would not be directly involved with dispersing roosts under this alternative. WS would recommend and demonstrate for use those methods addressed in Appendix B, except for DRC-1339.

As discussed under Alternative 1, the ability of WS to provide technical assistance would likely increase the likelihood that those persons requesting assistance achieve success when those methods and recommendations made by WS are followed. A technical assistance only alternative may not be as effective in dispersing roosting crows since the option for direct participation by WS in resolving the request would not be available under this alternative. In addition, the availability of DRC-1339 to manage crow roosts would not be available under this alternative which can be an effective method is reducing the number of crows roosting.

Under a technical assistance only alternative the probability of dispersing a crow roost by a property owner would likely be higher when compared to Alternative 1 (no involvement by WS). However, a higher likelihood of success could be achieved under the proposed action and Alternative 4 (non-lethal methods only) since WS could provide direct operational assistance under those alternatives.

Alternative 3 - Continuing the Current Integrated Approach to Managing Crow Damage (Proposed Action/No Action)

Under the proposed action, WS would provide both technical assistance and direct operation assistance to those requesting assistance. A technical assistance program under this alternative would be the same as would be implemented under the other alternatives, except for Alternative 1 where no technical assistance would be provided by WS and Alternative 4 which would restrict the methods recommend to only non-lethal methods.

The only methods that would be available to manage damage associated with crow roosts under the proposed action that would not be available under the other alternatives would be DRC-1339 and mesurol. As stated previously, the repellent mesurol would not be employed in urban areas for the purpose of dispersing roosting crows. The DRC-1339 would not be available under any of the other alternatives since the use of the avicide is restricted to use by WS employees or people under their direct supervision. DRC-1339 would be employed to reduce the number of crows using a roost location which would likely result in a reduction in the amount of fecal droppings occurring under the roost which could reduce or eliminate the need for cleaning and sanitizing areas where fecal droppings are a concern.

In those cases where WS receives a request for assistance to manage crow damage, WS would be able to provide operational assistance including the use of DRC-1339 when determined to be appropriate by the WS Decision Model. Since WS would be available to provide direct operational assistance to those persons requesting assistance under the proposed action instead of providing no assistance (Alternative 1) or technical assistance only (Alternative 2), activities conducted under the proposed action have a higher

likelihood of achieving the desired result of dispersing crow roosts from areas where damage is occurring. Under Alternative 4 (non-lethal methods only), the use of DRC-1339 would not be available to reduce crow roosts where damage was occurring. WS' activities would be limited to non-lethal harassment methods. The use of DRC-1339 can be effective at reducing the number of crows using roost locations which further increases the likelihood of the proposed action alternative providing the level of service required to reduce damage occurring to property when compared to Alternative 4.

Alternative 4 - Use of Non-lethal Methods Only

Alternative 4 would incorporate the technical assistance program discussed in Alternative 2 and would include methods that would be available under the proposed action but would not include the use of lethal methods for resolving crow damage in the State. Under a non-lethal only alternative, WS, when direct assistance is requested, would only use non-lethal methods to address crow roosts that are resulting in damage to property in the State. Under this alternative, DRC-1339 would not be available for use by WS or any other entity in the State. DRC-1339 can be an effective method in reducing the number of crows using roost location. In addition, the use of firearms to lethally take crows would also not be available under this alternative. Many of the non-lethal harassment methods are effective because they mimic the noise produced by a firearm or results in a flight response in crows because of the novel noise produced. Birds often habituate to non-lethal methods after repeatedly use without positive reinforcement of the noise. Birds quickly learn there are no negative stimuli associated with the noise produced by non-lethal methods and learn to ignore the noise. Similarly responses are observed from other non-lethal methods that are applied repeatedly such as effigies. Therefore, the use of a firearm reinforces the noise associated with non-lethal methods and can increase the effectiveness of those methods.

Under this alternative, WS would not recommend the use of the hunting season to reduce the number of crows at a roost. Similar to the use of a firearm, the act of hunting crows during the hunting season can disperse crow roosts or reduce the number of crows using a roost site.

This alternative would not allow for the maximum number of methods to be employed to resolve requests for assistance which could lower the likelihood that damage to property would not be lowered to the degree necessary. Applying both lethal and non-lethal methods allows for the maximum number of methods to be employed as determined by the WS Decision Model which can increase the likelihood that damage management methods achieve the desired result of dispersing crow roosts.

Issue 6 - Effects of Management Methods on Human Health and Safety

A common concern is the potential adverse affects methods available could have on human health and safety. The threats to human safety of methods available under the alternatives are evaluated below by each of the alternatives.

Alternative 1 – No Crow Damage Management Conducted by WS

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

Similar to the technical assistance only alternative, DRC-1339 and meserol would not be available under this alternative to those experiencing damage or threats from crows. Since most methods available to

resolve or prevent crow damage or threats are available to anyone, the threats to human safety from the use of those methods are similar between the alternatives. However, methods employed by those not experienced in the use of methods or are not trained in their proper use, could increase threats to human safety. Overall, the methods available to the public, when applied correctly and appropriately, pose minimal risks to human safety.

Alternative 2 - Crow Damage Management by WS through Technical Assistance Only

Under this alternative, WS would be restricted to making recommendations of methods and the demonstration of methods only to resolve damage. WS would only provide technical assistance to those requesting assistance with crow damage and threats. Although hazards to human safety from non-lethal methods exist, those methods are generally regarded as safe when used by trained individuals who are experienced in their use. Risks to human safety from the use of non-lethal methods were considered low when evaluated in a formal risk assessment in WS' programmatic FEIS (USDA 1997). Risks to human safety associated with non-chemical methods such as resource management methods (*e.g*., crop selection, limited habitat modification, modification of human behavior), exclusion devices, frightening devices, and cage traps were considered low based on their use profile for alleviating damage associated with wildlife (USDA 1997). Although some risk of fire and bodily harm exists from the use of pyrotechnics and propane cannons, when used appropriately and in consideration of those risks, they can be used with a high degree of safety.

Under a technical assistance only alternative, the use of DRC-1339 and meserol would not be available to the general public. Personnel employing nets are present at the site during application to ensure the safety of the public and operators. Although some fire and explosive hazards exist with rocket nets during ignition and storage of the explosive charges, safety precautions associated with the use of the method, when adhered to, pose minimal risks to human safety and primarily occur to the handler. Nets would not be employed in areas where public activity is high which further reduces the risks to the general public. Nets would be employed in areas where public access is restricted whenever possible to reduce risks to human safety. Overall, nets would pose minimal risks to the public.

The use of chemical methods that are considered non-lethal would also be available under this alternative. Chemical methods available would include repellents. There are few chemical repellents registered for use to manage crows. Most repellents required ingestion of the chemical to achieve the desired affects on target species. Repellents that require ingestion are intended to discourage foraging on vulnerable resources and to disperse birds from areas where the repellents are applied. The active ingredients of repellents that are currently registered for use to disperse crows include methyl anthranilate and polybutene. Another common active ingredient in repellents intended to disperse other bird species contain the active ingredient anthraquinone. Currently, no repellents are currently registered for use to disperse crows in the State that contain the active ingredient anthraquinone. Methyl anthranilate (grape derivative) and anthraquinone (plant extract) are naturally occurring chemicals. Repellents, when used according to label directions, are generally regarded as safe especially when the ingredients are considered naturally occurring. Some risk of exposure to the chemical occurs to the applicator and to others from the potential for drift as the product is applied. Some repellents also have restrictions on whether application can occur on edible plants with some restricting harvest for a designated period after application. All restriction on harvest and required personal protective equipment would be included on the label and if followed, would minimize risks to human safety associated with the use of those products.

The recommendation by WS that crows be harvested during the regulated hunting season which is established by the MDNR would not increase risks to human safety above those risks already inherent with hunting crows. Recommendations of allowing hunting on property owned or managed by a cooperator to reduce crow populations which could then reduce crow damage or threats would not

increase risks to human safety. Safety requirements established by the MDNR for the regulated hunting season will further minimize risks associated with hunting. Although hunting accidents do occur, the recommendation of allowing hunting to reduce localized crow populations will not increase those risks.

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

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

Given the use profile of many methods to manage damage and threats associated with crows, the risks to human safety from the use of those methods are low (USDA 1997). The cooperator requesting assistance is also made aware of threats to human safety associated with the use of those methods. Minimization measures and SOPs for methods are discussed in Chapter 3 of this EA. Risks to human safety from activities and methods recommended under this alternative would be similar to the other alternatives since the same methods would be available. If misused or applied inappropriately, any of the methods available to alleviate crow damage could threaten human safety. However, when used appropriately methods available to alleviate damage would not threaten human safety.

Alternative 3 - Continuing the Current Integrated Approach to Managing Crow Damage (Proposed Action/No Action)

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

Lethal methods available under the proposed action would include the use of firearms, DRC-1339, live-capture followed by euthanasia, and the recommendation that crows be harvested during the regulated hunting season established for those species by the USFWS and the MDNR.

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

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

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

Safety issues due arise related to misusing firearms and the potential human hazards associated with firearms use when employed to reduce damage and threats. To help ensure safe use and awareness, WS' employees who use firearms to conduct official duties are required to attend an approved firearm safety training course and to remain certified for firearm use, WS' employees must attend a re-certification safety training course in accordance with WS Directive 2.615. WS' employees who carry and use firearms as a condition of employment, are required to sign a form certifying that they have not been convicted of a misdemeanor crime of domestic violence. A thorough safety assessment will be conducted before firearms are deemed appropriate to alleviate or reduce damage and threats to human safety when conducting activities. WS will work closely with cooperators requesting assistance to ensure all safety issues are considered before the use of firearms are deemed appropriate for use. All methods, including firearms, must be agreed upon with the cooperator to ensure the safe use of methods. A risk assessment conducted during the development of WS' programmatic FEIS, determined the risks to human safety from the use of firearms was low based on the use profile of the method (USDA 1997).

All WS' personnel who handle and administered chemical methods will be properly trained in the use of those methods. Training and adherence to agency directives will ensure the safety of employees applying chemical methods. Crows euthanized by WS or taken using chemical methods will be disposed of by deep burial or incinerated to ensure the risks to human safety are minimal (WS Directive 2.515). All euthanasia will occur in the absence of the public to further minimize risks. Minimization measures and SOPs are further described in Chapter 3 of this EA.

The recommendation of repellents or the use of those repellents registered for use to disperse crows in the State could occur under the proposed action as part of an integrated approach to managing crow damage. Those chemical repellents that would be available to recommend for use or be directly used by WS under this alternative would also be available under any of the alternatives. Therefore, risks to human safety from the recommendation of repellents or the direct use of repellents would be similar across all the alternatives. Risks to human safety associated with the use or recommendation of repellents were

addressed under the technical assistance only alternative (Alternative 2) and would be similar across all the alternatives. WS' involvement, either through recommending the use of repellents or the direct use of repellents, would ensure that label requirements of those repellents are discussed with those persons requesting assistance when recommended through technical assistance or would be specifically adhered to by WS' personnel when using those chemical methods. Therefore, the risks to human safety associated with the recommendation of or direct use of repellents could be lessened through WS' participation.

Mesurol contains the active ingredient methiocarb and is registered by the EPA for use to condition crows not to feed on the eggs of threatened and endangered species. Mesurol is currently not registered for use in Maryland but will be evaluated in this assessment as a repellent that could be employed under the proposed action or Alternative 4 if the product becomes available. Mesurol is mixed with water and once mixed, placed inside raw eggs that are similar in size and appearance to the eggs of the species being protected. Treated eggs are placed in the area where the protected species are known to nest at least 3 weeks prior to the onset of egg-laying to condition crows to avoid feeding on eggs. Methicarb is a carbamate pesticide that acts as a cholinesterase inhibitor. Crows ingesting treated eggs become sick (*e.g.*, regurgitate, become lethargic) but recover. Human safety risks associated with the use of mesurol occur primarily to the mixer and handler during preparation. WS' personnel with follow all label requirements, including the personal protective equipment required to handle and mix bait. When used according to label requirements, the risks to human safety from the use of mesurol would be minimal.

Risks to human safety from the use of avicides could occur either through direct exposure of the chemical or exposure to the chemical from birds that have been lethally taken. The only avicide currently registered for use in Maryland is DRC-1339 (3-chloro-p-toluidine hydrochloride) that could be used for crow damage management. DRC-1339 is currently registered with the EPA to manage damage associated with several bird species and can be formulated on a variety of bait types depending on the label. For use on crows, technical DRC-1339 (powder) must be mixed with water and in some cases, a binding agent (required by the label for specific bait types). Once the technical DRC-1339, water, and binding agent, if required, are mixed, the liquid is poured over the bait and mixed until the liquid is absorbed and evenly distributed. The treated bait is then allowed to air dry. The mixing, drying, and storage of DRC-1339 treated bait occurs in controlled areas that are not accessible by the public. Therefore, risks to public safety from the preparation of DRC-1339 are minimal. Some risks do occur to the handlers during the mixing process from inhalation and direct exposure on the skin and eyes. Adherence to label requirements during the mixing and handling of DRC-1339 treated bait for use of personal protective equipment ensures the safety of WS' personnel handling and mixing treated bait. Therefore, risks to handlers and mixers that adhere to the personal protective equipment requirements of the label are low. Before application at bait locations, treated bait is mixed with untreated bait at ratios required by the product label to minimize non-target hazards and to avoid bait aversion by target species.

Locations where treated bait may be placed are determined based on product label requirements (*e.g.*, distance from water, specific location restrictions), the target bird species use of the site (determined through prebaiting and an acclimation period), on non-target use of the area (areas with non-target activity are not used or abandon), and based on human safety (*e.g.*, in areas restricted or inaccessible by the public or where warning signs have been placed). Once appropriate locations are determined, treated baits are placed in feedings stations or are broadcast using mechanical methods (ground-based equipment or hand spreaders) and by manual broadcast (distributed by hand) per label requirements. Once baited using the diluted mixture (treated bait and untreated bait) when required by the label, locations are monitored for non-target activity and to ensure the safety of the public. After each baiting session, all uneaten bait is retrieved. Through prebaiting, target birds can be acclimated to feed at certain locations at certain periods of time. By acclimating birds to a feeding schedule, baiting can occur at specific times to ensure bait placed is quickly consumed by target bird species, especially when large flocks of target species are present. The acclimation period allows for treated bait to be placed at a location only when target birds

are conditioned to be present at the site and provides a higher likelihood that treated bait is consumed by the target species which makes it unavailable for potential exposure to humans. To be exposed to the bait, someone would have to approach a bait site and handle treated bait. If the bait has been consumed by target species or is removed by WS, then treated bait is no longer available and human exposure to the bait could occur. Therefore, direct exposure to treated bait during the baiting process would only occur if someone approached a bait site that contained bait and if treated bait was present, would have to handle treated bait.

Factors that minimize any risk of public health problems from the use of DRC-1339 are: 1) its use is prohibited within 50 feet of standing water and cannot be applied directly to food or feed crops (contrary to some misconceptions, DRC-1339 is not applied to feed materials that livestock can feed upon), 2) DRC-1339 is highly unstable and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours; in general, DRC-1339 on treated bait material is almost completely broken down within a week if not consumed or retrieved, 3) the chemical is more than 90% metabolized in target birds within the first few hours after they consume the bait. Therefore, little material is left in bird carcasses that may be found or retrieved by people, 4) application rates are extremely low (EPA 1995), 5) a human would need to ingest the internal organs of birds found dead from DRC-1339 to be exposed, and 6) the EPA has concluded that, based on mutagenicity (the tendency to cause gene mutations in cells) studies, this chemical is not a mutagen or a carcinogen (*i.e.*, cancer-causing agent) (EPA 1995).

Of additional concern is the potential exposure of people to crows harvested during the regulated hunting season that have ingested DRC-1339 treated bait. The hunting season for crows in the State during the development of this assessment occurred from mid-August until mid-March the following calendar year with no daily take limit and no possession limit (MDNR 2009). Under the proposed action, baiting using DRC-1339 to reduce crow damage could occur in the State during the period of time when crows can be harvested. Although baiting could occur in rural areas of State during those periods of time, most requests for assistance to manage crow damage during the period of time when crows can be harvested in the State occur in urban areas associated with urban crow roosts. Crows using urban communal roost locations often travel long distances to forage before returning to the roost location during the evening.

When managing damage associated with urban crow roosts, the use of DRC-1339 would likely occur at known forage areas (where crows from a roost location are known to travel to) or could occur near the roost location where crows have be conditioned to feed through the use of prebaiting. Crows are known to stage (congregate) in an area prior to entering a roost location in the evenings. The staging behavior of exhibited by blackbirds occurs consistently and can be induced to occur consistently at a particular location through the use of prebaiting since blackbirds often feed prior to entering a roost location. Prebaiting can also induce feeding at a specific location as crows exit a roost location in the morning by providing a consistent food source. Baiting with DRC-1339 treated baits most often occurs during the winter when the availability of food is limited and crows can be conditioned to feed consistently at a location by providing a consistent source of food. Given the range in which the death of sensitive bird species occurs, crows that consume treated bait could fly long distances. Although not specifically known for crows, sensitive bird species that ingest a lethal dose of DRC-1339 treated bait generally die within 24 to 72 hours after ingestion (USDA 2001). Therefore, crows that ingest a lethal dose of DRC-1339 at the bait site could die in other areas besides the roost location or the bait site.

For a crow that ingested DRC-1339 treated bait to pose a potential risk to human safety to someone harvesting crows during the hunting season in the State, a hunter would have to harvest a crow that ingested DRC-1339 treated bait and subsequently consume certain portions of the crow. The mode of action of DRC-1339 requires ingestion by crows so handling a crow harvested or found dead would not pose any primary risks to human safety. Although not specifically known for crows, in other sensitive

species, DRC-1339 is metabolized and/or excreted quickly once ingested. In starlings, nearly 90% of the DRC-1339 administered dosages well above the LD_{50} for starlings was metabolized or excreted within 30 minutes of dosage (Cunningham et al. 1979). In one study more than 98% of a DRC-1339 dose delivered to starlings could be detected in the feces with 2.5 hours (Peoples and Apostolou 1967) with similar results found for other bird species (Eisemann et al. 2003). Once death occurs, DRC-1339 concentrations appear to be highest in the gastrointestinal tract of birds but some residue could be found in other tissue of carcasses examined (Giri et al. 1976, Cunningham et al. 1979, Johnston et al. 1999) with residues diminishing more slowly in the kidneys (Eisemann et al. 2003). However, most residue tests to detect DRC-1339 in tissues of birds have been completed using DRC-1339 dosages that far exceeded the known acute lethal oral dose for those species tested and far exceeds the level of DRC-1339 that would be ingested from treated bait. Johnston et al. (1999) found DRC-1339 residues in breast tissue of boat-tailed grackles (*Quiscalus major*) using acute doses ranging from 40 to 863 mg/kg. The acute lethal oral dose of DRC-1339 for boat-tailed grackles has been estimated to be ≤ 1 mg/kg which is similar to the LD_{50} for crows (Eisemann et al. 2003). In those boat-tailed grackles consuming a trace of DRC-1339 up to 22 mg/kg, no DRC-1339 residues were found in the gastrointestinal track nor found in breast tissue (Johnston et al. 1999).

In summary, nearly all of the DRC-1339 ingested by sensitive species is metabolized or excreted quickly, normally within a few hours. Residues of DRC-1339 have been found in the tissues of birds consuming DRC-1339 at very high dosage rates that exceed current acute lethal dosages achieved under the label requirements of DRC-1339. Residues DRC-1339 ingested by birds appears to be primarily located in the gastrointestinal tract of birds.

As stated previously, to pose of risks to human safety, a hunter would have to harvest a crow that has ingested DRC-1339 and then, ingest tissue of the crow containing residue. Very little information is available on the acute or chronic toxicity of DRC-1339 on people. However, based on the information available risks to human safety would be extremely low based on several mitigating factors. First, a hunter would have to harvest a crow that had ingested DRC-1339. As stated previously, the use of DRC-1339 primarily occurs to address damage associated with urban roosts. Hunting and discharging a firearm is prohibited in most municipal areas. Therefore, a crow would have to ingest treated bait and then travel to an area (typically outside of the city limit) where hunting was allowed. WS would not recommend hunting as a damage management tool in those general areas where DRC-1339 was actively being applied. Secondly, to pose a risk to human safety the crow would have to be consumed and the tissue consumed would have to contain chemical residues. Current information indicates that the majority of the chemical is excreted within a few hours of ingestion. The highest concentration of the chemical occurs in the gastrointestinal tract of the bird which is discarded and not consumed. Although residues have been detected in the tissues that might be consumed, residues appear to only be detectable when the bird has consumed a large dose of the chemical that far exceeds the LD_{50} for that species and would not be achievable under normal baiting procedures. Although no information is currently available on the number of people that might consume crows in Maryland, very few, if any, people are likely consuming crows harvested in Maryland or elsewhere. Crows are harvested for recreational purposes and to alleviate damage in the State and are not harvested for subsistence (B. Harvey, MDNR pers. comm. 2009).

Under the proposed action, the controlled and limited circumstances in which DRC-1339 would be used would prevent any exposure of the public to this chemical. Based on current information, the human health risks from the use of DRC-1339 would be virtually nonexistent under this alternative.

The recommendation by WS that crows be harvested during the regulated hunting season which is established by the MDNR under frameworks determined by the USFWS would not increase risks to human safety above those risks already inherent with hunting those species. Recommendations of allowing hunting on property owned or managed by a cooperator to reduce crow populations which could

then reduce damage or threats would not increase risks to human safety. Safety requirements established by the MDNR for the regulated hunting season will further minimize risks associated with hunting. Although hunting accidents do occur, the recommendation of allowing hunting to reduce localized populations of crows will not increase those risks.

No adverse affects to human safety have occurred from WS' use of methods to alleviate crow damage in the State from FY 2004 through FY 2008. The risks to human safety from the use of non-lethal and lethal methods, when used appropriately and by trained personnel, is considered low.

Alternative 4 - Use of Non-lethal Methods Only

Under a non-lethal only program, the availability of methods for use by WS' would be similar to those methods discussed in under the proposed action and other alternatives. Non-lethal methods currently available for use to manage damage caused by crows would be available under all the alterantives. DRC-1339 would not be available under a non-lethal method only alternative. Repellents could also continue to be used or recommended under this alternative.

The efficacy and safety of those chemical methods available under this alternative would be similar to the proposed action given most methods available could be employed or recommended under either alternative. The exception would be the use of DRC-1339 which would be available under proposed action but would be unavailable under any other alternatives.

Under this alternative, non-chemical methods that might raise safety concerns are similar to those addressed under the other alternatives. Risks to the public from the use of those methods would be similar to those described under all the alternatives.

Issue 7 - Effects on the Regulated Harvest of Crows

Alternative 1 – No Crow Damage Management Conducted by WS

WS would have no impact on the ability to harvest crows under this alternative. WS would not be involved with any aspect of crow damage management. The USFWS and the MDNR would continue to regulate populations through adjustments of the allowed take during the regulated harvest season and the continued use of the depredation order.

Alternative 2 - Crow Damage Management by WS through Technical Assistance Only

WS would have no impact on regulated hunting since WS would not lethally remove crows under this alternative. However, resource/property owners may remove crows under the blackbird depredation order resulting in impacts similar to the proposed action and the other alternatives. The recommendation of non-lethal methods could disperse or exclude birds from areas under this alternative which could limit the ability of those interested to harvest those crows in the damage management area. However, the recommendation of harassment techniques to disperse crows using urban roosts could increase opportunities to harvest crows by dispersal crows from areas where hunting is prohibited or restricted. However, the populations of those crows species would be unaffected by WS under this alternative.

Alternative 3 - Continuing the Current Integrated Approach to Managing Crow Damage (Proposed Action/No Action)

The magnitude of take of crows addressed in the proposed action would be low when compared to the mortality of those species from all known sources. When WS' proposed take of crows was included as

part of the known mortality of those species and compared to the estimated population, the impact on those species' populations was below the level of removal required to lower population levels.

With oversight of crow populations by the USFWS and the MDNR, the number of crows allowed to be taken by WS will not limit the ability of those interested to harvest those crow species during the regulated season. All take by WS will be reported to the USFWS and the MDNR annually to ensure take by WS is incorporated into population management objectives established for crow populations. Based on the limited take proposed by WS and the oversight of by the USFWS and the MDNR, WS' take of crows annually will have no effect on the ability of those interested to harvest crows during the regulated harvest season.

Alternative 4 - Use of Non-lethal Methods Only

Similar to the Alternative 1 and Alternative 2, WS would have no impact on regulated hunting since WS would not lethally remove crows under this alternative. However, resource/property owners may remove crows under the blackbird depredation order resulting in impacts similar to the proposed action and the other alternatives. The use and recommendation of non-lethal methods could disperse or exclude birds from areas under this alternative which could limit the ability of those interested to harvest those crows in the damage management area. However, the use and recommendation of harassment techniques to disperse crows using urban roosts could increase opportunities to harvest crows by dispersal crows from areas where hunting is prohibited or restricted. However, the populations of those crows species would be unaffected by WS under this alternative.

4.2 CUMULATIVE IMPACTS OF THE PROPOSED ACTION BY ISSUE

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 other actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time.

WS will continue to coordinate crow damage management activities and will report all take of crows to the USFWS and MDNR annually. WS will also annually monitor program activities to ensure those activities are within the scope analyzed in this EA.

Issue 1 - Effects on Crow Populations

Evaluation of activities relative to target species indicated that program activities will likely have no cumulative adverse affects on crow populations when targeting those species responsible for damage. WS' actions would be occurring simultaneously, over time, with other natural processes and human generated changes that are currently taking place. These activities include, but are not limited to:

- Natural mortality of crows
- Human-induced mortality of crows through private damage management activities
- Human and naturally induced alterations of wildlife habitat
- Annual and perennial cycles in wildlife population densities

All those factors play a role in the dynamics of crow populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate target species populations or place target species at a juncture to cause damage to resources. The 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 uses the Decision Model to evaluate damage occurring, including other affected elements and the dynamics of the damaging species; to determine 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). 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.

With management authority over crow population, the USFWS and the MDNR can adjust take levels, including the take of WS, to ensure population objectives for crows are achieved. Consultation and reporting of take by WS will ensure the USFWS and the MDNR considers any activities conducted by WS.

WS' take of crows in Maryland from FY 2004 through FY 2008 was of a low magnitude when compared to the total known take. WS' annual take of crows in the State will occur under the established blackbird depredation order that allows crows to be taken when committing or about to commit damage or posing human safety threats. The USFWS and the MDNR considers all known take when determining population objectives for crows and can adjust the number of crows that can taken during the regulated hunting season and the number of crows taken for damage management purposes to achieve the population objectives. Any take by WS will occur at the discretion of the USWFS and the MDNR. Any crow population declines or increases will be the collective objective for crow populations established by the USFWS and the MDNR through the regulation of take. Therefore, the cumulative take of crows annually or over time by WS will occur at the desire of the USFWS and the MDNR as part of management objectives for crows in the State.

No cumulative adverse impacts on target and non-target wildlife are expected from WS' crow damage management actions based on the following considerations:

1. Historical outcomes of WS' damage management activities on wildlife

Crow damage management activities are conducted by WS only at the request of a cooperator to reduce damage that is occurring or prevent damage from occurring and only after methods to be used are agreed upon by all parties involved. WS' annually monitors activities to ensure any potential impacts are identified and addressed. WS works closely with state and federal resource agencies to ensure damage management activities are not adversely impacting crow populations and that WS' activities are considered as part of management goals established by those agencies. Historically, WS' activities to manage crows in Maryland have not reached a magnitude that would cause adverse impacts to crow population in the State.

2. SOP and mitigation strategies built into the WS program

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

3. Current status of potentially affected wildlife species

Natural and human-induced mortality patterns for crows are expected to remain essentially unchanged in Maryland. This is true of elements outside WS' programs and the programs

themselves. As a result, no cumulative adverse affects are expected from repetitive programs over time in the fairly static set of conditions currently affecting wildlife in Maryland.

Issue 2 - Effects on Non-target Wildlife Species Populations, Including T&E Species

Potential effects on non-target species from conducting crow damage management arise from the use of non-lethal and lethal methods to alleviate or prevent those damages. The use of non-lethal methods during activities to reduce or prevent damage caused by crows 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 will 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 will 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 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 target wildlife after being triggered by a target individual. Capture methods are employed in such a manner as to minimize the threat to non-target species by placement in those areas frequently used by target wildlife, using baits or lures that are as species specific as possible, and modification of individual methods to exclude non-targets from capture. Most methods described in Appendix B are methods that are employed to confine or restrain wildlife that are subsequently euthanized using humane methods since relocation is currently not considered. With all live-capture devices, non-target wildlife captured can be released on site if determined to be able to survive following release. Minimization and 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 and euthanasia methods are essentially selective for target species since identification of an individual is made prior to the application of the method. Euthanasia methods are applied through direct application to target wildlife. Therefore, the use of those methods will not impact non-target species.

Chemical methods available for use under the proposed action are DRC-1339 and repellents that are described in Appendix B. All chemical methods are employed using baits that are highly attractive to target species and used in areas where exposure to non-targets are minimal. The use of DRC-1339 requires pre-baiting and monitoring of potential bait sites for non-target activity. All chemicals will be used according to product label which ensure that proper use will minimize non-target threats. WS' adherence to Directives, SOPs, and mitigation measures governing the use of chemicals also ensures non-target hazards are minimal.

All chemical methods will be tracked and recorded to ensure proper accounting of used and unused chemicals occurs. All chemicals will be stored and transported according the WS and DOT regulations. The amount of chemicals used or stored by WS will be minimal to ensure human safety. Based on this

information, WS' use of chemical methods, as part of the proposed action, will not have cumulative impacts on non-targets.

All label requirements of DRC-1339 will be followed to minimize non-target hazards. As required by the label, all potential bait sites are pre-baited and monitored for non-target use as outlined in the pre-treatment observations section of the label. If non-targets are observed feeding on the pre-bait, the plots are abandoned and no baiting would occur at those locations. Once sites are baited, sites are monitored daily to further observe for non-target feeding activity. If birds are observed feeding on bait, those sites are abandoned. WS will retrieve all dead crows to the extent possible, following treatment with DRC-1339 to minimize secondary hazards associated with scavengers feeding on crow carcasses.

Repellents may also be used or recommended by the WS program in Maryland to manage crow damage. The active ingredient in numerous commercial repellents is methyl anthranilate which has been categorized by the EPA as "generally recognized as safe". Methyl anthranilate is a derivative of grapes and used as a flavoring in food and as a fragrance in cosmetics. Other repellents available contain the active ingredient polybutene, which when applied, creates a sticky surface which is intended to prevent perching. Although not registered for use to disperse crows in Maryland, other bird repellents registered contain the active ingredient anthraquinone, which is a naturally occurring plant extract. Characteristics of these chemicals and potential use patterns indicate that no significant cumulative impacts related to environmental fate are expected from their use in WS' programs in Maryland when used according to label requirements.

The methods described in Appendix B all have a high level of selectivity and can be employed using SOPs and minimization measures to ensure minimal impacts to non-targets species. No non-targets were taken by WS during crow damage management activities from FY 2004 through FY 2008. Based on the methods available to resolve crow 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 under the proposed action of non-targets will not cumulatively impact non-target species. WS' has reviewed the T&E species listed by the MDNR, the USFWS, and the National Marine Fisheries Services and has determined that crow damage management activities proposed by WS will not likely adversely affect T&E species. Cumulative impacts will be minimal on non-targets from any of the alternatives discussed**.**

Issue 3 - Humaneness and Animal Welfare Concerns of Methods

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) will be checked and monitored to ensure any wildlife confined or restrained are addressed in a timely manner to minimize distress of the animal. All euthanasia methods used for live-captured crows will be applied according to AVMA guidelines for free-ranging wildlife. Shooting will occur in limited situations and personnel will be trained in the proper use of firearms to minimize pain and suffering of crows 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 minimization measures and SOPs that guide WS in the use of methods to address damage and threats associated with crows in the State, the cumulative impacts on the issue of method humaneness are minimal. All methods will 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 4 - Effects on the Aesthetic Values of Crows

The activities of WS would result in the removal of crows from those areas where damage or threats were occurring. Therefore, the aesthetic value of crows 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 crow densities, including the return of native plant species that may be suppressed or killed by accumulations of fecal dropping by high crow densities found under roost areas.

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 crows 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 the target species identified in this EA.

Crow population objectives are established and enforced by the USFWS and the MDNR through the regulating the take of during during the statewide hunting and trapping season after consideration of other known mortality factors. Therefore, WS has no direct impact on the status of the crow population since all take by WS occurs at the discretion of the USFWS and the MDNR. Since those persons seeking assistance could remove crows from areas where damage is occurring without a permit from the USFWS or the MDNR, WS' involvement would have no effect of the aesthetic value of crows in the area where damage was occurring. When damage caused by crows has occurred, any removal of crows by the property or resource owner would likely occur whether WS was involved with taking the crows 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.

Issue 5 – Effects on the Aesthetic Value of Property

Requests for assistance to manage damage to property associated with crows often arise from the aesthetically displeasing appearance of fecal droppings that can occur under areas where crows roost. In addition to fecal droppings being unsightly, large accumulations of droppings can produce noxious odors. The presence of unsightly fecal droppings on property and noxious odors associated with roost locations can lead people to avoid those areas. If accumulations of fecal dropping occur on storefronts, near businesses, or other public-use areas, people may avoid those business or areas which can lead to economic losses to those businesses or property owners. In some cases, businesses may go out-of-business or public-use areas may close due to the avoidance of people of those areas due to the aesthetically displeasing presence of fecal droppings.

Wildlife damage management methods and techniques are employed to reduce damage or reduce the threat of damage. In the absence of available methods or in the absence of any assistance, the displeasing aesthetic of fecal droppings and reduce the aesthetic value of property. A reduced aesthetic value of property can lead to business closures and de-value the property. When those methods available are employed as intended, those methods have a reasonable opportunity to reduce damage and improve the aesthetic value of the property by reducing the accumulations of droppings occurring on that property. Since methods are available to address crows responsible for causing damage, the cumulative impact on the aesthetic value of property is expected to be extremely low under any of the alternatives considered.

The level of assistance available from WS under the alternatives varies. If WS' assistance under the alternatives increased the likelihood that damage associated with fecal droppings was reduced, then the cumulative impact associated with the aesthetic value of property would likely be reduced under those alternatives in which WS was involved with resolving damage. The degree would be difficult to calculate and determined. However, a reasonable determination could be made that with an increasing level of involvement by WS, an increasing likelihood of reducing damage would result. Therefore, no adverse affects on the aesthetic value of property is expected from any of the alternatives.

Issue 6 - Effects of Management Methods on Human Health and Safety

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 to ensure the safety of the public. Capture methods also require direct contact to trigger ensuring that those methods, when left undisturbed will 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 and minimization measures 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, poses 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.

Personnel employing non-chemical methods will 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 will not cumulatively impact human safety.

Repellents have been available for use to disperse crows from areas of application are available. All repellents must be registered with the EPA according to the FIFRA. 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.

Crow damage management programs which include the use of pesticides as a lethal population management component may have the greatest potential for cumulative impacts on the environment as such impacts relate to the deposit of chemical residues in the physical environment with potential for environmental toxicosis.

DRC-1339 may be used by WS or recommended by WS for use to manage damage or threats associated with crows in Maryland. DRC-1339 has been evaluated for possible residual effects which might occur from buildup of the chemical in soil, water, or other environmental sites. DRC-1339 is formulated on baits and placed in areas only after pre-baiting has occurred and in only those areas where non-targets are not present or would not be exposed to treated baits. Baits treated with DRC-1339 are placed on platforms or other hard surfaces where they seldom come into contact with soil, surface water, and/or ground water. All uneaten bait is recovered and disposed of according to EPA label requirements.

DRC-1339 exhibits a low persistence in soil or water, and bioaccumulation of the chemical is unlikely (USDA 1997). Additionally, the relatively small quantity of DRC-1339 that could potentially be used in crow damage management programs in Maryland, the chemical's instability which results in degradation

of the product, and application protocols used in WS' programs further reduces the likelihood of any environmental accumulation. From FY 2005 through FY 2008, WS has used 95.4 grams of DRC-1339 during bird damage management activities. DRC-1339 has not been used previously by WS to manage crow damage. Previous uses of DRC-1339 by WS occurred to alleviate pigeon and starling damage. The use of DRC-1339 under the proposed action and in other bird damage management activities is not expected to increase to a level that adverse affects would occur from the cumulative use of the chemical. Based on potential use patterns, the chemical and physical characteristics of DRC-1339, and factors related to the environmental fate, no cumulative impacts are expected from the lethal chemical components used or recommended by the WS program in Maryland.

WS has received no reports or documented any adverse affects to human safety from WS' crow damage management activities conducted from FY 2004 through FY 2008. No cumulative adverse affects from the use of those methods discussed in Appendix B are expected given the use patterns of those methods for resolving crow damage in the State.

Issue 7 - Effects on the Regulated Harvest of Crows

As discussed in this EA, the magnitude of WS' crow take for damage management purposes from FY 2004 through FY 2008 was low when compared to the total take of crows and when compared to the estimated statewide population. Since all take of crows is regulated by the USFWS and the MDNR, the take of crows by WS that would occur annually and cumulatively would occur pursuant to crow population objectives established in the State. WS' take of up to 8,000 crows (combined take) annually to alleviate damage would be a minor component to the known take that occurs annually. Take of up to 500 fish crows would similarly be considered a low magnitude of take when compared to trend information, harvest information, and population data. With oversight of crow take, the USFWS and the MDNR maintains the ability to regulate take by WS to meet management objectives for crows in the State. Therefore, the cumulative take of crows is considered as part of the USFWS and the MDNR objectives for crow populations in the State.

CHAPTER 5: LIST OF PREPARERS AND PERSONS CONSULTED

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APPENDIX A
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APPENDIX B

CROW DAMAGE MANAGEMENT METHODS AVAILABLE FOR USE OR RECOMMENDATION BY THE MARYLAND WILDLIFE SERVICES PROGRAM

NONLETHAL METHODS - NONCHEMICAL

Agricultural producer and property owner practices. These consist primarily of nonlethal preventive methods such as cultural methods and habitat modification. Cultural methods and other management techniques are implemented by the agricultural producer or property owners/managers. Resource owners/managers may be encouraged to use these methods, based on the level of risk, need, and professional judgment on their effectiveness and practicality. These methods include:

> **Cultural methods.** These may include altering planting dates so that crops are not young and more vulnerable to damage when the damage-causing species is present, or the planting of crops that are less attractive or less vulnerable to such species. At feedlots or dairies, cultural methods generally involve modifications to the level of care or attention given to livestock which may vary depending on the age and size of the livestock. Animal husbandry practices include but are not limited to techniques such as night feeding, indoor feeding, closed barns or corrals, removal of spilled grain or standing water, and use of bird proof feeders (Johnson and Glahn 1994).
>
> **Environmental/Habitat modification** can be an integral part of crow damage management activities. Wildlife production and/or presence is directly related to the type, quality, and quantity of suitable habitat. Therefore, habitat can be managed to reduce or eliminate the production or attraction of certain bird species or to repel certain birds. In most cases, the resource or property owner is responsible for implementing habitat modifications, and WS only provides advice on the type of modifications that have the best chance of achieving the desired effect. Habitat management is most often a primary component of crow damage management strategies at or near airports to reduce bird aircraft strike problems by eliminating bird nesting, roosting, loafing, or feeding sites. Generally, many bird problems on airport properties can be minimized through management of vegetation and water from areas adjacent to aircraft runways. Habitat management is often necessary to minimize damage caused by crows that form large roosts during late autumn and winter. Bird activity can be greatly reduced at roost sites by removing all the trees or selectively thinning the stand.

Animal behavior modification. This refers to tactics that alter the behavior of wildlife to reduce damage. Animal behavior modification may involve use of scare tactics or fencing to deter or repel animals that cause loss or damage (Twedt and Glahn 1982). Some but not all methods that are included by this category are:

- Bird-proof barriers
- Electronic guards
- Propane exploders
- Pyrotechnics
- Distress Calls and sound producing devices
- Chemical frightening agents
- Repellents
- Effigies
- Mylar tape
- Eye-spot balloons

These techniques are generally only practical for small areas. Scaring devices such as distress calls, helium filled eye spot balloons, raptor effigies and silhouettes, mirrors, and moving disks can be effective but usually for only a short time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1983, Bomford 1990, Rossbach 1975, Graves and Andelt 1987, Mott 1985, Shirota and Masake 1983, Conover 1982, Arhart 1972). Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et al. 1986, Tobin et al. 1988).

Bird proof barriers can be effective but are often cost-prohibitive, particularly because of the aerial mobility of birds which requires overhead barriers as well as peripheral fencing or netting. Exclusion adequate to stop bird movements can also restrict movements of livestock, people and other wildlife (Fuller-Perrine and Tobin 1993). Overhead wire grids can deter crow use of specific areas where they are causing a nuisance (Johnson 1994). The birds apparently fear colliding with the wires and thus avoid flying into areas where the method has been employed.

Netting can be used to exclude crows from a specific area by the placement of bird proof netting over and around the specific resource to be protected. Exclusion may be impractical in most settings (*e.g*., commercial agriculture), however it can be practical in small areas (*e.g*., personal gardens) or for high-value crops (*e.g*., grapes) (Johnson 1994). Although this alternative would provide short-term relief from damage, it may not completely deter crows from feeding, loafing, staging, or roosting at that site. A few people would find exclusionary devices such as netting unsightly and a lowering of the aesthetic value of the neighborhood when used over personal gardens.

Auditory scaring devices such as propane exploders, pyrotechnics, electronic guards, scare crows, and audio distress/predator vocalizations are effective in many situations for dispersing damage-causing bird species. These devices are sometimes effective but usually only for a short period of time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1983, Bomford 1990, Rossbach 1975, Mott 1985, Shirota and Masake 1983, Arhart 1972). Williams (1983) reported an approximate 50% reduction in blackbirds at two south Texas feedlots as a result of pyrotechnics and propane cannon use. However, they are often not practical in dairy or feedlot situations because of the disturbance to livestock, although livestock can generally be expected to habituate to the noise. Birds, too, quickly learn to ignore scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Visual scaring techniques such as use of Mylar tape (highly reflective surface produces flashes of light that startles birds), eye-spot balloons (the large eyes supposedly give birds a visual cue that a large predator is present), flags, effigies (scarecrows), sometimes are effective in reducing bird damage. Effigies to disperse urban crow roosts appear to be an effective method (Avery et al. 2008). Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et.al. 1986, Tobin et.al. 1988). Birds quickly learn to ignore visual and other scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Nest destruction is the removal of nesting materials during the construction phase of the nesting cycle. Nest destruction is generally only applied when dealing with a single bird or very few birds. This method is used to discourage birds from constructing nests in areas which may create nuisances for home and business owners. Heusmann and Bellville (1978) reported that nest removal was an effective but time-consuming method because problem bird species are highly mobile and can easily return to damage sites from long distances, or because of high populations. This method poses no imminent danger to pets or the public.

Egg addling/destruction is a method of suppressing reproduction in local nuisance bird populations by destroying egg embryos prior to hatching. Egg addling is conducted by vigorously shaking an egg numerous times which causes detachment of the embryo from the egg sac. Egg destruction can be

accomplished in several different ways, but the most commonly used methods are manually gathering eggs and breaking them, or by oiling or spraying the eggs with a liquid which covers the entire egg and prevents the egg from obtaining oxygen (see egg oiling below). Although WS does not commonly use egg addling or destruction, it is a valuable damage management tool and has proven effective in some applications.

Egg oiling is a method for suppressing reproduction of nuisance birds by spraying a small quantity of corn oil on eggs in nests. The oil prevents exchange of gases and causes asphyxiation of developing embryos and has been found to be 96-100% effective in reducing hatchability (Pochop 1998, Pochop et al. 1998). The method has an advantage over nest or egg destruction in that the incubating birds generally continue incubation and do not re-nest. The EPA has ruled that use of corn oil for this purpose is exempt from registration requirements under FIFRA. To be most effective, the oil should be applied anytime between the fifth day after the laying of the last egg in a nest and at least five days before anticipated hatching. This method is extremely target specific and is less labor intensive than egg addling.

Lure crops/alternate foods. When depredations cannot be avoided by careful crop selection or modified planting schedules, lure crops can sometimes be used to mitigate the loss potential. Lure crops are planted or left for consumption by wildlife as an alternative food source. This approach provides relief for critical crops by sacrificing less important or specifically planted fields. Establishing lure crops is sometimes expensive, requires considerable time and planning to implement, and may attract other unwanted species to the area.

Live traps (although live traps are non-lethal, birds may be euthanized upon capture). In most situations live trapped crows are subsequently euthanized. Relocation to other areas following live capture would not generally be effective because problem bird species are highly mobile and can easily return to damage sites from long distances; habitats in other areas are generally already occupied; and relocation would most likely result in bird damage problems at the new location. Translocation of wildlife is also discouraged by WS' policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats. Live traps include:

> **Decoy traps** are used by WS for preventive and corrective damage management. Decoy traps are similar in design to the Australian Crow Trap as reported by McCracken (1972) and Johnson and Glahn (1994). Live decoy birds of the same species that are being targeted are usually placed in the trap with sufficient food and water to assure their survival. Perches are configured in the trap to allow birds to roost above the ground and in a more natural position. Feeding behavior and calls of the decoy birds attract other birds which enter and become trapped themselves. Active decoy traps are monitored daily, every other day, or as appropriate, to remove and euthanize excess birds and to replenish bait and water. Decoy traps and other cage/live traps, as applied and used by WS, pose no danger to pets or the public and if a pet is accidentally captured in such traps, it can be released unharmed.
>
> **Foot-hold traps** are used by WS for preventative and corrective damage management. Trapping with foot-hold traps can be effective in areas where a small resident crow population is present (Johnson 1994). No. 0 or 1 foot-hold traps with padded jaws would be used to trap individual birds in areas habitually used by crows. Traps would be monitored a minimum of twice each day and trapped birds euthanized by methods approved by the AVMA.
>
> **Mist nets** are more commonly used for capturing small-sized birds such as House Sparrows but can be used to capture larger birds such as ducks and ring-neck pheasants or even smaller nuisance hawks and owls. It was introduced in to the United States in the 1950's from Asia and the Mediterranean where it was used to capture birds for the market (Day et al. 1980). The mist net is a fine black silk or

nylon net usually 3 to 10 feet wide and 25 to 35 feet long. Net mesh size determines which birds can be caught and overlapping pockets in the net cause birds to entangle themselves when they fly into the net.

Cannon nets are normally used for larger birds such as pigeons and use mortar projectiles to propel a net up and over birds which have been baited to a particular site.

Lasers are non-chemical, non-lethal, and an experimental technique evaluated by the NWRC to disperse double-crested cormorant roosts (Glahn et al. 2000). The lasers must be used after sunset and before sunrise to be effective at dispersing cormorants. Moving the laser light through the tree branches rather than touching birds with the laser light elicited an avoidance response from cormorants (Glahn et al. 2000). During pen trials with lasers the cormorants were inconsistent in their response with some birds showing no response to the laser (Glahn et al. 2000). The lack of overt response by cormorants to lasers is not clearly understood, but suggests laser light is not a highly aversive agent (Glahn et al. 2000). Blackwell et al. (2002) tested lasers on several bird species and observed varied results among species. Lasers were ineffective at dispersing starlings and cowbirds (Blackwell et al. 2002). Lasers were initially effective at dispersing pigeons and mallard ducks but the birds habituated in approximately 5-minutes and 20-minutes, respectively (Blackwell et al. 2002). Canada geese reacted to the laser displaying neophobic avoidance to the approaching laser beam.

Lasers are available with a power of 5 mW (moderate power) and 68 mW (low power). The difference between the lasers is beam intensity and diameter (Glahn et al. 2000). The lasers do not appear to present any detectable ocular hazards to cormorants but do present human safety concerns (Glahn et al. 2000). Both the Desman and Dissuader laser devices which would be used by WS to disperse birds are classified as Class-IIIB lasers (OSHA 1991). Lasers in lower ranges of Class-IIIB do not produce hazardous diffuse reflection unless someone intentionally stares at the laser closer to the diffuser. The lasers can cause temporary flash blindness, afterimage, and glare in people. It is recommended that lasers not be pointed a people (Glahn et al. 2000). The cost of lasers may be a disadvantage to their use (Glahn et al. 2000).

NONLETHAL METHODS - CHEMICAL

Methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by WS as a bird repellent, if and when it becomes registered for use on crows. Methyl anthranilate (artificial grape flavoring food additive) has been shown to be a promising repellent for many bird species (Dolbeer et al. 1993). Cummings et al. (1995) found effectiveness of methyl anthranilate declined significantly after 7 days. Belant (1996) found methyl anthranilate ineffective as a bird grazing repellent, even when applied at triple the recommended label rate. Methyl anthranilate is also under investigation as a potential bird taste repellent. Methyl anthranilate may become available for use as a livestock feed additive (Mason et.al. 1984, Mason et al. 1989). It is registered for applications to turf or to surface water areas used by unwanted birds. The material has been shown to be nontoxic to bees (LD_{50} > 25 micrograms/bee[12]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[13]), and of relatively low toxicity to fish and other invertebrates. Methyl anthranilate is naturally occurring in concord grapes and in the blossoms of several species of flowers and is used as a food additive and perfume ingredient (Dolbeer et al. 1992). It has been listed as "Generally Recognized as Safe" by the Food and Drug Administration (Dolbeer et al. 1992). Research has been conducted to potentially register methyl anthranilate as a crow repellant for landfill operations (Timm 1994).

[12] An LD_{50} is the dosage in milligrams of material per kilogram of body weight, or, in this case in micrograms per individual bee, required to cause death in 50% of a test population of a species.

[13] An LC_{50} is the dosage in milligrams of material per liter of air required to cause death in 50% of a test population of a species through inhalation.

Water surface and turf applications of methyl anthranilate are generally considered expensive. For example, the least intensive application rate required by label directions is 20 lbs. of product (8 lbs. active ingredient) per acre of surface water at a cost of about $64/lb. with retreating required every 3-4 weeks. Cost of treating turf areas would be similar on a per acre basis. Also, methyl anthranilate completely degrades in about 3 days when applied to water which indicates the repellent effect is short-lived.

Another potentially more cost effective method of methyl anthranilate application is by use of a fog-producing machine (Vogt 1997). The fog drifts over the area to be treated and is irritating to the birds while being nonirritating to any humans that might be exposed. Fogging applications must generally be repeated 3-5 times after the initial treatment before the birds abandon a treatment site. Applied at a rate of about .25 lb/ acre of water surface, the cost is considerably less than when using the turf or water treatment methods.

Methyl anthranilate is also being investigated as a livestock feed additive to reduce or prevent feed consumption by birds. Such chemicals undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by EPA or the Food and Drug Administration.

Rejex-It (fogger) is a chemical, non-lethal technique which is registered with the EPA for dispersing birds. Rejex-It TP 40 has a supplemental label allowing the use of Rejex-It in thermal or mechanical fog generators. The label allows the use of Rejex-It TP 40 fog to repel birds from roosting areas and other areas. The active ingredient in Rejex-It is methyl anthranilate. Inactive ingredients in Rejex-It TP40 include limonene, a human irritant. Limonene is added to Rejex-It TP 40 to make it float on water. Fogging is not recommended for urban/suburban areas because of cloud drift and chemical sensitivity of the public. The public would be concerned with odor sensitivity and allergic reaction to methyl anthranilate.

Rejex-It TP 40 fogger has variable effectiveness on birds and is thought to work best on passerines and waterfowl. Stevens and Clark (1998) found starlings were irritated by exposure to methyl anthranilate as an aerosol and did not habituate to the aerosol. Additionally, birds may habituate to fogging. Belant et al. (1996) found Canada geese habituated or developed tolerance for methyl anthranilate when applied to turf. The use of a fog may repel other desirable birds and it leaves a strong grape odor which may persist for several days. Finally, Stevens and Clark (1998) cautioned that an irritation response in the laboratory does not directly translate into an avoidance response in the field.

Mesurol was recently registered by WS to repel crows and ravens from birds' nests of T&E species. It could be used by WS only as a bird repellent to deter predation by crows on eggs of threatened or endangered species. Dimmick and Nicolaus (1990) showed breeding pairs of crows could be conditioned with aversive chemicals to avoid eggs. However, Avery and Decker (1994) observed increased consumption of eggs treated with higher doses of Mesurol by fish crows. Sullivan and Dinsmore (1990) reported bird nests greater than 700 meters from crow nests were relatively safe from crow predation, thus nests beyond 700 meters from active crow nests may not need to be treated.

WS would treat eggs similar in appearance as those eggs of the species needing protection. The active ingredient is injected into eggs which are placed in artificial nests or upon elevated platforms. Upon ingestion, birds develop post-ingestional malaise (Mason 1989) and crows develop an aversion to consuming similar looking eggs (Dimmick and Nicolaus 1990). Repeated exposures may be necessary to develop and maintain aversion to threatened or endangered species eggs as the learning curve for crows can take from 23 days to 3 months (Dimmick and Nicolaus 1990, Avery and Decker 1994).

Treated areas will be posted with warning signs at access points to exclude people from endangered or threatened species nesting areas. Treated eggs are not placed in locations where threatened or endangered species may eat the treated eggs. Mesurol is highly toxic to birds and mammals and toxic to fish. It is also highly toxic to honey bees.

Polybutene is contained in a number of tactile repellent products are on the market which reportedly deters birds from roosting on certain structural surfaces by presenting a tacky or sticky surface that the birds avoid. However, experimental data in support of this claim are sparse (Mason and Clark 1992). The repellency of tactile products is generally short-lived because of dust, and they sometimes cause aesthetic problems and expensive clean-up costs by running down the sides of buildings in hot weather.

Anthraquinone is a naturally occurring chemical found in many plant species and in some invertebrates as a natural predator defense mechanism, has shown effectiveness in protecting rice seed from red-winged blackbirds and boat-tailed grackles (Avery et al. 1997). It has also shown effectiveness as a foraging repellent against Canada goose grazing on turf and as a seed repellent against brown-headed cowbirds (Dolbeer et al. 1998).

LETHAL METHODS - MECHANICAL

Shooting is more effective as a dispersal technique than as a way to reduce bird densities when large numbers of birds are present. Normally shooting is conducted with shotguns, rifles or air rifles. Shooting is a very individual specific method and is normally used to remove a single offending bird. However, at times, a few birds could be shot from a flock to make the remainder of the birds more wary and to help reinforce nonlethal methods. Shooting can be relatively expensive because of the staff hours sometimes required (USDA 1997). It is selective for target species and may be used in conjunction with the use of spotlights, decoys, and calling. Shooting with shotguns, air rifles, or rim and center fire rifles is sometimes used to manage bird damage problems when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible. All firearm safety precautions are followed by WS when conducting crow damage management activities and all laws and regulations governing the lawful use of firearms are strictly complied with.

Firearm use is very sensitive and a public concern because of safety issues relating to the public and misuse. To ensure safe use and awareness, WS' employees who use firearms to conduct official duties are required to attend an approved firearms safety course prior to the use of firearms (WS Directive 2.615). WS employees, who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Sport hunting is sometimes recommended by WS as a viable damage management method when the target species can be legally hunted. A valid hunting license and other licenses or permits may be required by the MDNR and USFWS for certain species. This method provides sport and food for hunters and requires no cost to the landowner. Sport hunting is occasionally recommended if it can be conducted safely for crow damage management around crops or other resources.

Cervical dislocation is sometimes used to euthanize birds which are captured in live traps. The bird is stretched and the neck is hyper extended and dorsally twisted to separate the first cervical vertebrae from the skull. The AVMA approves this technique as humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of poultry and other small birds (AVMA 2007). Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and is rapidly accomplished (AVMA 2007).

LETHAL METHODS - CHEMICAL

All chemicals used by WS are registered as required by the FIFRA (administered by the EPA and the Maryland Department of Agriculture, Pesticide Regulation Section). WS personnel that use restricted-use chemical methods are certified as pesticide applicators by Maryland Department of Agriculture, Pesticide Regulation Section and are required to adhere to all certification requirements set forth in FIFRA and Maryland pesticide control laws and regulations. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner/manager.

Carbon dioxide is sometimes used to euthanize birds which are captured in live traps. Live birds are placed in a container such as a plastic 5-gallon bucket or chamber and sealed shut. Carbon dioxide gas is released into the bucket or chamber and birds quickly die after inhaling the gas. This method is approved as a euthanizing agent by the AVMA (AVMA 2007). Carbon dioxide gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of carbon dioxide by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

DRC-1339 is the principal chemical method that would be used for crow damage management in the proposed action. For more than 30 years, DRC-1339 has proven to be an effective method of starling, blackbird, gull, and pigeon control at feedlots, dairies, airports, and in urban areas (West et al. 1967, Besser et al. 1967, Decino et al. 1966). Studies continue to document the effectiveness of DRC-1339 in resolving blackbird/starling problems at feedlots (West and Besser 1976, Glahn 1982, Glahn et al. 1987), dispersing crow roosts in urban/suburban areas (Boyd and Hall 1987), and Blanton et al. (1992) reports that DRC-1339 appears to be a very effective, selective, and safe means of urban pigeon population reduction. Glahn and Wilson (1992) noted that baiting with DRC-1339 is a cost-effective method of reducing damage by blackbirds to sprouting rice.

DRC-1339 is a slow acting avicide that is registered with the EPA for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to sensitive species but only slightly toxic to non-sensitive birds, predatory birds, and mammals (Schafer 1981, Schafer 1991, Johnson et al. 1999). For example, starlings, a highly sensitive species, require a dose of only 0.3 mg/bird to cause death (Royall et al. 1967). Most bird species that are responsible for damage, including starlings, blackbirds, pigeons, crows, magpies, and ravens are highly sensitive to DRC-1339. Many other bird species such as raptors (Schafer 1981), sparrows, and eagles are classified as non-sensitive. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to non-target and T&E species (USDA 1997). Secondary poisoning has not been observed with DRC-1339 treated baits, except crows eating gut contents of pigeons (Kreps 1974). During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1981). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds and starlings killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost nonexistent (Schafer 1981, Schafer 1991, Johnson et al. 1999). DRC-1339 acts in a humane manner producing a quiet and apparently painless death.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility. The half life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (*i.e.*, degradation

chemicals) have low toxicity. Aquatic and invertebrate toxicity is low (USDA 1997). Appendix P of USDA (1997) contains a thorough risk assessment of DRC-1339 and the reader is referred to that source for a more complete discussion. That assessment concluded that no adverse effects are expected from use of DRC-1339. DRC-1339 has several EPA Registration Labels depending on the application or species involved in the bird damage management project. However, only one label (56228-29) is currently available to manage damage caused by crows. Maryland WS used or supervised the use of an average of 23.85 grams of DRC-1339 per year for the past 4 years.

Appendix C
Federally-listed Species in Maryland

Listings and occurrences for Maryland

Notes: This report shows the listed species associated in some way with the State of Maryland.

- 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.
- Click on the highlighted scientific names below to view a Species Profile for each listing.

Summary of species listings and occurrences for Maryland

- 31 listings in Maryland
- 24 occurring in Maryland
- 7 not occurring in Maryland
- 0 species listed in some other state occurring in Maryland

Summary of Animals listings

- 21 listings in Maryland
- 17 occurring in Maryland
- 4 not occurring in Maryland
- 0 species listed in some other state occurring in Maryland

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

Status	Species
E	Bat, Indiana (*Myotis sodalis*)
E	Darter, Maryland (*Etheostoma sellare*)
T	Plover, piping except Great Lakes watershed (*Charadrius melodus*)
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	Squirrel, Delmarva Peninsula fox Entire, except Sussex Co., DE (*Sciurus niger cinereus*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
T	Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
T	Tiger beetle, Puritan (*Cicindela puritana*)
T	Turtle, bog (=Muhlenberg) northern (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)

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

Status	Species
E	Whale, right (*Balaena glacialis (incl. australis)*)

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

Status	Species
E	Beetle, American burying (*Nicrophorus americanus*)
E	Curlew, Eskimo (*Numenius borealis*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Wolf, gray Lower 48 States, except where delisted and where EXPN. Mexico. (*Canis lupus*)

Summary of Plant listings

- 10 listings in Maryland
- 7 occurring in Maryland
- 3 not occurring in Maryland
- 0 species listed in some other state occurring in Maryland

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

Status	Species
T	Amaranth, seabeach (*Amaranthus pumilus*)
E	Bulrush, Northeastern (*Scirpus ancistrochaetus*)
E	Dropwort, Canby's (*Oxypolis canbyi*)
E	Gerardia, sandplain (*Agalinis acuta*)
E	Harperella (*Ptilimnium nodosum*)
T	Joint-vetch, sensitive (*Aeschynomene virginica*)
T	Pink, swamp (*Helonias bullata*)

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

Status	Species
E	Chaffseed, American (*Schwalbea americana*)
E	Coneflower, smooth (*Echinacea laevigata*)
T	Pogonia, small whorled (*Isotria medeoloides*)