ENVIRONMENTAL ASSESSMENT

Managing Damage to Resources and Threats to Human Safety Caused by Birds in the State of Georgia

Prepared by

United States Department of Agriculture
Animal and Plant Health Inspection Service
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ACRONYMS

AI	Avian Influenza
APHIS	Animal and Plant Health Inspection Service
AQDO	Aquaculture Depredation Order
AVMA	American Veterinary Medical Association
BASH	Bird-Aircraft Strike Hazard
BBS	Breeding Bird Survey
BDM	Bird Damage Management
BO	Biological Opinion
CBC	Christmas Bird Count
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
EA	Environmental Assessment
ECOFRAM	Ecological Committee on FIFRA Risk Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESC	Enteric Septicemia of Catfish
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
FR	Federal Register
FY	Fiscal Year
GDNR	Georgia Department of Natural Resources
GDA	Georgia Department of Agriculture
HP	Highly Pathogenic
IPN	Infectious Pancreatic Necrosis
MA	Methyl Anthranilate
MOU	Memorandum of Understanding
MBTA	Migratory Bird Treaty Act
NAS	National Audubon Society
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NWRC	National Wildlife Research Center
PRDO	Public Resources Depredation Order
SOP	Standard Operating Procedure
SVC	Spring Viraemia of Carp
T&E	Threatened and Endangered
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
VHS	Viral Haemorrhagic Septicaemia
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 Georgia 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 double-crested cormorants (*Phalacrocorax auritus*), great blue herons (*Ardea herodias*), great egrets (*Ardea alba*), cattle egrets (*Bubulcus ibis*), black-crowned night herons (*Nycticorax nycticorax*), white ibis (*Eudocimus albus*), black vultures (*Coragyps atratus*), turkey vultures (*Cathartes aura*), northern harriers (*Circus cyaneus*), red-shouldered hawks (*Buteo lineatus*), red-tailed hawks (*Buteo jamaicensis*), laughing gulls (*Larus atricilla*), ring-billed gulls (*Larus delawarensis*), Eurasian collared-doves (*Streptopelia decaocto*), mourning doves (*Zenaida macroura*), American crows (*Corvus brachyrhynchos*), American robins (*Turdus migratorisus*), red-winged blackbirds (*Agelaius phoeniceus*), Eastern meadowlarks (*Sturnella magna*), common grackles (*Quiscalus quiscula*), boat-tailed grackles (*Quiscalus major*), and brown-headed cowbirds (*Molothrus ater*). Normally, individual wildlife damage management actions conducted by the WS program could be categorically excluded from further analysis under the National Environmental Policy Act (NEPA), in accordance with APHIS implementing regulations for evaluating actions under the NEPA (7 CFR 372.5(c), 60 FR 6000-6003).

The purpose of this Environmental Assessment (EA) is to evaluate activities conducted by WS to manage damage and threats to agricultural resources, property, natural resources, and threats to humans caused by those bird species. This EA will assist in determining if the proposed management of bird damage could have a significant impact on the human environment for both humans and other organisms, analyzes alternatives, coordinate efforts with other federal, state, and local agencies, informs the public, and to comply with the NEPA. This EA analyzes the potential effects of bird damage management when requested, as coordinated between WS, the United States Fish and Wildlife Service (USFWS), and the Georgia Department of Natural Resources (GDNR).

More specifically, 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 proposed activities, and 5) evaluate and determine if there are any potentially significant or cumulative adverse affects from the alternatives. The analyses contained in this EA are based on information derived from WS' Management Information System, published documents (Appendix A), interagency consultations, public involvement, the analyses in the USFWS Final Environmental Impact Statement (FEIS) for the management of double-crested cormorants (USFWS 2003), and the analyses in WS' programmatic FEIS[2] (USDA 1997) which will be incorporated into this document by reference.

The EA evaluates the need for action to manage damage associated with birds in the State, the potential issues associated with bird damage management, and the environmental consequences of conducting different alternatives to address the need for action and the identified issues. 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. Issues relating to cormorant damage management (USFWS 2003) were also considered during the development of the EA. The issues and alternatives associated with bird damage management were initially developed by WS in consultation

[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).

[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).

with the USFWS, the GDNR, and the Georgia Department of Agriculture (GDA). The USFWS has regulatory authority to manage populations of migratory bird species in the State. To assist with the identification of additional issues and alternatives to managing damage associated with birds in Georgia, the EA will be made available to the public for review and comment prior to 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 reduce threats to human safety. WS' programmatic Final Environmental Impact Statement summarizes the relationship of wildlife values and wildlife damage in this way (USDA 1997):

"*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 person or community toward 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. 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). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated and the need for damage management is derived from the specific threats to resources. Those species have no intent to do harm. They utilize habitats (*e.g.*, reproduce, walk, forage) where they can find a niche. If their activities result in lost economic value of resources or threaten human safety, people characterize this as damage. When damage exceeds or threatens to exceed an economic threshold and/or pose a threat to human safety, people seek assistance with resolving that damage or reducing those threats to human safety.

[3]After the development of the EA by WS and consulting agencies and after public involvement in identifying new issues and alternatives, WS 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 the NEPA and the Council of Environmental Quality regulations.

The need for action to manage damage and threats associated with birds in Georgia arises from requests for assistance[4] received by WS to reduce and prevent damage associated with birds from occurring to four major categories: agricultural resources, natural resources, property, and threats to human safety. WS has identified those bird species most likely to be responsible for causing damage to those four categories in the State based on previous requests for assistance and the assessment of the threats of bird strike hazards at airports in the State. Table 1.1 lists WS' technical assistance projects involving bird damage or threats of bird damage to those four major resource types in Georgia from the federal fiscal year[5] (FY) 2004 through FY 2009. Technical assistance is provided by WS to those requesting assistance with resolving damage or the threat of damage by providing information and recommendations on bird damage management activities that can be conducted by the requestor without WS' direct involvement in managing or preventing 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 birds in Georgia. Since FY 2004, WS has conducted 841 technical assistance projects in Georgia that addressed damage and threats associated with those bird species addressed in this evaluation. WS has conducted 644 technical assistance projects involving damage or threats of damage associated with turkey vultures and black vultures since FY 2004. Vultures often roost in mixed species flocks in large numbers. Fecal droppings often accumulate under areas where vultures 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. Damage can also occur to property from vultures pulling and tearing shingles, trim, and rubber material on buildings and vehicles.

Vultures can cause injuries and death to newborn lambs and calves during the birth of the animals. Vultures often attack the soft tissue areas of newborns as they are being expunged from the female. During the birthing process, newborns and mothers are vulnerable and often unable to prevent attacks by large groups of vultures. Vultures often attack the eyes and rectal area of newborns during delivery that results in serious injury to the lamb or calf which often leads to the death of the animal.

Table 1.1 – Technical assistance projects conducted by WS from FY 2004 through FY 2009

Species	Projects	Species	Projects
Double-crested cormorants	40	**American robin**	3
Cattle egrets	3	**Boat-tailed grackle**	4
Black vulture	303	**Blackbirds (mixed)**	37
Turkey vulture	170	**Red-tailed hawk**	27
Vultures (mixed)	171	**Red-shouldered hawk**	3
Laughing gull	2	**Great blue heron**	18
Ring-billed gull	8	**Great egret**	11
Mourning dove	11	**Egret/heron/ibis (mixed)**	19
American crow	9	**White ibis**	2
		TOTAL	**841**

Table 1.2 lists those bird species and the resource types that those bird species can cause damage to in Georgia. Many of the bird species can cause damage to or pose threats to a variety of resources. In Georgia, most requests for assistance received by WS are related to threats associated with those bird

[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.

species being struck by aircraft. Bird strikes can cause substantial damage to aircraft requiring costly repairs. In some cases, bird strikes can lead to the catastrophic failure of the aircraft which can threaten passenger safety.

Many of the species addressed in this assessment are gregarious species (*i.e.*, 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 birds are concentrated into large flocks such as migration periods and during winter months when food sources are limited. For some bird species, high concentrations of birds can be found during the breeding season where suitable nesting habitat exists, such as cormorants. The flocking behavior of many bird species during migration periods can pose increased risks when those species occur near or on airport properties. Aircraft striking multiple birds not only increases the damage to the aircraft but can also increase the risk that a catastrophic failure of the aircraft might occur, especially if multiple birds are ingested into aircraft engines.

Table 1.2 – Bird species that WS in Georgia routinely receives requests for assistance and the resource type damaged by those species

Species	Resource				Species	Resource			
	A	N	P	H		A	N	P	H
Double-crested Cormorant	X	X	X	X	**Laughing Gull**	X	X	X	X
Great Blue Heron	X	X	X	X	**Ring-billed Gull**	X	X	X	X
Great Egret	X	X	X	X	**Eurasian Collared-Dove**	X	X	X	X
Cattle Egret	X		X	X	**Mourning Dove**	X		X	X
Black-crowned Night Heron	X	X	X	X	**American Crow**	X	X	X	X
White Ibis	X	X	X	X	**American Robin**			X	X
Black Vulture	X		X	X	**Red-winged Blackbird**	X		X	X
Turkey Vulture	X		X	X	**Eastern Meadowlark**			X	X
Northern Harrier	X	X	X	X	**Common Grackle**	X	X	X	X
Red-shouldered Hawk	X		X	X	**Boat-tailed Grackle**	X		X	X
Red-tailed Hawk	X	X	X	X	**Brown-headed Cowbird**	X	X	X	X

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

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 Georgia that include agricultural resources, natural resources, property, and human safety. More specific information regarding bird damage to those main categories are discussed in the following subsections of the EA:

Need to Resolve Bird Damage to Agricultural Resources

According to the National Agricultural Statistics Service (NASS), agriculture is one of the leading industries in Georgia with over 10.1 million acres devoted to agricultural production with a market value of agricultural products sold estimated at $7.1 billion in 2007 (NASS 2009). The top two farm commodities for cash receipts were poultry and cattle and calves, which together, accounted for 75% of the cash receipts. Georgia's poultry industry ranks third in the United States in broiler production and thirteenth in egg production. The cattle inventory in Georgia in 2007 was 1.1 million head with an estimated 263,471 hogs (NASS 2009).

As shown in Table 1.2, many of the bird species addressed in this EA have been identified as causing or posing threats to agricultural resources in Georgia.

Damage to Aquaculture Resources

Damage to aquaculture resources occurs primarily from the economic losses associated with birds consuming fish and other commercially raised aquatic wildlife. Damage can also result from the death of fish and other aquatic wildlife from injury associated with bird predation as well as the threat of disease transmission from one impoundment to another or from one aquaculture facility to other facilities as birds move between sites. The principal species propagated in Georgia are catfish and trout (USDA 2009). In 2007, there were 86 commercial catfish operations in Georgia with nearly 1.4 million pounds of catfish sold (USDA 2009). There were also 15 commercial trout producing operations in the State during 2007 with nearly 900,000 pounds of trout sold (USDA 2009). Of those birds shown in Table 1.2 associated with damage to agriculture, of primary concern to aquaculture facilities in Georgia are the double-crested cormorant, herons, egrets, and to a lesser extent red-tailed hawks, crows, and common grackles.

Double-crested cormorants can feed heavily on fish being raised for human consumption, and on fish commercially raised for bait and restocking in Georgia (USFWS 2003). The frequency of occurrence of cormorants at a given aquaculture facility can be a function of many interacting factors, including: (1) size of the regional and local cormorant population; (2) the number, size, and distribution of aquaculture facilities; (3) the size distribution, density, health, and species composition of fish populations at facilities; (4) the number, size, and distribution of wetlands in the immediate area; (5) the size distribution, density, health, and species composition of free-ranging fish populations in the surrounding landscape; (6) the number, size, and distribution of suitable roosting habitat; and (7) the variety, intensity and distribution of local damage abatement activities. Cormorants are adept at seeking out the most favorable foraging and roosting sites. As a result, cormorants rarely are distributed evenly over a given region, but rather tend to be highly clumped or localized. Damage abatement activities can shift bird activities from one area to another; thereby, not eliminating predation but only reducing damage at one site while increasing damage at another location (Aderman and Hill 1995, Mott et al. 1998, Reinhold and Sloan 1999, Tobin et al. 2002). Thus, it is not uncommon for some aquaculture producers in a region to suffer little or no economic damage from cormorants, while others experience exceptionally high losses.

Price and Nickum (1995) concluded that the aquaculture industry has small profit margins so that even a small percentage reduction in the farm gate value due to predation is an economic issue. The magnitude of economic impacts that cormorants have on the aquaculture industry can vary and is dependent upon many different variables including, the value of the fish stock, number of depredating birds present, and the time of year the predation is taking place.

In addition to cormorants, great blue herons are also known to forage at aquaculture facilities (Parkhurst et al. 1987). During a survey of aquaculture facilities in the northeastern United States, 76% of respondents identified the great blue heron as the bird of highest concern from predation (Glahn et al. 1999*a*). Glahn et al. (1999*a*) found that 80% of the aquaculture facilities surveyed in the northeastern United States perceived birds as posing an economic threat due to predation which coincided with 81% of the facilities surveyed having birds present on aquaculture ponds. Great blue herons were found at 90% of the sites surveyed by Glahn et al. (1999*a*). Loss of trout in ponds with herons present ranged from 9.1% to 39.4% in Pennsylvania with an estimated loss in production ranging from $8,000 to nearly $66,000 (Glahn et al. 1999*b*). The stomach contents of great blue herons collected at trout producing facilities in the northeastern United States contained almost exclusively trout (Glahn et al. 1999*b*).

In addition to cormorants and herons, other bird species have also been identified as causing damage or posing threats to aquaculture facilities. In 1984, a survey of fish producing facilities identified 43 species of birds as foraging on fish at those facilities, including red-tailed hawks, American crows, common grackles, and brown-headed cowbirds (Parkhurst et al. 1987).

Predation at aquaculture facilities can also occur from American crows (Parkhurst et al. 1987, Parkhuarst et al. 1992). During a survey of ten fisheries in 1985 and 1986, American crows were observed at eight of the facilities in central Pennsylvania (Parkhurst et al. 1992). The mean size of trout captured by crows in one study was 22.5 centimeters with a range of 15.2 to 31.7 centimeters (Parkhurst et al. 1992). Crows consumed a mean of 11,651 trout per year per site from ten trout hatcheries in Pennsylvania in 1985 and 1986 (Parkhurst et al. 1992). Since crows selected for larger fish classes at fish facilities, Parkhurst et al. (1992) determined economic losses from foraging by crows led to a higher mean economic impacts at facilities compared to other avian foragers based on the value of larger fish classes.

Although primarily insectivorous during the breeding season and granivorous during migration periods (Peer and Bollinger 1997), common grackles have been identified as feeding on fish (Hamilton 1951, Beeton and Wells 1957, Darden 1974, Zottoli 1976, Whoriskey and Fitzgerald 1985, Parkhurst et al. 1992). During a study of aquaculture facilities in central Pennsylvania, Parkhurst et al. (1992) found grackles feeding on trout fry at nine of the ten facilities observed. The mean length of trout captured by grackles was 7.6 centimeters with a range of 6.0 to 7.9 centimeters. Once fish reached a mean size of 14 centimeters, grackles switch to alternative food sources at the facilities (Parkhurst et al. 1992). Among all predatory bird species observed during the study conducted by Parkhurst et al. (1992), grackles captured and removed the most fish per day per site which was estimated at 145,035 fish captured per year per site.

Also of concern to aquaculture facilities is the transmission of diseases by birds between impoundments and from facility to facility. Given the confinement of aquatic organisms inside impoundments at aquaculture facilities and the high densities of those organisms in the impoundments, the introduction of a disease can result in substantial economic losses since the entire impoundment is likely to become infected and result in extensive mortality. Although the actual transmission of diseases through transport by birds is difficult to document, birds have been documented as having the capability of spreading diseases through fecal droppings and possibly through other means such as on feathers, feet, and regurgitation.

Birds have been identified as a possible source of transmission of three fish viruses in Europe: Spring Viraemia of Carp (SVC), Viral Haemorrhagic Septicaemia (VHS), and Infectious Pancreatic Necrosis (IPN) (European Inland Fisheries Advisory Commission 1989). VHS and IPN are known to occur in North America (Price and Nickum 1995). SVC has also been documented to occur in North America (USDA 2003). Peters and Neukirch (1986) found the IPN virus in the fecal droppings of herons when the herons were fed IPN infected trout. Olesen and Vestergard Jorgensen (1982) found herons could transmit the VHS (Egtved virus) from beak to fish when the beaks of herons were contaminated with the virus. However, Eskildsen and Vestergaard Jorgensen (1973) found the Egtved virus did not pass through the digestive tracks into the fecal droppings of black-headed gulls (*Larus ridibundus*) when the virus was artificially inserted into the esophagus of the gulls.

Birds are also capable of passing bacterial pathogens through fecal droppings and on their feet (Price and Nickum 1995). The bacterial pathogen for the fish disease Enteric Septicemia of Catfish (ESC) has been found within the intestines and rectal areas of great blue herons and double-crested cormorants from aquaculture facilities in Mississippi (Taylor 1992). However, since ESC is considered endemic in the region, Taylor (1992) did not consider birds as a primary vector of the disease. Birds also pose as primary hosts to several cestodes, nematods, trematodes, and other parasites which can infect fish. Birds can also act as intermediate hosts of parasites that can infect fish after completing a portion of their life-cycle in crustaceans or mollusks (Price and Nickum 1995).

Although documentation that birds, primarily herons and cormorants, can pose as vectors of diseases known to infect fish, the rate of transmission is currently unknown and is likely very low. Since fish-eating birds are known to target fish that are diseased and less likely to escape predation at aquaculture

facilities (Price and Nickum 1995, Glahn et al. 2002) and given the mobility of birds to move from one impoundment or facility to another, the threat of disease transmission is a concern given the potential economic loss resulting from the extensive mortality of fish or other cultivated aquatic organisms if a disease outbreak occurs.

Damage and Threats to Livestock Operations

Damage to livestock operations can occur from several bird species in Georgia. Economic damage can occur from birds 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 birds can cause economic damage to livestock producers, such as a vulture or a group of vultures feeding on newborn cattle, most economic damage occurs from bird species 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. For some bird species, high concentrations of birds can be found during the breeding season where suitable nesting habitat exists, such as common grackles. Of primary concern to livestock feedlots and dairies in Georgia are red-winged blackbirds, grackles, cowbirds, and to a lesser extent crows. The flocking behavior of those species either from roosting and/or nesting behavior can lead to economic losses to agricultural producers from the consumption of livestock feed and from the increased risks associated with the transmission of diseases from fecal matter being deposited in feeding areas and in water used by livestock.

Economic damages associated with starlings and blackbirds feeding on livestock rations has been documented in France and Great Britain (Feare 1984), and in the United States (Besser et al. 1968, Dolbeer et al. 1978, Glahn 1983, Glahn and Otis 1986). Diet rations for cattle contain all of the nutrients and fiber that cattle need, and are so thoroughly mixed that cattle are unable to select any single component over others. Livestock feed and rations are often formulated to ensure proper health of the animal. Higher fiber roughage in livestock feed is often supplemented with corn, barley, and other grains to ensure weight gain and in the case of dairies, for dairy cattle to produce milk. Livestock are unable to select for certain ingredients in livestock feed while birds often can selectively choose to feed on the corn, barley, and other grains formulated in livestock feed. Livestock feed provided in open troughs are most vulnerable to feeding by birds. Birds often select for those components of feed that are most beneficial to the desired outcome of livestock. When large flocks of birds selectively forage for components in livestock feeds, the composition and the energy value of the feed can be altered which can negatively impact the health and production of livestock. The removal of this high energy source by birds, is believed to reduce milk yields, weight gains, and is economically critical (Feare 1984). Glahn and Otis (1986) reported that blackbird damage was also associated livestock feeding practices and roost locations.

The economic significance of feed losses to starlings and blackbirds has been demonstrated by Besser et al. (1968) who concluded that the value of losses in feedlots near Denver, Colorado was $84 per 1,000 birds in 1967. Williams (1983) estimated seasonal feed losses to five species of blackbirds (primarily brown-headed cowbirds) at one feedlot in south Texas at nearly 140 tons valued at $18,000.

In addition, large concentrations of birds feeding, roosting, and/or loafing at livestock operations increase risks of disease transmission from fecal matter being deposited in areas where livestock feed, water, and are housed. Birds feeding in open troughs on livestock feed leave fecal deposits which can be consumed by feeding livestock, fecal matter can also be deposited in sources of water for livestock which increases the likelihood of disease transmission, and can contaminate other surface areas where livestock can encounter fecal matter deposited by birds. Many bird species, especially those encountered at livestock

operations, are known to carry infectious diseases which can be excreted in fecal matter which not only poses a risk to individual livestock operations but can be a source of transmission to other livestock operations as birds move from one area to another.

Although birds are known to be carriers of diseases (vectors) that are transmissible to livestock, the rate that transmission occurs is unknown. Since many sources of disease transmission exist, identifying a specific source can be difficult. Birds are known to be vectors of disease which increases the threat of transmission when large numbers of birds are defecating and contacting surfaces and areas used by livestock. The rate of transmission is likely very low; however, the threat of transmission exists since birds are known vectors of many diseases transmittable to livestock.

Certain bird species are also known to prey upon livestock which can result in economic losses to livestock producers. Vultures are known to prey upon newly born calves and harass adult cattle, especially during the birthing process. The NASS reported livestock owners in the United States lost 8,600 head of cattle and calves from vultures in 2006 valued at $3.8 million (NASS 2006). Damage from vultures was primarily reported from black vultures (NASS 2006). Although turkey vultures are known to feed on livestock in mixed species flocks of vultures, livestock damages from vultures is generally restricted to the range of the black vulture. While both turkey vultures and black vultures have been documented harassing expectant cattle, WS in Georgia has documented calf predation by black vultures. Black vulture predation on livestock is distinctive. Lovell (1947, 1952) and Lowney (1999) reported black vultures killed pigs by pulling eyes out followed by attacks to the rectal area or directly attacking the rectal area. WS in Georgia has also documented reports of birthing cows being harassed and distressed by black vultures. During a difficult delivery, black vultures will peck at the half-expunged calf and kill it. Reports of calf depredation occur throughout Georgia but are not necessarily common. Many livestock producers do not leave birthing cows unattended.

Economic losses can also result from raptors, particularly red-tailed hawks, feeding on domestic fowl, such as chickens and waterfowl. Free-ranging fowl or fowl allowed to range outside of confinement for a period of time are particularly vulnerable to predation by raptors.

Damage to Agricultural Crops

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), but also consists of damage to fruits associated with feeding and fecal contamination. In 2007, cash receipts from vegetables and melons were estimated at $459 million in the State (NASS 2009). Commercial fruit and vegetable production occurs in the State and Georgia ranks highly amongst States in the annual production of those commodities. Damage to agricultural crops in Georgia occurs primarily from American crows, red-winged blackbirds, grackles, cowbirds, and to a lesser extent gulls and American robins.

Fruit and nut crops can be damaged by crows, robins, red-winged blackbirds, grackles, cowbirds, and American crows. Besser (1985) estimated bird damage to grapes, cherries, and blueberries exceed $1 million dollars annually in the United States. In 1972, Mott and Stone (1973) estimated that birds caused $1.6 to $2.1 million in damage to the blueberry industry in the United States, with starlings, robins, and grackles causing the most damage. Red-winged blackbirds, cowbirds, and crows are also known to cause damage to blueberries (Besser 1985). Damage to blueberries typically occurs from birds plucking and consuming the berry (Besser 1985). Approximately 41 million pounds of cultivated blueberries were utilized in Georgia during 2008 (USDA 2008).

Damage to apples occurs from beak punctures which makes the apples unmarketable (Besser 1985). Crows and robins 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). Georgia produced 12 million pounds of apples during 2008 (USDA 2008).

Bird damage to sweet corn can also result in economic losses to producers. Damage to sweet corn is often amplified since damage to sweet corn caused by birds makes the ear of corn unmarketable because the damage is unsightly to the consumer (Besser 1985). Large flocks of red-winged blackbird are responsible for most of the damage reported to sweet corn with damage also occurring from grackles (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. Birds will puncture the kernel to ingest the contents. Once punctured, the area of the ear damaged 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). In 2008, Georgia ranked third in the United States in the production of sweet corn (USDA 2008).

Damage can also occur to sprouting corn as birds pull out the sprout or dig the sprout up to feed on the seed kernel (Besser 1985). Damage to sprouting corn occurs primarily from grackles and crows but red-winged blackbirds are also known to cause damage to sprouting corn (Stone and Mott 1973). Damage to sprouting corn is likely localized and highest in areas where grackle breeding colonies exist in close proximately to agricultural fields planted with corn (Stone and Mott 1973, Rogers and Linehan 1977). Rogers and Linehan (1977) found grackles damaged two corn sprouts per minute on average when present at a field planted near a grackle breeding colony.

Need to Resolve Threats that Birds Pose to Human Safety

Several bird species listed in Table 1.2 can be closely associated with human habitation and often exhibit gregarious roosting behavior (roost in large numbers), such as vultures, crows, grackles, cowbirds, and red-winged blackbirds. The close association of those bird species with human activity can pose threats to human safety from disease transmission, threaten the safety of air passengers if birds are struck by aircraft, excessive droppings can be aesthetically displeasing, and aggressive behavior, primarily from raptors, can pose risks to human safety.

Threat of Disease Transmission

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 of zoonotic diseases in wild birds and on the risks to people from transmission of those diseases. 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 bird species 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 near areas where

fecal droppings accumulate express concerns for human health which is related to the potential for disease transmission. 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 the fungus *Histoplasma capsulatum* which causes the disease histoplasmosis in humans (Weeks and Stickley 1984). The disturbance of soil or fecal droppings under bird roosts where fecal droppings have accumulated can cause *H. capsulatum* to become airborne. Once airborne, the fungus could be inhaled by people in the area. For example, workers at an ethanol plant in eastern Nebraska became ill with histoplasmosis after breathing in fungus spores disturbed by construction in an area that had a starling roost (Mortality and Morbidity Weekly Report 2004). Ornithosis (*Chlamydia psittaci*) is another respiratory disease that can be contracted by humans, livestock, and pets that can be associated with accumulations of bird droppings. Pigeons are most commonly associated with the spread of Ornithosis to humans. Ornithosis is a virus that is spread through infected bird droppings when viral particles become airborne after infected bird droppings are disturbed. In most cases in which human health concerns are a major reason for requesting assistance, no actual cases of bird transmission of disease to humans have been proven to occur. Thus, it is the risk of disease transmission that is the primary reason for requesting assistance.

Research has shown that gulls carry various species of bacteria such as *Bacillus* spp., *Clostridium* spp., *Campylobacter* spp., *Escherichia coli*, *Listeria* spp., and *Salmonella* spp. (MacDonald and Brown 1974, Fenlon 1981, Butterfield et al. 1983, Monaghan et al. 1985, Norton 1986, Vauk-Hentzelt et al. 1987, Quessey and Messier 1992). Transmission of bacteria from gulls to humans is difficult to document; however, Reilley et al. (1981) and Monaghan et al. (1985) both suggested that gulls were the source of contamination for cases of human salmonellosis. Gulls can threaten the safety of municipal drinking water sources by potentially causing dangerously high levels of coliform bacteria from their fecal matter. Contamination of public water supplies by gull feces has been stated as the most plausible source for disease transmission in some cases (*e.g.*, Jones et al. 1978, Hatch 1996). Gull feces has also been implicated in accelerated nutrient loading of aquatic systems (Portnoy 1990), which could have serious implications for municipal drinking water sources.

Public health concerns often arise when gulls feed and loaf near fast food restaurants, and picnic facilities; deposit waste from landfills in urban areas and drinking water reservoirs; and contaminate industrial facility ventilation systems with feathers, nesting debris, and droppings. Gulls feeding on vegetable crops and livestock feed can potentially aid in the transmission of salmonella.

While transmission of diseases 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, Kassa et al. 2001). 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 birds may include testing of water for *coliform* bacteria, 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 to reduce risks. 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.

Situations in Georgia where the threat of disease transmission associated with birds might occur could be: exposure by residents to a bird roost which has been in a residential area for more than three years; accumulated droppings from roosting birds on structures at an industrial site where employees must work in areas of accumulation; birds nesting or loafing around a food court area of a recreational facility or other site where humans eat in close proximity to concentrated numbers of those birds; or birds depositing waste from landfills in urban, suburban, and other nearby areas.

Threat of Aircraft Striking Wildlife at Airports and Military Bases

In addition to threats of zoonotic diseases, birds also pose a threat to human safety from being struck by aircraft. Birds struck by aircraft, especially when ingested into engines, can lead to structural damage to the aircraft and can cause 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 2000, MacKinnon et al. 2001). Collisions between aircraft and wildlife are a concern throughout the world because wildlife strikes threaten passenger safety (Thorpe 1996), result in lost revenue, and repairs to aircraft can be costly (Linnell et al. 1996, Robinson 1996). Aircraft collisions with wildlife can also erode public confidence in the air transport industry as a whole (Conover et al. 1995). In several instances, wildlife-aircraft collisions in the United States have resulted in human fatalities. In 1995, an Air Force E-3B AWACS aircraft collided with a flock of Canada geese at Elmendorf Air Force Base, Alaska, killing all 24 passengers and crew. In addition, a $190 million plane was lost (Dolbeer 1997). The risk that birds pose to aircraft is well documented with the worst case reported in Boston in 1960 when 62 people were killed in the crash of an airliner which collided with a flock of European starlings (Terres 1980). From 1990 through 2008, a total of 1,326 birds have been reported as struck by aircraft in Georgia (Dolbeer et al. 2009).

Target bird species when in large flocks or flight lines entering or exiting a roost at or near airports or when present in large flocks foraging on or near an airport, present a safety threat to aviation. Vultures and raptors can also present a risk to aircraft because of their large body mass and slow-flying or soaring behavior. Vultures are considered to be the most hazardous bird for an aircraft to strike based on the frequency of strikes, effect on flight, and amount of damage caused by vultures throughout the country (Dolbeer et al. 2000).

From 1990-2008, 89,727 wildlife strikes have been reported to the Federal Aviation Administration (FAA). Birds were involved with nearly 97% of those reported strikes to civil aircraft in the United States (Dolbeer et al. 2009). This number is likely to be much greater since an estimated 80% of civil bird strikes go unreported (Cleary et al. 2005, Wright and Dolbeer 2005). In Georgia, nearly 98% of the reported aircraft strikes with wildlife have involved birds (Dolbeer et al. 2009). In Georgia, aircraft strikes with at least 64 species of birds have been reported (FAA 2009). Generally, bird collisions occur when aircraft are near the ground during take-off and approach to the runway. From 1990-2008, 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, 72% occurred less than 500 feet above ground level and approximately 92% occurred under 3,000 feet above ground level (Dolbeer et al. 2009).

Birds being struck by aircraft can cause substantial damage to aircraft. Bird strikes can cause catastrophic failure of aircraft systems (*e.g.*, ingesting birds into engines) which can cause the plane to become uncontrollable leading to crashes. Since 1988, more than 229 people worldwide have died in aircraft that have crashed after striking wildlife (Dolbeer and Wright 2008). A recent example occurred in Oklahoma where an aircraft struck American white pelicans (*Pelecanus erythrorhynchos*) causing the plane to crash killing all five people aboard (Dove et al. 2009).

Need to Resolve Bird Damage Occurring to Property

As shown in Table 1.2, all the bird species addressed in this assessment are known to cause damage to property in Georgia. Property damage can occur in a variety of ways and can result in costly repairs and clean-up. Of the technical assistance projects conducted in Georgia since FY 2004 that have involved bird species addressed in this assessment, nearly 64% have involved bird damage occurring to property.

Bird damage to property occurs through direct damage to structures, through roosting behavior, and through their nesting behavior. One example of direct damage to property occurs when vultures tear roofing shingles or pull out latex caulking around windows. Accumulations of fecal droppings can cause damage to buildings and statues. Direct damage can also result from birds that act aggressively toward their reflection in mirrors and windows which can scratch paint and siding. Aircraft striking birds can also cause substantial damage requiring costly repairs and aircraft downtime.

Gulls, doves, and raptors are three of the bird groups most frequently struck by aircraft in the United States. In the United States from 1990 through 2008, over 19% of the birds struck by aircraft involved gulls where identification of the species occurred, pigeons and doves comprised nearly 15% of the total reported strikes while raptors accounted for 13% of reported strikes. When struck, 28% of the reported gull strikes resulted in damage to the aircraft or had a negative effect on the flight while 28% of strikes involving raptors and 13% of strikes involving pigeons and doves resulted in damage (Dolbeer et al. 2009). Since 1990, over $40 million in damages to civil aircraft have been reported from strikes involving raptors (Dolbeer et al. 2009). In total, aircraft striking birds has resulted in over $308 million in reported damages to civil aircraft since 1990 in the United States (Dolbeer et al. 2009).

Damage to property associated with large concentrations of roosting birds occurs primarily from accumulations of droppings and feather debris. Many of the bird species addressed in this assessment are gregarious (*i.e.*, 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 birds are concentrated into large flocks such as migration periods and during winter months when food sources are limited. Birds that routinely roost and loaf in the same areas often leave large accumulations of droppings and feather debris which is aesthetically displeasing and can cause damage to property. The reoccurring presence of fecal droppings under bird roosts can lead to constant cleaning costs for property owners.

Gull attraction to landfills as a food source has been well documented (Mudge and Ferns 1982, Patton 1988, Belant et al. 1995, Gabrey 1997, Belant et al. 1998). Large numbers of gulls are attracted to and use landfills as feeding and loafing areas throughout North America. For example, in the northeastern United States, landfills often serve as foraging and loafing areas for gulls throughout the year, while attracting larger populations of gulls during migration periods (Bruleigh 1998). Landfills have even been suggested as contributing to the increase in gull populations (Verbeek 1977, Patton 1988, Belant and Dolbeer 1993). Bird conflicts associated with landfills include accumulation of feces on equipment and buildings, distraction of heavy machinery operators, and the potential for birds to transmit disease to workers on the site. The tendency for gulls to carry waste off site results in accumulation of feces and deposition of garbage on surrounding industrial and residential areas which creates a nuisance, as well as generates the potential for birds to transmit disease to neighboring residents.

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 the uric acid found in bird droppings. Electrical utility companies frequently have problems with birds and bird droppings causing power outages by shorting out transformers and substations. This has resulted in outage time for power companies and consumers. Damage can also occur from droppings entering into food items or contaminating surfaces used to prepare food items at manufacturing facilities and can introduce undesirable components into the materials used in manufacturing processes.

The nesting behavior of some bird species can also cause damage to property. Nesting material can be aesthetically displeasing and fecal droppings often accumulate near nests which can also be aesthetically displeasing. Many bird species are colonial nesters meaning they nest together in large numbers. Cormorants and many of the egret and heron species addressed in this assessment nest in large colonies.

Need for Bird Damage Occurring to Natural Resources

Birds can also negatively impact natural resources through habitat degradation, competition with other wildlife, and through direct depredation on natural resources. Habitat degradation occurs when large concentrations of birds in a localized area negatively impacts characteristics of the surrounding habitat that can adversely affect other wildlife species and can be aesthetically displeasing. Competition can occur when two species compete (usually to the detriment of one species) for available resources, such as food or nesting sites. Direct depredation occurs when predatory bird species feed on other wildlife species which can negatively influence those species' populations, especially when depredation occurs on threatened and endangered (T&E) species.

Habitat degradation in Georgia occurs primarily in areas where colonial waterbirds nest or where the gregarious roosting behavior of birds occurs. The degradation of habitat occurs from the continuous accumulation of fecal droppings under nesting colonies of birds or under areas where birds consistently roost. Over time, the accumulation of fecal droppings under areas where colonial waterbirds nest, such as cormorants and herons, can lead to the loss of vegetation due to the ammonium nitrogen found in the fecal droppings of birds. For example, ammonium toxicity from fecal droppings may be an important factor contributing to the declining presence of vegetation on some islands in the Great Lakes (Hebert et al. 2005). The combined activities of stripping leaves and branches for nesting material, the weight of nests of many colonial waterbirds breaking branches, and the accumulation of feces under areas where roosting and nesting occurs can lead to the death of surrounding vegetation within three to 10 years of areas being occupied by colonial waterbirds (Lewis 1929, Lemmon et al. 1994, Weseloh and Ewins 1994, Bédard et al. 1995, Weseloh and Collier 1995, Weseloh et al. 1995, Korfanty et al. 1999, Hebert et al. 2005). The establishment of cormorant colonies on islands in the Great Lakes can threaten the unique vegetative characteristic of many of those islands (Hebert et al. 2005). In some cases, the establishment of colonial waterbird nesting colonies on islands has led to the complete denuding of the island of vegetation. The removal of vegetation can lead to an increase in erosion of the island and can be aesthetically displeasing to recreational users.

Lewis (1929) considered the killing of trees by nesting cormorants to be very local and limited, with most trees having no commercial timber value. However, tree damage may be perceived as a problem if those trees are rare species, or aesthetically valued (Bédard et al. 1999, Hatch and Weseloh 1999). In addition to habitat degradation, nesting colonial waterbirds can adversely affect other wildlife species. Cormorants are known to displace other colonial nesting bird species such as black-crowned night herons, egrets, great blue herons, gulls, common terns (*Sterna hirundo*), and Caspian terns (*Sterna caspia*) through habitat degradation and nest site competition (USFWS 2003). Cuthbert et al. (2002) examined potential impacts of cormorants on great blue herons and black-crowned night herons in the Great Lakes and found that cormorants have not negatively influenced breeding distribution or productivity of either species at a regional scale, but did contribute to declines in heron presence and increases in site abandonment in certain site specific circumstances.

Cormorants can have a negative impact on vegetation that provides nesting habitat for other birds (Jarvie et al. 1999, Shieldcastle and Martin 1999) and wildlife, including State and federally-listed T&E species (Korfanty et al. 1999). Cuthbert et al. (2002) did find that cormorants have a negative effect on normal plant growth and survival on a localized level in the Great Lakes region. Wires and Cuthbert (2001) identified vegetation die off as an important threat to 66% of the colonial waterbird sites designated as conservation sites of priority in the Great Lakes of the United States. Of the 29 priority conservation sites reporting vegetation die off as a threat, Wires and Cuthbert (2001) reported cormorants were present at 23 of those sites. Based on survey information provided by Wires et al. (2001), biologists in the Great Lakes region reported cormorants as having an impact to herbaceous layers and trees where nesting occurred. Damage to trees was mainly caused by fecal deposits, and resulted in tree die off at breeding colonies and

roost sites. Impacts to the herbaceous layer of vegetation were also reported due to fecal deposition which can be reduced or eliminated from the colony site. In addition, survey respondents reported that the impacts to avian species from cormorants occurred primarily from habitat degradation and from competition for nest sites (Wires et al. 2001). Although loss of vegetation can have an adverse impact on many species, some colonial waterbirds such as pelicans and terns prefer sparsely vegetated substrates.

Large accumulations of fecal droppings under crow roosts 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).

Some species listed as threatened or endangered under the Endangered Species Act of 1973 (ESA) are preyed upon or otherwise adversely affected by certain bird species. Concentrations of gulls often impact the productivity and survivorship of rare or endangered colonial species such as terns (U.S. Department of the Interior 1996) and prey upon the eggs and chicks of colonial waterbirds. Colonial nesting gull species are also known to compete with other bird species for nest sites, such as terns and plovers.

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. 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 listed as an endangered species in the State by the GDNR. Although WS has not been requested previously to conduct bird damage management activities to reduce predation on T&E species, WS could be requested to provide assistance in the future.

Brood parasitism by brown-headed cowbirds has also become a concern for many wildlife professionals where those birds are plentiful. Inter-specific nest competition has been well documented in brown-headed cowbirds, which are known to parasitize the nests of at least 220 avian species (Lowther 1993).

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Actions Analyzed

This EA evaluates the need for bird 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 Georgia wherever such management is requested by a cooperator. This EA discusses the issues associated with conducting bird 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 Georgia. If WS enters into an agreement with a tribe for bird 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 would remain valid until WS, in consultation with the USFWS and the GDNR, 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 would be reviewed and supplemented pursuant to the NEPA. Review of the EA would 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 bird damage management activities conducted by WS in Georgia.

Site Specificity

This EA analyzes the potential impacts of bird damage management and addresses activities on all private and public lands in Georgia under MOU, cooperative service agreement, and in cooperation with the appropriate public land management agencies. It also addresses the impacts of bird 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 bird 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 bird 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 bird 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 bird damage and resulting management occurs, and are treated as such. The standard WS Decision Model (Slate et al. 1992, USDA 1997) would be the site-specific procedure for individual actions conducted by WS in Georgia.

The analyses in this EA are intended to apply to any action that may occur in any locale and at any time within Georgia. 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 bird damage management were initially developed by WS in consultation with the USFWS and the GDNR. 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 will be 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 birds in the State, and by posting the 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.

1.4 DECISIONS 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 is the responsibility of the USFWS. As the authority for the management of migratory bird populations, 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 take of migratory, native bird species can only occur pursuant to the Migratory Bird Treaty Act (MBTA) when authorized through the issuance of a depredation permit by the USFWS or under the authority of a depredation order established by the USFWS. The GDNR is responsible for managing wildlife in the State of Georgia, including birds. The GDNR establishes and enforces regulated hunting seasons in the State, including the establishment of seasons that allow the take of some of the bird species addressed in this assessment. For migratory birds, the GDNR can establish hunting seasons for those species under frameworks determined by the USFWS. WS' activities to reduce and/or prevent bird damage in the State would be coordinated with the USFWS and the GDNR which ensure WS' actions are incorporated into population objectives established by those agencies for bird populations in the State.

Based on the scope of this EA, the decisions to be made are: 1) should WS conduct bird 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 bird population when requested by the GDNR, the USFWS, and other entities, 3) should WS implement an integrated wildlife damage management strategy (proposed action), including technical assistance and direct operational assistance, to meet the need for bird damage management in Georgia, 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 this EA.

Double-crested Cormorant Management in the United States Final Environmental Impact Statement: The USFWS has prepared a FEIS on the management of double-crested cormorants in the United States (USFWS 2003). WS was a formal cooperating agency in the preparation of the FEIS and has adopted the FEIS to support WS' program decisions for its involvement in the management of cormorant damage. WS completed a Record of Decision (ROD) on November 18, 2003 (68 FR 68020). Pertinent and current information available in the FEIS have been incorporated by reference into this EA.

Extended Management of Double-crested Cormorants under 50 CFR 21.47 and 21.48 Final Environmental Assessment: The FEIS developed by the USFWS in cooperation with WS established a Public Resource Depredation Order (PRDO; 50 CFR 21.48) and made changes to the 1998 Aquaculture Depredation Order (AQDO; 50 CFR 21.47). To allow for an adaptive evaluation of activities conducted under the PRDO and the AQDO established by the FEIS, those Orders would have expired on April 30, 2009 (USFWS 2003). The EA determined that a five-year extension of the expiration date of the PRDO and the AQDO would not threaten cormorant populations and activities conducted under those Orders would not have a significant impact on the human environment (74 FR 15394-15398; USFWS 2009).

***Waterfowl Damage Management Environmental Assessment*:** WS prepared an environmental EA to evaluate potential impacts to the human environment from the implementation of a management program to address damage to agricultural resources, natural resources, property, and to reduce threats to human safety caused by waterfowl in Georgia. The EA evaluated the need for WS' activities and the relative effectiveness of four alternatives to meet that proposed need, while accounting for the potential environmental effects of those activities (USDA 2005). After consideration of the analysis contained in the EA and review of public comments, a Decision and Finding of No Significant Impact (FONSI) for the EA was issued on April 8, 2005. The Decision and FONSI selected the proposed action which implemented an integrated damage management program using multiple methods to adequately address the need to manage waterfowl damage.

***Pigeon, Starling, and House Sparrow Damage Management Environmental Assessment*:** The WS program in Georgia has also developed an EA to evaluate alternatives and issues related to the reduction of rock pigeon, European starling, and house sparrow damage to property, agricultural resources, natural resources, and threats to human safety in Georgia (USDA 2004). The EA evaluated the need for WS' activities and the relative effectiveness of four alternatives to meet that proposed need, while accounting for the potential environmental effects of those activities. After consideration of the analysis contained in the EA and review of public comments, a Decision and FONSI for the EA was issued on February 13, 2004. The Decision and FONSI selected the proposed action which implemented an integrated damage management program using multiple methods to adequately address the need to manage pigeon, starling, and house sparrow damage. Program activities involving pigeon, starling, and house sparrow damage management in Georgia conducted under the selected alternative were further evaluated and a new Decision and FONSI were signed on January 21, 2009.

Bird-Aircraft Strike Hazard (BASH) Program for Moody Air Force Base EA: The United States Department of Defense, United States Air Force, Moody Air Force Base, in cooperation with WS, developed an EA to evaluate the implementation of an expanded BASH program for Moody Air Force Base and lands surrounding the Base in Georgia (United States Air Force 2003). The EA evaluated expanding the current BASH program activities to address increasing threats associated with vultures and cattle egrets on and surrounding the Base. The Decision for the EA found the proposed action alternative in the EA would not significantly affect the human environment (United States Air Force 2003). The proposed action alternative evaluated using an integrated approach to managing threats associated with vultures and cattle egrets on and surrounding the Base.

Moody Air Force Base BASH Program EA: The United States Air Force has completed an EA and FONSI on the BASH program at Moody Air Force Base in Georgia (United States Air Force 2001). The EA evaluated alternatives for addressing wildlife hazards associated with aircraft striking wildlife at the Base. The Decision and FONSI selected the proposed action alternative of implementing an integrated approach, using a combination of legally available methods, to reduce threats of aircraft striking wildlife at the Base. Pertinent information available in the EA has been incorporated by reference into this EA.

Moody Air Force Base Pest Management Program EA: The United States Air Force has completed an EA and issued a FONSI on the pest management program at Moody Air Force Base (United States Air Force 2002). The EA includes information about bird species that may cause damage or pose threats of damage to the operation of Base. Pertinent information available in the EA has been incorporated by reference into this EA.

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 wildlife species that are listed as threatened or endangered under the 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 birds.

Georgia Department of Natural Resources, Wildlife Resources Division

The Georgia Department of Natural Resources' authority in wildlife management is given under Title 27, Chapters 1 - 5 of the Official Code of Georgia Annotated. The mission of the Wildlife Resources Division is to manage, protect, conserve, and enhance the wildlife and aquatic resources of Georgia for the sustainable benefit of the people of Georgia.

Georgia Department of Agriculture

The mission of the Georgia Department of Agriculture is to provide timely, fair and expert regulatory control over product, business entities, movement, and application of goods and services for which applicable State and Federal laws exist and strives to protect and provide service to Georgia consumers. Department personnel actively work to initiate and support economic development activities and promote domestic and international consumption of Georgia products. It is the Department's goal to be recognized for its employee's integrity and professional performance. The Pesticide Division enforces state laws pertaining to the use and application of pesticides.

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 makes it unlawful to pursue, hunt, take, capture, kill, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or their parts, nests, or eggs (16 U.S.C 703-711). A list of bird species protected under the MBTA can be found in 50 CFR 10.13. The MBTA also 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. Information regarding migratory bird permits can be found in 50 CFR 13 and 50 CFR 21. All actions conducted in this EA would 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 red-winged blackbirds, common grackles, boat-tailed grackles, brown-headed cowbirds, and American 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.

Depredation Order for Double-Crested Cormorants at Aquaculture Facilities (50 CFR §21.47)

The AQDO was established to reduce cormorant depredation of aquacultural stock at private fish farms and state and federal fish hatcheries. Under the AQDO, double-crested cormorants can be lethally at

commercial freshwater aquaculture facilities and state and federal fish hatcheries in 13 States, including Georgia. The Order authorizes landowners, operators, and tenants, or their employees/agents, that are actually engaged in the production of aquacultural commodities to lethally take cormorants causing or about to cause damage at those facilities without the need for a depredation permit. Those activities can only occur during daylight hours and only within the boundaries of the aquaculture facility. The AQDO also authorizes WS to take double-crested cormorants at roost sites near aquaculture facilities at any time from October through April without the need for a depredation permit with appropriate landowner permissions.

Depredation Order for Double-crested Cormorants to Protect Public Resources (50 CFR §21.48)

The purpose of the PRDO is to reduce the actual occurrence, and/or minimize the risk, of adverse impacts of double-crested cormorants to public resources. Public resources, as defined by the PRDO, are natural resources managed and conserved by public agencies. Public resources include fish (free-swimming fish and stocked fish at federal, State, and tribal hatcheries that are intended for release in public waters), wildlife, plants, and their habitats. The Order authorizes WS, state fish and wildlife agencies, and federally-recognized Tribes to conduct damage management activities involving double-crested cormorants without the need for a depredation permit from the USFWS in 24 states, including Georgia. It authorizes the take of cormorants on "*all lands and freshwaters*" including public and private lands. However, landowner/manager permission must be obtained before cormorant damage management activities may be conducted at any site.

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 Georgia in regards to bird damage management activities proposed which will be discussed in Chapter 4 of this EA.

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 Executive Order and is currently waiting for USFWS approval. WS will abide by the MOU once it is finalized and signed by both parties.

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 bird 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 the selected alternative.

Invasive Species - Executive Order 13112

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

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 bird 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.

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 Georgia, including the use of or recommendation of repellents are registered with and regulated by the EPA and the GDA, 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.

Occupational Safety and Health Act of 1970

The Occupational Safety and Health Act of 1970 and its implementing regulations (29 CFR 1910) on sanitation standards states that, "*Every enclosed workplace shall be so constructed, equipped, and maintained, so far as reasonably practical, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected*." This standard includes birds that may cause safety and health concerns at workplaces.

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 minimization 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, bird damage management activities could be conducted on federal, state, tribal, municipal, and private properties in Georgia. 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 birds may roost, loaf, feed, nest, or otherwise occur. Examples of areas where bird 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, military bases, 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 would 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 USFWS and the State.

Wildlife species, such as most native species are protected under state or federal law. For some bird species, take during the hunting season is regulated pursuant to the MBTA by the USFWS through the issuance of frameworks, that includes the allowable length of hunting seasons, methods of take, and allowed take which are implemented by the GDNR. Under the blackbird depredation order (50 CFR 21.43), blackbirds can be taken by any entity without a depredation permit when those species identified in the Order are found committing or about to commit damage or posing a human safety threat. Similarly, double-crested cormorants can be lethally taken under the AQDO and the PRDO without the need for a permit by those entities authorized. Pursuant to the MBTA, the USFWS can issue depredation permits to those entities experiencing damage associated with birds, when deemed appropriate. When a non-federal entity (*e.g.*, agricultural producers, health agencies, municipalities, counties, private companies, individuals, or any other non-federal entity) takes a bird damage management action, the action is not subject to compliance with the NEPA due to the lack of federal involvement[6] 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 birds will occur and even the particular methods that will be used,

[6]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.

WS' involvement in the action would not affect the environmental status quo if the requestor would have conducted the action in the absence of WS' involvement since take can occur either during hunting seasons, under depredation orders, or through the issuance of depredation permits. In addition most methods available for use by WS are also available for use by other entities; therefore, most methods available to alleviate damage associated with birds can be employed by those entities experiencing damage or threats despite WS' lack of involvement in the activity. 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 either during the hunting season, under depredation orders, or through the issuance of a depredation permit. Under those 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 regulated harvest season, under depredation orders, or under depredation permits and has already made the decision to remove or otherwise manage birds to stop damage with or without WS' assistance, WS' participation in carrying out the action would not affect the environmental status quo.

In some situations, however, certain aspects of the human environment may actually benefit more from WS' involvement than from a decision not to assist. For example, WS could have greater expertise to selectively remove birds than a non-WS entity; WS' management activities may have less of an impact on target and non-target species than if the non-federal entity conducted the action alone. The concern arises from those persons implementing damage management activities having no prior experience with managing damage or threats associated with birds. The lack of experience in bird 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 and preventing damage to resources and to reduce threats to human safety caused by wildlife, including birds in Georgia. 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' programmatic FEIS which analyzed specific data relevant to WS' programmatic activities at the time of preparation. Those issues identified in the cormorant management FEIS (USFWS 2003) developed by the USFWS, in cooperation with WS, were also reviewed and considered during the development of this EA. Issues related to managing damage associated with birds in Georgia were developed by WS in consultation with the USFWS and the GDNR. The EA will also be made available to the public for review and comment to identify additional issues.

The issues as they 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 of Damage Management Activities on Target Bird Populations

A common issue when addressing damage caused by wildlife are the potential impacts of management actions on the populations 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 that are causing damage which reduces the presence of those species at the site and potentially the immediate area around the site where non-lethal methods are employed. Lethal methods would be employed to remove a bird or those birds responsible for causing damage or posing threats to human safety. The use of lethal methods would therefore result in local population reductions in the area where damage or threats were occurring. The number of target species removed from the population using lethal methods under the alternatives would be dependent on the number of requests for assistance received, the number of individuals involved with the associated damage or threat, and the efficacy of methods employed.

Bird species specifically addressed in this EA include double-crested cormorants, great blue herons, great egrets, cattle egrets, black-crowned night herons, white ibis, black vultures, turkey vultures, northern harriers, red-shouldered hawks, red-tailed hawks, laughing gulls, ring-billed gulls, Eurasian collared-doves, mourning doves, American crows, American robins, red-winged blackbirds, Eastern meadowlarks, common grackles, boat-tailed grackles, and brown-headed cowbirds.

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 of birds by WS would occur at the requests of a cooperator seeking assistance and only after a depredation permit has been issued by the USFWS for the take of the bird species causing damage. In the case of blackbirds, including crows, and cormorants, lethal take would occur pursuant to the depredation orders for those species without the need for a depredation permit when the criteria of those orders have been met but lethal methods would only be used when requested by the cooperator seeking assistance. In addition, Eurasian collared-doves are not afforded protection from take under the MBTA and therefore, take to alleviate damage or the threat of damage can occur without the need for a depredation permit.

WS' proposed action alternative discussed in chapter 3 of this EA incorporates an adaptive approach to resolve damage and reduce threats to human safety by targeting a bird or groups of birds 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 bird populations in Georgia from implementation of the identified alternatives, including the proposed action, are analyzed in Chapter 4.

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 derived from data collected during the BBS. Under established guidelines, observers count birds at survey points along roadways for a set duration along a pre-determined route. Routes are 24.5 miles long and are surveyed once per year with the observer stopping every 0.5 miles along the route to conduct the survey. The numbers of birds observed and heard within 0.25 miles of each of the survey points are recorded during a 3-minute sampling period at each point. Surveys were started in 1966 and are conducted in June which is generally considered as the period of time when those birds present at a location are likely breeding in the immediate area. The BBS is 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 United States 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 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 data reported by Sauer et al. (2008) from the BBS has a statistical level of significance set at $P<0.05$.

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 over time. 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 do 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 GDNR. Those species addressed in this EA that have established hunting seasons include American crows and mourning doves. Eurasian collared-doves could also be taken during the regulated hunting season for mourning doves given the similarity in appearance between the two species. However, Eurasian collared-doves are not afforded protection from take under the MBTA and are considered a non-native species in Georgia.

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 GDNR in published reports.

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 would 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 considered for use to manage damage or threat associated with birds includes the avicide DRC-1339, Avitrol, mesurol, and repellents. Chemical methods being considered for use to manage damage and threats associated with birds in Georgia are further discussed in Appendix B.

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 - Effects of Damage Management Methods[7] 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 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 to disperse birds from an area or discourage birds from feeding on desired resources. Avitrol is an avian repellent available for use to manage damage associated with some bird species. Other repellents are also available with the most common ingredients being polybutene, anthraquinone, 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 GDA, and by WS Directives[8]. WS' use of chemical methods is also 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 birds, 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; thereby, making the cooperator aware of the use of those methods on property they own or manage to identify any risks to human safety associated with the use of those methods. Many of the non-chemical methods are only activated when triggered by attending personnel (*e.g.*, cannon nets, firearms, pyrotechnics, lasers), are passive live-capture methods (*e.g.*, walk-in style

[7]A complete list of chemical and non-chemical methods available for use under the identified alternatives, except the alternative with no damage management (Alternative 3), 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.
[8]At the time of preparation, WS' Directives could be found at the following web address: http://www.aphis.usda.gov/wildlife_damage/ws_directives.shtml.

live-traps, mist nets), or are passive harassment methods (*e.g.*, effigies, exclusion, anti-perching devices, electronic distress calls).

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 bird populations were addressed previously. The low risk of disease transmission from birds 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 which 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 4 - Effects on the Aesthetic Values of Birds

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. Some people may consider individual wild animals and birds as "*pets*" or exhibit affection toward those 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 or photographing the animal in nature) (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 lethal 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. Those human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

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

Issue 5 - 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 "[f]*or 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 birds 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 measures and SOPs to alleviate pain and suffering are discussed in Chapter 3.

Issue 6 – Effects of Bird Damage Management Activities on the Regulated Harvest of Birds

Another issue commonly identified is a concern that bird damage management activities conducted by WS would affect the ability of persons to harvest crows and mourning doves 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 those birds species are used to reduce bird densities through dispersal in damage management areas. Similarly, lethal methods used to reduce damage associated with those birds could lower densities in areas where damage is occurring resulting in a reduction in the availability of those species 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 area where damage was occurring which could serve to move those bird species from those less accessible areas to places accessible to hunters.

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

Additional issues were also identified by WS, the GDNR, and the USFWS during the scoping process of this EA that were considered but will not receive 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 Georgia 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 an 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 the destruction of wild animal populations over broad areas at a much more intensive level than would be desired by most people, including WS and other agencies. Such broad scale population management would also be impractical or impossible to achieve within WS' policies and professional philosophies.

Lead agencies have the discretion to determine the geographic scope of their analyses under the NEPA (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 birds in the State to analyze individual and cumulative impacts and to provide a thorough analysis.

In terms of considering cumulative effects, one EA analyzing impacts for the entire State would 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 could potentially have a significant impact on the quality of the human environment, then an EIS would be prepared. Based on previous requests for assistance, the WS program in Georgia would continue to conducted bird 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 Georgia and only targets those birds identified as causing damage or posing a threat. Therefore, bird damage management would 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 bird 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 birds would be funded through cooperative service agreements with individual property owners or associations. A minimal federal appropriation is allotted for the maintenance of a WS program in Georgia. The remainder of the WS program is entirely fee-based. Technical assistance is provided to requesters as part of the federally-funded activities, but all direct

assistance in which WS' employees perform damage management activities is funded through cooperative service agreements between the requester and WS.

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 birds and that prove to be the most cost effective would receive the greatest application. As part of an integrated approach, evaluation of methods would continually occur to allow for those methods that are most effective at resolving damage or threats to be employed under similar circumstance where birds 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 minimize 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. 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 birds are likely to return to the area, either after removal occurs or the following year when birds return to the area which creates a financial incentive to continue the use of only lethal methods. This assumes birds 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 birds returning to an area where damage was occurring once those methods are no longer used. The common factor when employing any method is that birds would

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

return if suitable conditions continue to exist at the location where damage was occurring and bird 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 would be temporary if habitat conditions continue to exist that attract birds to an area where damage occurs.

Therefore, any method that disperses or removes birds from areas would only be temporary if habitat containing preferred habitat characteristics continues to exist the following year when other birds return. Dispersing birds using non-lethal methods addressed in Appendix B often requires repeated application to discourage birds from returning to a location which increases costs, moves birds to other areas where they could cause damage, and are temporary if habitat conditions at the site where damage was occurring remain unchanged. Dispersing and the relocating of birds could be viewed as moving a problem from one area to another which would require addressing damage caused by those birds at another location which increases costs and could be perceived as creating a financial incentive to continue the use of those methods since birds would have to be addressed annually and at multiple locations. WS' recommendation of or use of techniques to modify existing habitat or making areas unattractive to birds 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 bird damage that is agreed upon by the cooperator.

Managing damage caused by birds 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 birds to limit use of an area where damage or threats were occurring. Short-term redistribution approaches may include prohibiting feeding, the use of 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 birds, and habitat modification are considered long-term solutions to managing damage caused by birds (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 locations when birds are present and must be repeated every day 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 first year 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 birds to 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*a*) demonstrated that an

integrated approach (including removal of 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 would 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 would 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.

Impacts of Avian Influenza (AI) on Bird Populations

AI is caused by a virus in the Orthomyxovirus group. Viruses in this group vary in the intensity of illness they may cause (virulence). Wild birds, in particular waterfowl and shorebirds, are considered to be the natural reservoirs for AI (Clark and Hall 2006). Most strains of AI rarely cause severe illness or death in birds although the H5 and H7 strains tend to be highly virulent and very contagious. However, even the strains which do not cause severe illness in birds are a concern for human and animal health officials because the viruses have the potential to become virulent and transmissible to other species through mutation and reassortment (Clark and Hall 2006).

Recently, the occurrence of highly pathogenic (HP) H5N1 AI virus has raised concern regarding the potential impact on wild birds, domestic poultry, and human health should it be introduced into the United States. It is thought that a change occurred in a low pathogenicity AI virus of wild birds, allowing the virus to infect chickens, followed by further change into the HP H5N1 AI. HP H5N1 AI has been circulating in Asian poultry and fowl resulting in death to those species. HP H5N1 AI likely underwent further change allowing infection in additional species of birds and mammals, including humans. More recently, this virus moved back into wild birds resulting in mortality of some species of waterfowl, and other birds. This is only the second time in history that highly pathogenic form of AI has been recorded in wild birds. Numerous potential routes for introduction of the virus into the United States exist including: illegal movement of domestic or wild birds, contaminated products, infected travelers, and the migration of infected wild birds. WS has been one of several agencies and organizations conducting surveillance for AI virus in migrating birds. The nationwide surveillance effort has detected some instances of low pathogenic AI viruses, as was expected given that waterfowl and shorebirds are considered to be the natural reservoirs for AI. Tens of thousands of birds have been tested, but there has been no evidence of the HP H5N1 virus in North America.

Bird Damage Should Be Managed By Private Nuisance Wildlife Control Agents

Private nuisance wildlife control agents could be contacted to reduce bird damage for property owners when deemed appropriate by the resource owner. 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 could 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 would only use non-toxic shot as defined in 50 CFR 20.21(j) when using shotguns to take all birds.

The take of birds by WS in the State occurs primarily from the use of shotguns. However, the use of rifles could be employed to lethally take some species. 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 would 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 would greatly reduce the risk of scavengers ingesting or being exposed to lead.

However, deposition of lead into soil could occur if, during the use of a rifle, the projectile passes 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*" at a shooting range, 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 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.

WS' assistance with removing birds would not be additive to the environmental status quo since those birds 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 bird 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 would 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 Bird 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, effigies, and electronic distress calls (Booth 1994, Avery et al. 2008, Chipman et al. 2008). A similar continuing conflict can develop when habitat alteration is used to disperse a bird roost. This concern is heightened in large metropolitan areas where the likelihood of birds dispersed from a 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 bird roost creating the conflict problem.

In urban areas, WS often works with the community or municipal leaders to address bird damage involving large bird 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 bird damage management activities involving urban bird roosts, funding is often provided by the municipality where the roost is located which allows for bird damage management activities to occur within city limits where bird 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 bird 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 Bird 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, are

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 would 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.

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 bird damage management in Georgia 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 - Continuing the Current Integrated Approach to Managing Bird 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 birds in Georgia. A major goal of the program would be to resolve and prevent bird damages and to reduce threats to human safety. To meet this goal, WS, in consultation the USFWS, the GDNR, and the GDA, 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 birds 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 would work with those persons experiencing bird damage in addressing those birds responsible for causing damage as expeditiously as possible. To be most effective, damage management activities should begin as soon as birds begin to cause damage. Bird damage that has been ongoing can be difficult to resolve using available methods since birds are conditioned to feed, roost, loaf, and are familiar with a particular location. Subsequently, making that area unattractive through the use of available methods can be difficult to achieve once damage has been ongoing. WS would 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, nest/egg destruction, 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, DRC-1339, and shooting. Euthanasia of live-captured birds would occur through the use of cervical dislocation or carbon dioxide once birds 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). The use of firearms could also be used to euthanize birds live-captured and is considered a conditionally acceptable method for wildlife (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 to managing bird damage would include limited 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 birds causing damage thereby, reducing the presence of birds 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 birds from the area resulting in a reduction in the presence of those birds at the site where those methods were employed. The use of non-lethal methods in an integrated approach has proved effective in dispersing birds. Non-lethal methods have been effective in dispersing crow roosts (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). Chipman et al. (2008) found the use of only non-lethal methods to disperse urban crow roosts often requires a long-term commitment of affected parties, including financial commitments, to achieve and maintain the desired result of reducing damage. 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 the habituation of birds to 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 those birds causing damage. Employing methods soon after damage begins or soon after threats are identified increases the likelihood that those damage management activities would achieve success in addressing damage. Therefore, coordination and timing of methods is necessary to be effective in achieving expedient resolution of bird damage.

Lethal methods would be employed to resolve damage associated with those birds 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

[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".*

efficacy of methods employed. Under the proposed action, the lethal methods being considered are the use of the avicide DRC-1339, shooting with firearms, the live-capture of birds that are subsequently euthanized, and the recommendation of hunting as a population management tool.

Most lethal methods are intended to reduce the number of birds present at a location since a reduction in the number of birds at a location leads to a reduction in damage which is applicable whether using lethal or non-lethal methods. The use of lethal methods has been successful in reducing bird damage (Boyd and Hall 1987, Gorenzel et al. 2000). The intent of non-lethal methods is to harass, exclude, or otherwise make an area unattractive to birds which disperses those birds to other areas which leads to a reduction in damage at the location where those birds 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 birds 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 birds using a location (similar to dispersing birds), the use of a firearm is most often used to supplement and reinforce the noise associated with non-lethal methods. The capture of birds using live-traps and subsequently euthanizing those birds is employed to reduce the number of birds using a particular area where damage is occurring. Similarly, the recommendation that birds be harvested during the regulated hunting season for those species in the State is intended to manage those 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 bird 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 birds 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) which would also occur if lethal methods were employed. Similarly, the use of DRC-1339 is intended to reduce the number of birds using a location. Hall and Boyd (1987) found the use of DRC-1339 to reduce local crow 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 birds that are lethally taken would only be replaced by other birds either during the application of those methods (either from other birds that immigrate or emigrate into the area) or by birds 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 indicate 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.

Most lethal and non-lethal methods currently available provide only short-term benefits when addressing bird damage. Those methods are intended to reduce damage occurring at the time those methods are employed but do not necessarily ensure birds would not return once those methods are discontinued or the following year when birds return to an area. Long-term solutions to resolving bird 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 bird damage, long-term solutions generally involve modifying existing habitat or making conditions to be less attractive to birds. To ensure complete success, alternative sites in areas where damage is not likely to occur are often times required to achieve complete success in reducing damage and avoid moving the problem from one area to another. Modifying a site to be less attractive to birds would likely result in the dispersal of those birds to other areas where damage could occur or could result in multiple occurrences of damage situations.

WS may recommend birds be harvested during the regulated hunting season for those species in an attempt to reduce the number of birds causing damage. Managing bird populations over broad areas could lead to a decrease in the number of birds causing damage. Establishing hunting seasons and the allowed take during those seasons is the responsibility of the GDNR 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 birds.

Technical Assistance Recommendations

Under the proposed action, WS would provide technical assistance to those persons requesting bird damage management as part of an integrated approach to managing damage. Technical assistance would occur as described in Alternative 2 of this EA. Technical assistance is also 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.

Between FY 2004 and FY 2009, WS has conducted 841 technical assistance projects in Georgia associated with birds addressed in this assessment that involved 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 also 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 Georgia 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 birds 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 bird 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. 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 birds 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 bird damage management activities. This process allows decisions on bird damage management activities to be made based on local input.

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/or 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 would 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

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. 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.

Alternative 2 - Bird 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 birds with technical assistance only. Technical assistance would provide those cooperators experiencing damage or threats associated with birds 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; those 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 persons experiencing damage or threats associated with birds in the State except for DRC-1339 and mesurol which are only available to WS.

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 bird damage as permitted by federal, state, and local laws and regulations or those persons could take no action.

Alternative 3 – No Bird 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 bird damage management in the State. All requests for assistance received by WS to resolve damage caused by birds would be referred to the USFWS, the GDNR, and/or private entities.

Despite no involvement by WS in resolving damage and threats associated with birds in the State, those persons experiencing damage caused by birds could continue to resolve damage by employing those

methods legally available since the take of birds can occur either through the issuance of depredation permits by the USFWS, take during the hunting seasons for crows and doves, blackbirds can be taken at any time when found committing or about to commit damage or posing a human safety threat without the need for a depredation permit, cormorants can be taken pursuant to the PRDO and AQDO, and non-native bird species can be taken without the need for a depredation permit issued by the USFWS. All methods described in Appendix B would be available for use by those experiencing damage or threats except for the use of DRC-1339 for blackbirds and gulls along with mesurol for crows which can only be used by WS. The only formulation of DRC-1339 registered in the State at the time this EA was developed was the DRC-1339 formulation to manage blackbird damage at feedlots (EPA Reg. No. 56228-10). Mesurol was not registered for use in the State at the time this EA was developed.

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 birds 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 bird damage.

Those persons 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 (Alternative 1) 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 Non-lethal Methods Only by WS

Under this alternative, WS would be required to implement non-lethal methods only to resolve damage caused by birds in Georgia. Only those methods discussed in Appendix B that are considered non-lethal would be employed by WS. No lethal take of birds would occur by WS. The use of lethal methods could continue to be used under this alternative by those persons experiencing damage by birds. 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 birds across large areas. The non-lethal methods used or recommended by WS under this alternative would be identical to those identified in any of the alternatives.

In situations where non-lethal methods were impractical or ineffective to alleviate damages, WS would refer requests for information regarding lethal information to the GDNR, the 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' non-lethal 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 bird 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.

The proposed action, using an integrated damage management approach, incorporates the use of non-lethal methods when addressing requests for assistance. In those instances where non-lethal methods would effectively resolve damage from birds those methods would be used or recommended under the proposed action. Since non-lethal methods would be available for use under the alternatives analyzed in detail, this alternative would not add to the analyses.

Use of Lethal Methods Only by WS

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 bird damage. For example, the use of non-lethal methods has been effective in dispersing urban crow roosts (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 Translocate Birds 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 translocated. Translocation sites would be identified and have to be approved by the USFWS, the GDNR, and/or the property owner where the translocated birds would be placed prior to live-capture and translocation. Live-capture and translocation could be conducted as part of the alternatives analyzed in detail. However, the translocation of wildlife could only occur under the authority of the USFWS and/or GDNR. Therefore, the translocation of birds by WS would only occur as directed by those agencies. When requested by the USFWS and/or the GDNR, WS could translocate birds under any of the alternatives analyzed in detail. Since WS does not have the authority to translocate birds in the State unless permitted by the USFWS and/or the GDNR, this alternative was not considered in detail since translocation of birds could occur under any of the alternatives analyzed in detail.

Translocation of damaging birds to other areas following live-capture generally would not be effective or cost-effective. Translocation 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 translocation would most likely result in bird damage problems at the new location. Also, hundreds or thousands of birds would need to be captured and relocated to solve some damage problems; therefore, translocation would be unrealistic. Translocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of stress to the translocated animal, poor survival rates, and difficulties in adapting to new locations or habitats (Nielsen 1988).

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 most bird 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 most bird populations, this alternative was not evaluated in detail. If a reproductive inhibits becomes available to manage a large number of bird populations and has proven effective in reducing bird 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. Currently, the only reproductive inhibitors that are registered with the EPA are nicarbazin which is registered for use on Canada geese and pigeons. However, the only reproductive inhibitor available in Georgia currently is nicarbazin to manage pigeon populations.

Compensation for Bird Damage

The compensation alternative would require WS to establish a system to reimburse persons impacted by bird damage. Under such an alternative, WS would continue to provide technical assistance to those persons seeking assistance with managing damage. In addition, WS would conduct site visits to verify damage. Analysis of this alternative in WS' programmatic FEIS indicated that a compensation only alternative had many drawbacks (USDA 1997). 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 MEASURES AND SOPs FOR BIRD DAMAGE MANAGEMENT

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 Georgia, uses many such minimization measures which are discussed in detail in Chapter 5 of WS' programmatic FEIS (USDA 1997). Those minimization measures would be incorporated into activities conducted by WS when addressing bird 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 affects occur 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 would 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.

- 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 bird damage.

- WS employs methods and conducts activities for which the risk of hazards to public safety and hazard to the environment have been determined to be low according to a formal risk assessment (USDA 1997). Where such activities are conducted on private lands or other lands of restricted public access, the risk of hazards to the public is even further reduced.

3.4 ADDITIONAL MINIMIZATION MEASURES SPECIFIC TO THE ISSUES

Issue 1 - Effects of Damage Management Activities on Target Bird Populations

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

- WS would 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, would be used to determine bird damage management strategies.

- WS would annually monitor bird damage management activities to ensure activities do not adversely affect bird 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 would occur prior to application.

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

- WS' personnel would use bait, 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 would be released whenever it is possible and safe to do so.

- Carcasses of birds retrieved after damage management activities have been conducted would be disposed of in accordance with WS Directive 2.515.

- Personnel would 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 birds to the extent possible following treatment with DRC-1339.

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

- WS would 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 - Effects of Damage Management Methods on Human Health and Safety

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

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

- All personnel employing chemical methods would be properly trained and certified in the use of those chemicals. All chemicals used by WS would 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 2.401.

- All chemical methods used by WS or recommended by WS would be registered with the EPA and the GDA.

- Carcasses of birds retrieved after damage management activities would be disposed of in accordance with WS Directive 2.515.

Issue 4 - Effects on the Aesthetic Values of Birds

- Management actions to reduce or prevent damage caused by birds 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 under WS Directive 2.101. 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 - Humaneness and Animal Welfare Concerns of Methods

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

- WS' use of euthanasia methods would comply with WS Directive 2.505.

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

Issue 6 – Effects of Bird Damage Management Activities on the Regulated Harvest of Birds

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

- Damage management activities would only occur after a request for assistance is received by WS.

- WS' activities to manage damage and threats caused by birds would be coordinated with the USFWS and the GDNR.

- WS' lethal take (killing) of birds would be reported to and monitored by the USFWS and/or the GDNR to ensure WS' take is considered as part of management objectives for those bird species in the State.

- WS would annually monitor bird damage management activities to ensure activities do not adversely affect bird 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 as those alternatives relate 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. Those resources will not be analyzed further. The activities proposed in the alternatives would have a negligible effect on atmospheric conditions including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur as a result of any of the proposed alternatives. Those alternatives would meet the requirements of applicable laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

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 GDNR, the USFWS, and the GDA.

Issue 1 - Effects of Damage Management Activities on Target Bird Populations

A common issue is whether damage management actions would adversely affect the populations of target bird species, especially when lethal methods are employed. WS maintains ongoing contact with USFWS and the GDNR to ensure activities are within management objectives for those species. WS submits annual bird damage management activity reports to the USFWS. 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 the USFWS and the GDNR assures local, state, and regional knowledge of wildlife population trends are considered. While local populations of birds may be reduced, compliance with applicable state and federal laws and regulations authorizing take of birds and their nest and eggs would ensure that the regional and statewide populations of those species would 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 those bird species addressed in this assessment is analyzed for each alternative below.

Alternative 1 - Continuing the Current Integrated Approach to Managing Bird 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 birds

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 birds in the State.

The issue of the effects on target bird 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 target bird species from the implementation of the proposed action are analyzed for each species below.

Double-crested Cormorant Population Impact Analysis

Double-crested cormorants are large fish-eating colonial waterbirds widely distributed across North America (Hatch and Weseloh 1999). The current range of cormorants appears to be expanding in North America (Hatch 1995) especially in the northern and eastern portions of their breeding ranges and along their winter range (Hatch and Weseloh 1999). The double-crested cormorant is one of six species of cormorants breeding in North America and has the widest range (Hatch 1995). Double-crested cormorants range throughout North America, from the Atlantic coast to the Pacific coast (USFWS 2003). During the last 20 years, the cormorant population has expanded to an estimated 372,000 nesting pairs; with the population (breeding and non-breeding birds) in the United States estimated to be greater than 1 million birds (Tyson et al. 1999). The USFWS estimated the continental population at approximately 2 million cormorants during the development of the cormorant management FEIS (USFWS 2003). Tyson et al. (1999) found that the cormorant population increased about 2.6% annually during the early 1990s. The greatest increase was in the Interior region which was the result of a 22% annual increase in the number of cormorants in Ontario and those states in the United States bordering the Great Lakes (Tyson et al. 1999). From the early 1970s to the early 1990s, the Atlantic population of cormorants increased from about 25,000 pairs to 96,000 pairs (Hatch 1995). While the number of cormorants in this region declined by 6.5% overall in the early to mid-1990s, some populations were still increasing during this period (Tyson et al. 1999). The number of breeding pairs of cormorants in the Atlantic and Interior population was estimated at over 85,510 and 256,212 nesting pairs, respectively (Tyson et al. 1999). The breeding population in the southeastern United States, including Georgia, has been estimated at 10,600 breeding pairs (Hunter et al. 2006).

As wintering populations of cormorants increased in the State and as the production of aquaculture resources has increased, the level of economic damage associated with cormorants feeding on fish raised for sale has also increased. For example, the economic damage to aquaculture production in the State of Mississippi just to replace fish eaten by cormorants was estimated to be $5 million annually based on wintering cormorant population estimates in the late 1990s (Glahn et al. 2000*a*).

As stated in the cormorant management FEIS developed by the USFWS, the recent increase in the double-crested cormorant population in North America, and the subsequent range expansion, has been well-documented along with concerns of negative impacts associated with the expanding cormorant population (USFWS 2003). Wires et al. (2001) and Jackson and Jackson (1995) have suggested that the current cormorant resurgence may be, at least in part, a population recovery following years of DDT-induced reproductive suppression and unregulated take prior to protection under the MBTA. There

appears to be a correlation between increasing cormorant populations and growing concern about associated negative impacts, thus creating a very real management need to address those concerns (USFWS 2003, USFWS 2009).

To address cormorant damage to aquaculture resources and other resources, the USFWS, in cooperation with WS, prepared a FEIS that evaluated alternative strategies to manage cormorant populations in the United States (USFWS 2003). The selected alternative in the FEIS modified the existing AQDO and established a PRDO that allow for the take of cormorants without a depredation permit when cormorants are committing or about to commit damage to those resource types. The AQDO allows cormorants to be taken in 13 States, including Georgia, without a depredation permit to reduce depredation on aquaculture stock at private fish farms and state and federal fish hatcheries (see 50 CFR 21.47). The PRDO allows for the take of cormorants without a depredation permit in 24 states, including Georgia, when those cormorants cause or pose a risk of adverse affects to public resources (*e.g.*, fish, wildlife, plants, and their habitats) (see 50 CFR 21.48). All other take of cormorants to alleviate damage requires a depredation permit issued by the USFWS.

The cormorant management FEIS developed by the USFWS predicted the number of cormorants taken by authorized entities under the selected alternative would increase by 4,140 cormorants per State, including Georgia (USFWS 2003). The FEIS predicted the increased take per State evaluated under the selected alternative would result in the authorized lethal take of up to 8.0% of the continental cormorant population (USFWS 2003).

Cormorants are present year-round in Georgia (NAS 2002, Sauer et al. 2008) with the largest concentrations occurring during the fall and winter months when the winter migrant population is present (USFWS 2003). The wintering population of cormorants in the State is primarily composed of birds from the Interior and Atlantic populations (Dolbeer 1991, Jackson and Jackson 1995). Cormorants are opportunistic feeders and often congregate where a food resource is readily available (Hatch and Weseloh 1999). An increase in the number of cormorants observed overwintering in the State has coincided with an increase in aquaculture production in the region (Glahn and Stickley 1995, Glahn et al. 1999*c*, Glahn et al. 2000*a*).

Hunter et al. (2006) estimated the number of breeding cormorants in the State at 50 breeding pairs. However, the number of cormorants observed in the State during the breeding season has increased an estimated 21.8% annually since 1966 with a 14.3% annual increase observed from 1980 through 2007 (Sauer et al. 2008). The data quality rating assigned by the BBS for the number of cormorants observed in the State indicates important deficiencies in the data may exist due to very low abundance, small sample size, or due to other species-specific limitations of BBS survey methods. Cormorant breeding populations are showing an increasing trend across the United States estimated at 5.1% annually since 1966, which is a statistically significant trend (Sauer et al. 2008). In the southeastern United States, cormorant breeding populations are also showing an increasing trend estimated at 1.7% annually since 1966 (Sauer et al. 2008). The total nesting population of cormorants for the southeastern United States was estimated at over 13,604 nesting pairs (USFWS 2003). The number of cormorants observed during the BBS conducted along routes in the eastern region of the United States has shown an increasing trend estimated at 4.3% annually since 1966, which is a statistically significant trend (Sauer et al. 2008). The number of cormorants overwintering in the State shows a general increasing trend since 1966 (NAS 2002).

The Southeast United States Regional Waterbird Conservation Plan ranks cormorants in the "*population control*" action level which includes those species' populations that are increasing to a level where damages to economic ventures or adverse affects to populations of other species are occurring (Hunter et al. 2006). One of the objectives in the Conservation Plan is to maintain no more than 15,000 pairs of

double-crested cormorants in the southeastern United States with no more than 4,000 breeding pairs occurring in the South Atlantic Coastal Plain, which includes Georgia (Hunter et al. 2006). Cormorants are considered a species that "*...may impact either native species or economic interests in portions of the Southeastern U.S. Region for which no increase and potentially population decreases may be recommended*" (Hunter et al. 2006).

The take of cormorants by all entities to alleviate damage in the State from FY 2004 through FY 2009 are shown in Table 4.1. Since FY 2004, WS has lethally taken one cormorant in Georgia to alleviated damage or threats. In addition to the take occurring by WS, the take of cormorants can also occur by other entities under the depredation orders and through the issuance of a depredation permit by the USFWS.

Table 4.1 – Number of double-crested cormorants addressed in Georgia from 2004 to 2009

Year	Dispersed by WS[1]	Take by Entity	
		WS[1]	All Entities[2]
2004	0	1	49
2005	0	0	101
2006	0	0	82
2007	27	0	54
2008	0	0	89
2009	2	0	303
TOTAL	**29**	**1**	**678**

[1]The number of bird dispersed by WS and WS' take are reported by federal fiscal year

[2]Take by all entities is reported by calendar year

Since 2004, a total of 678 cormorants have been lethally taken under depredation permits or orders in Georgia to alleviate damage or threats. The highest take level of cormorants occurred in 2009 when 303 cormorants were lethally taken in the State. No cormorants were lethally taken by WS in FY 2009. On average, 113 cormorants have been lethally taken annually in the State to alleviate damage and threats from 2004 through 2009. No cormorant egg and/or nests were destroyed in the State from 2004 through 2009.

Observers counted 130 cormorants in areas surveyed during the CBC conducted in 1966 with one area surveyed reporting cormorants (NAS 2002). During the CBC conducted in 2010, observers counted 8,314 cormorants in the State with 18 counts reporting cormorants which compared to 5,304 cormorants observed during the 2009 survey (NAS 2002). CBC data compiled since the 2001 survey in the State, indicates an average of 6,342 cormorants have been observed during the CBC conducted annually in the State. WS' highest level of cormorant take occurred in FY 2004 when one cormorant was taken. Observers counted 4,735 cormorants in the State during the 2004 CBC survey (NAS 2002). WS' take of one cormorant in the State in FY 2004 would represent 0.02% of the wintering count of cormorants in the State. CBC data is best interpreted as an indication of long-term trends in the number of birds observed wintering in the State and is not intended to represent population estimates of wintering bird populations. However, the information is presented in this analysis and compared to WS' take to indicate the low magnitude of take occurring by WS when compared to the number of cormorants observed in the State during the CBC which would be considered a minimum population estimate given the survey parameters of the CBC and the survey only covering a small portion of the State.

Although only limited cormorant damage management activities have been conducted by WS in Georgia, WS anticipates the number of requests for assistance to manage damage caused by cormorants could increase based on the increasing number of cormorants observed in the State during the breeding season

and overwintering in the State. If an increase in the number of requests for assistance occurs, under the proposed action of implementing an integrated approach to managing damage, the number of cormorants lethally taken annually by WS would also likely increase to address requests for assistance. Based on increasing trends in the number of cormorants in the State observed during the development of this EA, WS' anticipates that up to 100 cormorants could be lethally taken by WS annually to alleviate damage. In addition, up to 100 cormorant nests and/or eggs could be destroyed annually by WS to alleviate damage.

As stated previously, an average of 6,342 cormorants have been observed in the State during the CBC since the 2001 surveys were conducted. WS' take of up to 100 cormorants annually would represent 1.7% of the average number of cormorants observed in the State during the CBC since the 2001 surveys which would be considered a minimum estimate. The number of cormorants observed in the State during the CBC between 2001 and 2010 has ranged from a low of 3,978 cormorants observed during the 2005 survey to a high of 10,032 cormorants observed during the 2008 survey (NAS 2002). The take of up to 100 cormorants by WS would range from a low of 1.0% to a high of 2.5% based on the range of cormorants observed in the State during the CBC.

The cormorant management FEIS developed by the USFWS predicted the number of cormorants taken by authorized entities under the selected alternative would increase by 4,140 cormorants per State, including Georgia (USFWS 2003). The FEIS also predicted the increased take per State evaluated under the selected alternative would result in the authorized lethal take of up to 8.0% of the continental cormorant population (USFWS 2003). Furthermore, the USFWS predicted through the analyses that the authorized take of cormorants and their eggs for the management of double-crested cormorant damage, including those taken in Georgia, was anticipated to have no significant impact on regional or continental double-crested cormorant populations (USFWS 2003). This includes cormorants that may be killed in Georgia under the AQDO by aquaculture producers at aquaculture facilities and by WS in winter roost sites; under the PRDO by WS and Indian Tribes; and those cormorants taken under USFWS issued depredation permits. Cormorants are a long-lived bird species and egg addling programs are anticipated to have minimal effects on regional or continental cormorant populations (USFWS 2003).

The total take of cormorants by all entities in Georgia on an annual basis from 2004 through 2009 has not exceeded the predicted increased take evaluated and authorized under the selected alternative in the cormorant management FEIS. WS' proposed take of up to 100 cormorants annually to address damage and threats would represent 2.4% of the 4,140 cormorants per State analyzed in the cormorant management FEIS. From 2004 through 2009, an average of 113 cormorants has been taken annually in the State to alleviate damage. When the average number of cormorants is included in the proposed take evaluated in this EA, the cumulative take would represent 4.2% of the allowable take of cormorants evaluated in the cormorant management FEIS. The cormorant management FEIS also evaluated nest and egg take to alleviate damage and threats. Based on the available information, the FEIS concluded that nest and egg take by all entities would not adversely affect cormorant populations.

Great Blue Heron Population Impact Analysis

Great blue herons are a common widespread wading bird that can be found throughout most of North America and can be found year-round in most of the United States, including Georgia (Butler 1992). Great blue herons are most often located in freshwater and brackish marshes, lakes, rivers, and lagoons (MANEM Waterbird Plan 2006). Herons are known to nest in trees, rock ledges, and coastal cliffs and may travel up to 30 km to forage with a mean forage distance of 2.6 to 6.5 km (MANEM Waterbird Plan 2006). Great blue herons feed mainly on fish but are also known to capture invertebrates, amphibians, reptiles, birds, and mammals (Butler 1992).

Great blue herons are showing statistically significant increases across all survey routes of the BBS. Since 1966, the number of great blue herons observed survey-wide during the BBS has increased at an annual rate of 1.3% which is a statistically significant increase (Sauer et al. 2008). In Georgia, herons observed on BBS routes are showing a statistically significant upward trend estimated at 3.7% annually from 1966 through 2007 (Sauer et al. 2008). Herons observed overwintering in Georgia have shown an overall increasing trend since 1966 (NAS 2002). The number of counts in the State reporting great blue herons during CBC surveys increased from nine counts reporting herons in 1966 to 26 counts reporting herons during the 2010 survey. The number of birds observed during the CBC has also increased from 55 birds observed during the 1966 survey conducted in Georgia to 663 individuals observed in areas surveyed during the 2010 count (NAS 2002). The current population of great blue herons is currently unknown in Georgia.

A survey of great blue herons in Mississippi found that the population peaked in mid-winter as migrant birds arrived (Glahn et al. 1999*c*). The peak population in Georgia is also likely to occur in mid-winter as birds arrive in the State during the migration periods. Glahn et al. (1999*c*) estimated the great blue heron population in the Delta region of Mississippi likely exceeded 25,000 herons based on density surveys conducted at aquaculture facilities in that region. In 2006, the breeding population of great blue herons was estimated at 69,331 breeding pairs or 138,662 adult herons in the southeastern United States (Hunter et al. 2006). The overall population objective for herons in the southeastern United States is 50,000 to 100,000 breeding pairs (Hunter et al. 2006). In the Southeastern Coastal Plain (Bird Conservation Region 27)[11], which includes Georgia, the breeding population of great blue herons was estimated at 26,700 breeding pairs in 2006 with a population objective of 39,000 breeding pairs (Hunter et al. 2006).

To alleviate damage, WS has lethally taken four great blue herons in Georgia and employed non-lethal methods to disperse 360 herons from FY 2004 through FY 2009 (see Table 4.2). In addition to the take of herons by WS to alleviate damage or threats, the USFWS has issued depredation permits to other entities for the take of herons.

Table 4.2 – Number of great blue herons addressed in Georgia from 2004 to 2009

Year	Dispersed by WS[1]	Take under Depredation Permits	
		WS' Take[1]	Total Take by All Entities[2]
2004	0	0	24
2005	0	0	45
2006	6	0	62
2007	83	2	29
2008	98	0	43
2009	173	2	84
TOTAL	**360**	**4**	**287**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

From 2004 through 2009, 287 herons were lethally taken in the State by all entities to alleviate damage or threats associated with great blue herons. From 2004 through 2009, the average number of herons taken in the State by all entities has been 48 herons as permitted under depredation permits issued by the USFWS.

[11]The Southeastern Coastal Plain, also known as Bird Conservation Region 27, overlaps areas of Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, and small parts of Louisiana, Tennessee, and Kentucky. This region is characterized by extensive riverine swamps and marsh complexes along the Atlantic Coast. The region also includes the interior forests dominated by longleaf, slash, and loblolly pine forests.

To address requests for assistance to manage damage associated with great blue herons in the future, up to 20 herons could be lethally taken annually by WS to alleviate damage and threats. The increased level of take analyzed when compared to the take occurring by WS from FY 2004 through FY 2009 is in anticipation of requests to address threats of aircraft strikes at airports and to reduce damage to natural resources, such as nest site competition between herons and other colonial nesting waterbirds.

The number of great blue herons present in Georgia at any given time likely fluctuates throughout the year. No breeding or wintering population estimates are available for great blue herons in Georgia. The average annual take of herons by all entities in the State has been 48 herons from 2004 through 2009. If the average annual take of herons by all entities is reflective of take that will occur in the future, the combined WS' take and take by all entities would total 68 herons. If the annual take proposed by WS of up to 20 herons are included with the highest heron take that occurred by all entities of 84 herons, the total would be 104 herons lethally taken in the State. From 2006 through 2009, WS has addressed 90 great-blue herons annually using non-lethal methods.

Given the increasing population trends observed for herons in Georgia, the limited take proposed by WS when compared to the estimated breeding population in the southeastern United States, the magnitude of WS' estimated take could be considered low. The permitting of the take by the USFWS ensures the cumulative take of herons in the southeastern United States, including the take proposed by WS in Georgia under this assessment, will not reach a magnitude where undesired adverse affects occur. The take of herons by WS will occur within allowed levels of take permitted by the USFWS.

Great Egret Population Impact Analysis

Great egrets are large white birds of intermediate size between the larger herons and smaller egrets commonly found in the United States (Mccrimmon, Jr. et al. 2001). Great egrets can be found in freshwater, estuarine, and marine wetlands (Mccrimmon, Jr. et al. 2001). In Georgia, great egrets can be found in appropriate habitat throughout the year but are more common in the southern portion of the State (Mccrimmon, Jr. et al. 2001).

The overharvest of great egrets that occurred primarily from 1870 to 1910 for plumes and the millinery trade reduced the population in North America by >95% (Mccrimmon, Jr. et al. 2001). During surveys conducted in 1911-1912, the total known nesting population of great egrets was estimated at 1,000 to 1,500 breeding pairs in 13 colonies in seven States (Mccrimmon, Jr. et al. 2001). Following regulations that ended plume-hunting, great egret populations rapidly recovered with increases reported in the late 1920s and 1930s (Mccrimmon, Jr. et al. 2001). Similar fluctuations in great egret populations occurred in Georgia with the number of egrets present in the State increasing during the 1940s and 1950s; however, populations in the State again began to decline rapidly in the 1970s likely due to the conversion of lowland habitats to agricultural uses and the widespread use of organochloride pesticides (Hunter et al. 2006). However, populations of great egrets appear to be recovering.

Since the initiation of the BBS in 1966, the number of egrets observed along routes surveyed in Georgia has shown an increasing trend estimated at 1.5% annually (Sauer et al. 2008). From 1980 to 2007, the number of great egrets observed in the State during the BBS has shown an increasing trend estimated at 3.3% annually (Sauer et al. 2008). Across all BBS routes surveyed in the United States, the number of great egrets observed during the survey has shown an increasing trend estimated at 2.3% annually since 1966 (Sauer et al. 2008). The number of great egrets observed in areas surveyed during the CBC in the State has also shown a general increasing trend since 1966 (NAS 2002). In areas surveyed during the CBC conducted in 1996, a total of 96 great egrets were recorded with four counts reporting egrets. During the CBC conducted in 2010, a total of 1,162 egrets were recorded with 17 counts reporting seeing egrets (NAS 2002). In the Southeastern Coastal Plain region (Bird Conservation Region 27), which

includes the southern portion of the State, the breeding population of great egrets has been estimated at over 28,000 pairs (Hunter et al. 2006). In the southeastern United States, the breeding population of great egrets has been estimated at 119,266 breeding pairs (Hunter et al. 2006).

Of the five tiers of action levels for waterbirds in the southeastern United States, great egrets were assigned to the planning and responsibility tier which includes birds that require some level of planning to maintain sustainable populations in the region (Hunter et al. 2006). The planning and responsibility tier is the second lowest tier in terms of action priority ahead of only the last tier which includes those waterbirds that are considered above management levels and could require population management (Hunter et al. 2006). The North American Waterbird Conservation Plan classifies the great egret in a category of conservation concern considered as not currently at risk (Kushlan et al. 2002).

Like other waterbirds addressed in this assessment, great egrets can cause damage to aquaculture resources through consuming aquatic wildlife raised for sale and from the threats associated with disease transmission between aquaculture ponds and facilities. To address damages and threats associated with great egrets, the USFWS has issued depredation permits pursuant to the MBTA that allow the take of egrets to manage damage and threats. The total take of great egrets per year under depredation permits issued by the USFWS from 2004 through 2009 are shown in Table 4.3. The take of great egrets by WS to alleviate damage and threats are also shown in Table 4.3 along with the number of great egrets dispersed by WS to alleviate damage or threats of damage using non-lethal methods. On average, 13 egrets have been lethally taken in the State annually to alleviate damage or threats of damage. The highest level of take occurred in 2009 when 50 egrets were lethally taken in the State by all entities. WS' highest level of take occurred in FY 2006 when 23 egrets were taken to alleviate damage and threats of damage. WS has dispersed 1,848 great egrets in the State between FY 2004 and FY 2009. Based on previous and current levels of take by WS to alleviate damage and threats of damage associated with great egrets, WS' anticipates that up to 50 great egrets could be lethally taken in the State to manage damage and threats.

Table 4.3 – Number of great egrets addressed in Georgia from 2004 to 2009

Year	Dispersed by WS[1]	Take Under Depredation Permits	
		WS' Take[1]	Total Take[2]
2004	0	0	0
2005	13	0	20
2006	419	23	8
2007	311	15	0
2008	271	17	0
2009	834	14	50
TOTAL	**1,848**	**69**	**78**

[1]Data reported by federal fiscal year
[2]Data reported by calendar year

The population of great egrets in Georgia likely fluctuates throughout the year and is likely highest during migration periods. Nesting and winter populations of great egrets are currently unknown in Georgia. The average annual take of egrets by all entities in the State has been 13 egrets from 2004 through 2009. If the average annual take of egrets by all entities is reflective of take that will occur in the future, the combined WS' take and take by all entities would total 63 egrets. If the annual take proposed by WS of up to 50 egrets are included with the highest egret take that occurred by all entities of 50 egrets, the total would be 100 egrets lethally taken in the State.
Given the increasing population trends observed for egrets in Georgia, the limited take proposed by WS when compared to the estimated breeding population in the southeastern United States, the magnitude of WS' estimated take could be considered low. The permitting of the take by the USFWS ensures the

cumulative take of egrets in the southeastern United States, including the take proposed by WS in Georgia under this assessment, will not reach a magnitude where undesired adverse affects occur. The take of egrets by WS will occur within allowed levels of take permitted by the USFWS.

Like other migratory birds addressed in this assessment, the take of great egrets by WS will only occur at the discretion of the USFWS and only at levels permitted by the USFWS. Therefore, all take by WS to alleviate damage or threats associated with great egrets will be evaluated pursuant to the objectives of the MBTA.

Cattle Egret Population Impact Analysis

The cattle egret is a relatively new arrival to the North American continent with the first record for the continental United States occurring in south Florida in 1941 (Telfair II 2006). Today, cattle egrets can be found across much of North America, including Georgia (Telfair II 2006, Sauer et al. 2008). As their name implies, cattle egrets are closely associated with cattle where they forage on invertebrates disturbed by foraging livestock, primarily grasshoppers, crickets, and flies (Telfair II 2006). Cattle egrets are also known to consume fish, frogs, and birds, including eggs and nestlings (Telfair II 2006).

Cattle egrets form gregarious nesting colonies, or heronries, generally in medium to tall upland trees found in woodlands, swamps, and wooded islands adjacent to water. However, proximity to water is not a requirement of egret nesting sites with many heronries located in or near residential areas (Telfair II 2006). The accumulation of guano under heronries can defoliate and kill vegetation (Wiese 1979, Telfair II 1983) which can cause herons to abandon nest sites and create heronries in other areas (Telfair II 2006). Telfair II and Bister (2004) noted that the composition of vegetation under heronries rapidly changed within two- to three-years after the establishment of a cattle egret heronry in Texas due to large concentrations of feces. Egret heronries located near airports also pose a threat from the potential for egrets being struck by aircraft which can cause damage to property and threaten passenger safety.

The population of cattle egrets in Georgia is currently unknown. BBS data indicates the number of egrets observed in the State during the breeding season has declined annually at an estimated rate of -1.5% since 1966 (Sauer et al. 2008). In the southeastern United States, the number of egrets observed during the BBS have also shown a declining trend estimated at -0.6% annually since 1966 (Sauer et al. 2008). The total population of cattle egrets in North America has been estimated to range from 750,000 to 1,500,000 egrets (MANEM Regional Waterbird Plan 2006). The Southeast United States Regional Waterbird Conservation Plan ranks cattle egrets in the "*population control*" action level indicating that populations are increasing to a level where damages to economic ventures or adverse affects to populations of other species are occurring (Hunter et al. 2006). The increases in populations and the range expansion exhibited by cattle egrets have been attributed to the species broad use of terrestrial habits relative to other waterbirds (Hunter et al. 2006, Telfair II 2006). Cattle egrets have also been implicated as contributing to the declining trends of little blue herons and snowy egrets given the aggressive behavior exhibited by cattle egrets and the use of similar nesting habitats (Burger 1978, Hunter et al. 2006, Telfair II 2006).

The cattle egret population in the southeastern Bird Conservation Regions has been estimated at approximately 350,000 breeding pairs with nearly 57,000 breeding pairs occurring in the Southeastern Coastal Plain (Bird Conservation Region 27), 700 pairs occurring in the Appalachian Mountain Region (Bird Conservation Region 28)[12], and approximately 1,050 breeding pairs occurring in the Piedmont Bird

[12]The Appalachian Mountains, also known as Bird Conservation Region 28, overlaps areas of Alabama, Georgia, North Carolina, Tennessee, Kentucky, Virginia, and a small part of South Carolina extending northward into Ohio, West Virginia, Maryland, Pennsylvania, New Jersey, and New York. The region is characterized by oak-hickory forests and rugged terrain.

Conservation Region (Bird Conservation Region 29)[13], all of which include parts of Georgia (Hunter et al. 2006). The Conservation Plan calls for the reduction of cattle egret populations in the southeastern Bird Conservation Regions to less than 200,000 breeding pairs of cattle egrets with 30,000 breeding pairs in the Southeastern Coastal Plain Region which includes most of Georgia. Therefore, the Plan calls for reducing the cattle egret population by 300,000 egrets in the southeastern United States (Hunter et al. 2006). In the Southeastern Coastal Plain Bird Conservation Region which includes those egrets nesting in Georgia, the Plan calls for reducing the cattle egret breeding population by approximately 30,000 egrets (Hunter et al. 2006).

From 1966 through 2007 in Georgia, the relative abundance of cattle egrets in the State has been estimated at 15.41 egrets per BBS route in the State (Sauer et al. 2008). With a relative abundance estimated at 15.41 egrets, a statewide breeding population could be estimated at nearly 89,000 egrets based on the area of Georgia. Although cattle egrets have been observed overwintering in the State, the number observed during the CBC has been variable with some years reporting no egrets observed. The highest number of egrets observed in the State during the CBC occurred in 2004 when 57 egrets were observed (NAS 2002).

Similar to other bird species addressed in this assessment, the take of cattle egrets is prohibited under the MBTA unless a depredation permit has been issued by the USFWS pursuant to the Act. The number of cattle egrets taken by all entities in Georgia as permitted by the USFWS to alleviate damage and reduce threats is shown in Table 4.4. As shown in Table 4.4, the take of cattle egrets by entities other than WS did not occur from 2004 through 2008 with three cattle egrets taken by other entities in 2009. Since FY 2004, WS has lethally taken 567 egrets in the State or an average of 95 egrets per year. As part of an integrated approach to resolving previous requests for assistance, WS also dispersed 5,403 egrets using non-lethal methods from FY 2004 through FY 2009.

Table 4.4 – The number of cattle egrets addressed in Georgia from 2004 to 2009

Year	Dispersed by WS[1]	Take by Entity	
		WS[1]	Other Entities[2]
2004	0	12	0
2005	531	74	0
2006	429	23	0
2007	873	122	0
2008	2,811	286	0
2009	759	50	3
TOTAL	**5,403**	**567**	**3**

[1]The number of bird dispersed by WS and WS' take are reported by federal fiscal year

[2]Take by other entities is reported by calendar year

The number of egrets addressed by WS in Georgia to manage damage and threats has increased from FY 2004 through FY 2009. In FY 2004, WS addressed a total of 12 egrets to alleviate damage and threats compared to 809 egrets addressed in FY 2009. Nearly 91% of the egrets addressed by WS previously were harassed using non-lethal methods. As the number of requests for assistance increases and the number of egrets addressed to manage those requests increase, the lethal take of egrets could also increase under the proposed action along with an increase in the use of non-lethal methods. The use of non-lethal methods is generally regarded as having no effect on bird populations since those birds addressed are only dispersed to other areas and the disturbance is not widespread enough to cause adverse affects to

[13]The Piedmont, known as Bird Conservation Region 29, overlaps Georgia, South Carolina, North Carolina, Virginia, and a small part of Alabama extending northward into Maryland, Pennsylvania, and New Jersey. The region is characterized as a transitional area between the Appalachian Mountains and the Southeastern Coastal Plain consisting of a patchwork of various hardwood, grassland, and urban settings.

reproduction or survivability that would result in population declines. If the number of requests for assistance to manage damage and threats associated with cattle egrets increases, WS could take annually up to 400 cattle egrets in the State.

As was stated previously, based on the area of Georgia and the estimated relative abundance of birds per BBS route, the cattle egret breeding population could be estimated at nearly 89,000 egrets. Based on the best available information on cattle egret populations in Georgia, WS' take of up to 400 egrets annually to prevent and reduce damage to property and to reduce threats to human safety that egrets pose at airports would represent 0.5% of the estimated annual breeding population in Georgia.

Since the take of cattle egrets is prohibited under the MBTA unless authorized by the USFWS through the issuance of depredation permits, WS' take of up to 400 cattle egrets annually in the State would only occur when authorized by the USFWS through the issuance of a depredation permit. Therefore, the number of egrets taken annually by WS in the State would be at the discretion of the USFWS based on allowable harvest levels and population information. The take of cattle egrets by other entities to alleviate damage or threats of damage is expected to remain similar to previous annual take levels in the State. Since the take of egrets by other entities can only occur when permitted by the USFWS through the issuance of depredation permits, the cumulative take by all entities is considered by the USFWS when authorizing the take of egrets.

Black-crowned Night Heron Population Impact Analysis

Black-crowned night herons are common in North America and can be found breeding on all continents except Australia and Antarctica (Davis 1993). Similar to other heron species, black-crowned night herons feed primarily on fish and are gregarious nesters (Davis 1993). Similar to cattle egrets, damage or threats associated with night herons primarily occurs from the denuding of vegetation under heronries and the threats associated with aircraft strikes when nesting, roosting, or foraging occurs near or adjacent to airports. Night herons can also cause economic losses at aquaculture facilities from the potential for the spread of disease and from predation on fish.

Hunter et al. (2006) estimated the breeding population of black-crowned night herons in the southeastern United States at 7,333 breeding pairs with a range of 5,000 to 10,000 herons. The regional population objective for black-crowned night herons was set at 9,000 to 20,000 herons (Hunter et al. 2006). In Georgia, black-crowed night herons can be found breeding in central and southern Georgia and can be found throughout the year in southern Georgia (Hothem et al. 2010). Current populations of night herons in Georgia are unknown. CBC data collected in Georgia shows a general increasing trend for night herons wintering in Georgia (NAS 2002). The number of black-crowned night herons observed on routes surveyed during the BBS have shown a declining trend estimated at -11.5% annually from 1966 through 2007 but trending information from BBS data gathered from 1980 to 2007 indicates an increasing trend in the State estimated at 2.1% annually (Sauer et al. 2008). However, Sauer et al. (2008) indicates the data collected for the black-crowned night heron in Georgia has important deficiencies that may prevent accurate interpretation of the results. This deficiency is likely a result of the inconspicuous nature of night herons, especially during the nesting season which makes accurate counts difficult (Davis 1993). In addition, the data deficiencies are likely also due to the survey parameters of the BBS which are restricted to being conducted along roadways and only those birds heard or seen within a quarter mile radius of a survey point are counted.

As with other native bird species, the take of black-crowned night herons is prohibited unless authorized by the USFWS through the issuance of depredation permits pursuant to the MBTA. The number of black-crowned night herons lethally taken in the State through the issuance of depredation permits is shown in Table 4.5.

No take of herons has occurred by entities other than WS since 2004. From FY 2004 through FY 2009, WS has lethally taken 45 black-crowned night herons in the State to alleviate damage and threats of damage. In addition, WS has employed non-lethal methods to disperse a total of 19 herons in the State during FY 2007 and FY 2008. WS did not receive requests for direct operational assistance to manage damage associated with black-crowned night herons in Georgia during FY 2004 and FY 2005. Requests for assistance to manage damage associated with black-crowned night herons from FY 2004 through FY 2009 received by WS were primarily associated with threats of aircraft striking herons at airports in the State.

Table 4.5 – Number of black-crowned night herons addressed in Georgia from 2004 to 2009

Year	Dispersed by WS[1]	Take by Entity	
		WS[1]	Other Entities
2004	0	0	0
2005	0	0	0
2006	0	10	0
2007	3	17	0
2008	16	17	0
2009	0	1	0
TOTAL	**19**	**45**	**0**

[1]The number of bird dispersed by WS and WS' take are reported by federal fiscal year

Based on the increasing requests for assistance received to manage damage caused by night herons, WS also anticipates the number of black-crowned night herons that would be addressed annually to alleviate damage would also increase. If requests for assistance increase, up to 50 black-crowned night herons could be lethally taken by WS to alleviate damage and threats annually in the State. As was stated earlier, no take of black-crowned night herons would occur by WS in Georgia unless authorized by the USFWS through the issuance of a depredation permit pursuant to the MBTA. Therefore, any take by WS would occur at the discretion of the USFWS in consideration of the take level allowable for the species. The permitting of the take by the USFWS ensures WS' take of black-crowned night herons is below a level that would cause undesirable adverse affects on heron populations in the State.

White Ibis Population Impact Analysis

The white ibis, with its long downcurved bill, white plumage, and gregarious habits, makes it an icon of the freshwater and estuarine wetlands of the southeast United States (Heath et al. 2009). The white ibis feeds primarily on aquatic crustaceans and insects using their decurved bill to probe beneath the surface of the water in soft soil substrate (Heath et al. 2009). Similar to other colonial waterbirds, ibises nest in large nesting colonies primarily in live and dead woody vegetation with nesting occurring along the coasts from South Carolina to Florida and extending from Florida to Louisiana. Breeding also occurs along the coastal areas of Mexico and the Caribbean Islands. Non-breeding individuals and groups can also be found further inland along the Gulf Coast of the United States and parts of Mexico (Heath et al. 2009).

In the southeastern United States, the breeding population has been estimated at approximately 150,000 pairs with an objective set between 100,000 and 500,000 pairs (Hunter et al. 2006). Hunter et al. (2006) classified white ibis as a species in need of "*management attention*" at the regional level. Of primary concern are large-scale population shifts that have occurred since the 1930s as breeding birds abandon nesting locations in the region. Overall, the regional population appears to be stable to slightly increasing as birds shift to new breeding locations (Hunter et al. 2006). Other concerns raised by Hunter et al.

(2006) were associated with the species close relationship with crawfish and catfish aquaculture production. Population shifts and increases in the overall population in the region could be influenced by the presence and production of aquaculture. If aquaculture production declines for economic reasons, the availability of the artificial food source would also decline which could induce additional population shifts and lead to overall population declines (Hunter et al. 2006).

Like other colonial waterbirds, the population of white ibises is currently not known in Georgia but has been estimated at approximately 10,000 breeding pairs (Hunter et al. 2006). Ibises overwintering in Georgia remained stable until the early 1990s when observations of ibises began to generally increase during the CBC survey, though several cyclic patterns can be observed between some survey years (NAS 2002). The number of white ibis observed on routes surveyed during the BBS has shown an increasing trend in the State estimated at 2.2% annually since 1966 (Sauer et al. 2008). From 1966 through 2007, surveyors on the BBS have observed 2.95 white ibis per route (Sauer et al. 2008). Based on the area of Georgia and the relative abundance of white ibis on BBS routes in Georgia, a statewide breeding population could be estimated at over 17,000 birds. A breeding population estimated at over 17,000 birds in Georgia is consistent with population estimates for other coastal states cited in Heath et al. (2009) and would be similar to the 20,000 birds estimated by Hunter et al. (2006) using two adult birds per breeding pair estimated at 10,000 pairs.

As shown in Table 4.6, WS has lethally taken a total of 346 white ibis in the State from FY 2004 through FY 2009 to alleviate damage and threats. In addition, WS has employed non-lethal methods to disperse 9,032 white ibis from FY 2004 through FY 2009. As indicated in Table 4.6, the number of white ibis addressed by WS has also increased since FY 2004 due to an increase in the number of requests for assistance to manage damage associated with the species. Take by other entities did not occur in the State from 2004 through 2009. WS' highest level of take occurred in FY 2008 when 168 ibis were lethally taken to alleviate damage to property and to reduce threats to human safety, primarily associated with aircraft strikes at airports. On average, WS has lethally taken 58 white ibis in the State from FY 2004 through FY 2009. Based on the increasing number of requests for assistance to manage damage and the subsequent increase in the number of white ibis addressed to alleviate damage or threats associated with those requests, a take of up to 300 white ibis annually could occur by WS to address those requests.

Table 4.6 – The number of white ibises addressed in Georgia from 2004 to 2009

Fiscal Year	Dispersed by WS[1]	Take by Entity	
		WS[1]	Other Entities
2004	0	0	0
2005	73	0	0
2006	731	48	0
2007	4,372	119	0
2008	1,994	168	0
2009	1,862	11	0
TOTAL	**9,032**	**346**	**0**

[1]The number of bird dispersed by WS and WS' take are reported by federal fiscal year

A take of up to 300 white ibis by WS in the State would represent 1.8% of the estimated population of 17,000 white ibises based on an annual population that remains stable. The take of white ibis is prohibited under the MBTA unless authorized by the USFWS through the issuance of depredation permits. The take of white ibis by WS would only occur when authorized by the USFWS and only at levels authorized by depredation permits issued by the USFWS. Therefore, the take of white ibis would only occur when permitted by the USFWS and only at levels that the USFWS determines are appropriate to achieve the population objectives for white ibis in the State.

Black Vulture Population Impact Analysis

Historically in North America, black vultures occurred primarily in the southeastern United States, Texas, New Mexico, and parts of Arizona (Wilbur 1983). Recently, black vultures have been expanding their range northward in the eastern United States (Wilbur 1983, Rabenhold and Decker 1989). Black vultures are considered locally resident (Parmalee and Parmalee 1967, Rabenhold and Decker 1989); however, some populations do migrate (Eisenmann 1963 cited from Wilbur 1983). Black vultures nest and roost primarily in mature forested areas. Black vultures typically feed by scavenging but occasionally take live prey, especially newborn livestock (Brauning 1992). Black vultures have been reported to live to 25 years of age (Henny 1990).

According to BBS trend data provided by Sauer et al. (2008), the number of black vulture observed in the State during the breeding season have increased at an annual rate of 4.3% from 1966 through 2007, which is a statistically significant increase. During this same time period, the number of black vultures observed in the southeastern United States during the BBS has also increased at an annual rate of 2.8%, which is also a statistically significant increase (Sauer et al. 2008). Black vultures overwintering in the State have shown a cyclical pattern since 1966 with an overall general increasing trend (NAS 2002). Rich et al. (2004) estimated the statewide black vulture population at 17,000 vultures based on BBS data available from the State.

The number of black vultures addressed by WS and all entities are shown in Table 4.7. From FY 2004 through FY 2009, WS has lethally taken 116 black vultures in the State to alleviate damage and threats. In addition, WS has employed non-lethal harassment methods to disperse 1,275 vultures in the State to address requests for assistance to manage damage. All entities have lethally taken 149 vultures in the State under depredation permits issued by the USFWS. The number of black vultures addressed by WS in the State to alleviate damage has increased from FY 2004 through FY 2009. This increase is likely associated with the increasing population trends observed for black vultures in the State. Based on the increasing need to address damage associated with black vultures in the State, up to 300 black vultures could be lethally taken under the proposed action to address damage and threats associated with black vultures.

Table 4.7 – Number of black vultures addressed in Georgia from 2004 to 2009

Fiscal Year	Dispersed by WS[1]	Take by Entity	
		WS[1]	All Entities[2]
2004	0	2	51
2005	0	3	20
2006	0	13	12
2007	715	36	0
2008	206	47	45
2009	354	15	21
TOTAL	**1,275**	**116**	**149**

[1]The number of bird dispersed by WS and WS' take are reported by federal fiscal year

[2]Take by all entities is reported by calendar year

As shown in Table 4.7, a total of 149 black vultures have been taken in the State from 2004 through 2009 to alleviate damage which is an average of 25 vultures taken annually by all entities. Based on a stable population trend, the take of up to 300 black vultures annually would represent 1.8% of the estimated statewide population of black vultures. If the number of black vultures taken by other entities in the State (an average of six vultures have been lethally taken by other entities) remains similar to the number of black vultures taken from 2004 through 2009 and if 300 vultures were taken by WS, the annual take of

vultures would be 306 vultures which would represent 1.8% of the estimated statewide population if the population remains stable.

Similar to the other native bird species addressed in this assessment, the take of vultures can only occur when authorized through the issuance of depredation permits by the USFWS. The permitting of the take ensures the cumulative take of black vultures annually occurs within allowable take levels to achieve desired population objectives for the species. Therefore, the take of vultures by WS would only occur at levels permitted by the USFWS through the issuance of depredation permits.

Turkey Vulture Population Impact Analysis

Turkey vultures can be found throughout Mexico, across most of the United States, and along the southern tier of Canada (Wilbur 1983, Rabenhold and Decker 1989). Turkey vultures can be found throughout the year in Georgia (Kirk and Mossman 1998). Turkey vultures can be found in virtually all habitats but it is most abundant where forest is interrupted by open land (Brauning 1992). Turkey vultures nest on the ground in thickets, stumps, hollow logs, or abandoned buildings (Walsh et al. 1999). Turkey vultures often roost in large groups with black vultures near homes or other buildings where they can cause property damage from droppings or by pulling and tearing shingles. Turkey vultures prefer carrion but will eat virtually anything, including insects, fish, tadpoles, decayed fruit, pumpkins, and recently hatched heron and ibis chicks (Brauning 1992). Turkey vultures have been reported to live up to 16 years of age (Henny 1990).

The statewide population of turkey vultures is currently unknown but has been estimated at 26,000 turkey vultures based on BBS data (Rich et al. 2004). Trending data from the BBS indicates the number of turkey vultures observed along BBS routes in the State have shown an increasing trend estimated at 4.2% annually in the State which is a statistically significant trend (Sauer et al. 2008). The numbers of turkey vultures observed during the CBC in the State are also showing an increasing trend (NAS 2002).

The take of turkey vultures is also prohibited under the MBTA except through the issuance of depredation permits issued by the USFWS. The number of turkey vultures addressed in Georgia by all entities to alleviate damage is shown in Table 4.8. From FY 2004 through FY 2009, the WS program in Georgia has lethally taken 73 turkey vultures in the State and employed non-lethal methods to disperse 1,967 vultures to alleviate damage. In addition, 54 turkey vultures have been lethally taken from 2004 through 2009 by other entities in the State pursuant to depredation permits issued by the USFWS. From 2004 through 2009, an average of 21 turkey vultures has been lethally taken in the State by all entities to alleviate damage pursuant to depredation permits.

Table 4.8 – Number of turkey vultures addressed in Georgia from 2004 to 2009

Fiscal Year	Dispersed by WS[1]	Take by Entity	
		WS[1]	All Entities[2]
2004	0	0	31
2005	0	1	6
2006	7	0	16
2007	648	13	13
2008	358	46	43
2009	954	13	18
TOTAL	**1,967**	**73**	**127**

[1]The number of bird dispersed by WS and WS' take are reported by federal fiscal year

[2]Take by other entities is reported by calendar year

As the population of turkey vultures in the State has increased, the number of requests for assistance to alleviate damage associated with turkey vultures has also increased. The number of vultures addressed by WS increased between FY 2004 through FY 2009 in the State. Based on current population trends for turkey vultures in the State and the number of requests for assistance with managing damage associated with turkey vultures, the number of vultures addressed to meet those requests is also likely to increase. Therefore, based on previous requests for assistance and in anticipation of an increasing number of requests and the subsequent need to address more vultures, up to 200 turkey vultures could be lethally taken annually by WS to alleviate damage and threats.

If up to 200 turkeys vultures were taken annually by WS, WS' take would represent 0.8% of the estimated statewide population of 26,000 turkey vultures if the population remains at least stable. From 2004 through 2009, other entities have lethally taken 54 vultures which is an average of nine vultures taken annually. If the take by other entities remains stable, the cumulative take of vultures annually by all entities would be 209 vultures. The cumulative take of vultures would represent 0.8% of the statewide population if the population remains stable. The permitting of the take by the USFWS pursuant to the MBTA ensures take by WS and by other entities occurs within allowable take levels to achieve the desired population objectives for turkey vultures in the State.

Northern Harrier Population Impact Analysis

The northern harrier is a medium-sized raptor commonly found in upland grassland habitats and fresh- and saltwater marshes. The northern harrier is the most widely distributed harrier species breeding throughout North America and Eurasia (Macwhirter and Bildstein 1996). Like other harrier species, the northern harrier nests on the ground, usually in tall, dense clumps of vegetation (Macwhirter and Bildstein 1996). While foraging, northern harriers often fly low to the ground in search of small mammals and birds. The open grassland habitat associated with airports often provides ideal foraging conditions for northern harriers with most requests for assistance associated with harriers occurring at airports where the raptors pose an aircraft strike risk.

In Georgia, northern harriers are commonly found during the winter migration periods (Macwhirter and Bildstein 1996). Northern harriers have not been observed previously along routes surveyed during the BBS conducted annually in the State (Sauer et al. 2008). Across all routes surveyed during the BBS, the number of harriers observed has shown a declining trend estimated at -1.2% annually since 1966 which is a statistically significant trend (Sauer et al. 2008). Between 1980 and 2007, the number of harriers observed during the BBS across all routes surveyed has shown a declining trend estimated at -0.4% annually (Sauer et al. 2008). Rich et al. (2004) estimated the breeding population in North America at nearly 436,000 harriers based on BBS data. Between 1966 and 2010, the number of harriers observed in areas surveyed during the CBC has shown a general increasing trend in the State (NAS 2002).

As mentioned previously, most requests for assistance associated with northern harriers are received from airport authorities where harriers are posing an aircraft strike hazard. Previously, WS has employed lethal methods to take 16 harriers in the State to alleviate damage or threats of damage from FY 2004 through FY 2009. In addition, WS has employed non-lethal methods to disperse 116 harriers between FY 2004 through FY 2009 to reduce threats of damage in the State. The highest level of take by WS occurred in FY 2007 when nine harriers were lethally taken to alleviate strike hazards while the highest number of harriers dispersed occurred in FY 2009 when 40 harriers were addressed using non-lethal methods. Based on previous requests for assistance and the number of harriers addressed, WS could be requested to alleviate threats of damage associated with harriers that could involve the lethal take of up to 15 harriers annually.

Take would only occur at levels authorized by the USFWS through the issuance of depredation permits. Based on the limited take proposed when compared to the estimated breeding population, WS' take could be considered of low magnitude. The permitting of take by the USFWS ensures those activities occur within allowable take levels to meet population objectives for harriers.

Red-shouldered Hawk Population Impact Analysis

Red-shouldered hawks can be found throughout the year in Georgia preferring mature forested areas of the State. Across their range, red-shouldered hawks are commonly found in mature, mixed deciduous-coniferous forests, especially in bottomland hardwoods, riparian areas, and flooded deciduous swamps (Dykstra et al. 2008). Red-shouldered hawks are considered partial migrants with birds in the northern portion of their range moving southward during the fall and winter migration periods (Dykstra et al. 2008). Like other hawk species, red-shouldered hawks have a varied diet consisting primarily of small mammal species but with also feed on birds, crayfish, and insects (Dykstra et al. 2008).

The numbers of red-shouldered hawks observed along routes surveyed in the State during the BBS have shown an increasing trend in the State between 1966 through 2007 estimated at 4.9% annually which is a statistically significant trend (Sauer et al. 2008). Between 1980 and 2007, the number of red-shouldered hawks observed in the State during the BBS has shown an increasing trend estimated at 3.7% annually (Sauer et al. 2008). Across all routes surveyed in the United States, the number of red-shouldered hawks observed during the BBS has shown an increasing trend estimated at 3.2% between 1966 and 2007 which is also a statistically significant trend (Sauer et al. 2006). The numbers of red-shouldered hawks present in the State likely increases during the winter as birds begin arriving in the State from their northern range. In areas surveyed during the CBC, the number of red-shouldered hawks observed has shown a general increasing trend in the State between 1966 through 2010 (NAS 2002). Rich et al. (2004) estimated the statewide breeding population at 78,000 hawks based on BBS data.

Like other raptor species addressed in this assessment, most requests received by WS involving damages or threats of damages associated with red-shouldered hawks occur at airports within the State. Between FY 2004 and FY 2009, WS has addressed most requests for assistance associated with threats involving red-shouldered hawks using non-lethal dispersal methods. WS has addressed 91 red-shouldered hawks in the State between FY 2004 through FY 2009 using non-lethal methods with only one red-shouldered hawk being lethally taken by WS during that same timeframe. In FY 2008, WS addressed 45 red-shouldered hawks using non-lethal methods to alleviate damage or threats of damage which is the highest number of red-shouldered hawks addressed between FY 2004 through FY 2009.

Based on the number of red-shouldered hawks addressed annually by WS and in anticipation of continuing to receive requests for assistance associated with red-shouldered hawks, WS could take up to five red-shouldered hawks annually in the State to alleviate damage or threats of damage. Take would only occur when authorized by the USFWS through the issuance of depredation permits and only at levels permitted. If the breeding population in the State remains at least stable, an annual take of up to five red-shouldered hawks would represent 0.01% of the estimated breeding population of 78,000 red-shouldered hawks in the State. Take of red-shouldered hawks by other entities in the State under depredation permits issued by the USFWS did not occur between 2004 through 2009. Current population trends for red-shouldered hawks breeding within the State indicate increasing annual trends. The permitting of the take by the USFWS ensures any take by WS occurs within allowable take limits to ensure population objectives for red-shouldered hawks are met.

Red-tailed Hawk Population Impact Analysis

The red-tailed hawk is one of the most widely distributed raptor species in North America with a breeding range extending from northern Canada and Alaska southward to northern and central Mexico (Preston and Beane 2009). In the northern portion of their range, including most of Canada and Alaska, the red-tailed hawk is a common summer resident migrating southward during the fall and winter migration periods. In the conterminous United States, the red-tailed hawk is a year-round resident, including Georgia (Preston and Beane 2009). Migration movements are primarily dependent on snow cover and the availability of prey items with most migratory movements being less than 1,500 kilometers (Preston and Beane 2009). Red-tailed hawks are capable of exploiting a broad range of habitats with the availability of structures for perching, nesting, and the availability of prey items being the key factors. Red-tailed hawks are most commonly found in open areas interspersed with patches of trees or other similar structures and are tolerant of some human activity with breeding populations occurring in large, urban environments (Preston and Beane 2009).

Populations of red-tailed hawks in North America showed increasing trends during the mid- to late-1900s likely in response to the conversion of forested areas to more open environments for agricultural production (Preston and Beane 2009). Between 1966 and 2007, the number of red-tailed hawks observed along routes surveyed during the BBS has shown an increasing trend estimated at 2.4% annually across all routes surveyed in the United States which is a statistically significant trend (Sauer et al. 2008). Across all routes surveyed, the increase has been estimated at 2.1% annually which is also a statistically significant trend (Sauer et al. 2008). In Georgia, the number of red-tailed hawks observed during the BBS has also shown an increasing trend estimated at 2.8% annually between 1966 through 2007 (Sauer et al. 2008). The breeding population in Georgia has been estimated at 18,000 red-tailed hawks based on BBS data (Rich et al. 2004). The number of red-tailed hawks observed in areas surveyed during the CBC has also shown general increasing trends within the State between 1966 and 2010 (NAS 2002). The number of red-tailed hawks observed per surveyor hour during the CBC conducted in 2010 increased over 108% when compared to the number observed during the 1966 survey which is more than double the number of red-tailed hawks observed per surveyor hour.

The open grassland habitats of airports and the availability of perching structures often attract red-tailed hawks to airports where those birds pose a strike risk with aircraft. Most requests for assistance received by WS in Georgia associated with red-tailed hawks are associated with threats those hawks pose to aircraft. However, WS does occasional receive requests associated with red-tailed hawks where damages or threats of damages to agricultural resources are occurring. For example, red-tailed hawks are known to capture and feed on free-ranging chickens. WS has addressed previous requests for assistance associated with red-tailed hawks with non-lethal dispersal methods. From FY 2004 through FY 2009, the WS program in Georgia employed non-lethal methods to disperse a total of 30 red-tailed hawks. WS dispersed 16 red-tailed hawks in FY 2008 which was the highest number of hawks addressed by WS between FY 2007 and FY 2009. No requests for direct operational assistance for damage management activities associated with red-tailed hawks were received by WS from FY 2004 through FY 2006. No lethal take of red-tailed hawks occurred by WS from FY 2004 through FY 2009.

However, WS could be requested to employ lethal methods under the proposed action alternative to address damage or threats of damage associated with red-tailed hawks. Based on previous requests received by WS, up to five red-tailed hawks could be taken annually by WS to alleviate damage. Between 2004 and 2009, a total of two red-tailed hawks have been lethally taken in the State by other entities to alleviate damage or threats of damage. Based on a breeding population estimated at 18,000 red-tailed hawks, WS' take of up to five hawks annually would result in the lethal take of 0.03% of the estimated population in the State if the breeding population remains at least stable. Take by WS would only occur when permitted by the USFWS and only at levels authorized which ensures any take by WS

occurs within allowable limits for the species. The take of red-tailed hawks by other entities is not expected to increase greatly above the number of hawks taken between 2004 through 2009.

Laughing Gull Population Impact Analysis

The laughing gull is a common gull species found year-round in the southeastern United States with breeding colonies occurring along the coastal areas of the Atlantic Ocean, Gulf of Mexico, and the coastal areas of the Caribbean Islands (Burger 1996). Localized breeding colonies can also be found along the Gulf of California and the Pacific Coast of Mexico (Burger 1996). Characterized by a black hood, laughing gulls are often associated with human activities near coastal areas where food sources are readily available (Burger 1996). Burger (1996) cites several sources that indicate laughing gulls are opportunistic foragers feeding on a wide-range of aquatic and terrestrial invertebrates, small vertebrates, garbage, and plant material, such as berries.

The current population of laughing gulls in Georgia is unknown. Belant and Dolbeer (1993) estimated the population of breeding laughing gulls in the United States was 258,851 pairs based on state population records. Non-breeding and sub-adult gulls were not considered as part of the United States breeding population estimated by Belant and Dolbeer (1993). Wintering laughing gulls have shown a general increasing trend since 1966 in Georgia based on CBC data (NAS 2002). There is currently no BBS data for laughing gulls in Georgia (Sauer et al. 2008). Belant and Dolbeer (1993) estimated a minimum of 230,000 adult laughing gulls may winter in States along the Gulf Coast. In the southeastern United States, the number of laughing gulls observed along routes surveyed during the BBS has increased annually since 1966 estimated at 3.6% which is a statistically significant increase (Sauer et al. 2008).

From FY 2004 through FY 2009, the WS program in Georgia has responded to two requests for assistance to manage damage or threats associated with laughing gulls. WS responded to those requests for assistance through technical assistance which provides those persons seeking assistance with information and recommendation on approaches to managing damage associated with laughing gulls. As populations of laughing gulls increase and in anticipation of addressing gulls at an increasing number of airports in Georgia, up to 50 laughing gulls could be taken annually in the State to alleviate damage and threats.

From 2004 through 2008, no take of laughing gulls has occurred under depredation permits issued by the USFWS in the State. In 2009, a total of five laughing gulls were lethally taken by other entities within the State pursuant to depredation permits issued by the USFWS to alleviate damage or threats of damage. The take of laughing gulls by WS would only occur after the issuance of a depredation permit by the USFWS. The take of up to 50 laughing gulls by WS annually in the State would represent 0.02% of the 230,000 adult laughing gulls estimated to overwinter along the Gulf Coast states. The permitting of the take by the USFWS, pursuant to the MBTA, ensures the take of up to 50 laughing gulls annually by WS would occur within allowable take levels to reach desired population objectives for laughing gulls. The take of laughing gulls would only occur as determined and analyzed by the USFWS to ensure the desired population objectives for laughing gulls are achieved.

Ring-billed Gull Population Impact Analysis

Ring-billed gulls are migratory birds which prefer to nest on islands with sparse vegetation. The breeding population of ring-billed gulls is divided into two populations; the western population and the eastern population. The eastern breeding population of the United States includes New York, Vermont, Ohio, Illinois, Michigan, Wisconsin, and Minnesota (Blokpoel and Tessier 1986). Ring-billed gulls nest in high densities and, in the Great Lakes region, nesting colonies may be located on islands, parklands, slag yards, rooftops, breakwalls, and landfills (Blokpoel and Tessier 1986).

Currently, there are no known breeding ring-billed gull colonies in Georgia. Ring-billed gulls do overwinter in Georgia mainly along the coastal regions of the State. In 1984, the population of ring-billed gulls in the Great Lakes region was estimated at approximately 648,000 pairs (Blokpoel and Tessier 1986). Blokpoel and Tessier (1992) found that the nesting population of ring-billed gulls in the Canadian portion of the lower Great Lakes system increased from 56,000 pairs to 283,000 pairs from 1976 to 1990. Across all BBS routes, the number of ring-billed gulls observed during the survey has shown an increasing trend in the United States estimated at 2.6% since 1966 which is a statistically significant increase (Sauer et al. 2008). In the northeastern United States where breeding populations occur, the number of ring-billed gulls observed during the BBS has increased 4.4% annually since 1966 which is also statistically significant (Sauer et al. 2008). In the southeastern United States, the number of ring-billed gulls observed during the BBS has shown an increasing trend estimated at 0.8% annually since 1966. More recently, the number of ring-billed gulls documented along routes of the BBS has increased annually in the southeastern United States estimated at 2.0% from 1980 through 2007 (Sauer et al. 2008). The numbers of ring-billed gulls observed in areas surveyed during the CBC are also showing a general increasing trend in the State (NAS 2002).

Similar to laughing gulls addressed previously, WS has not provided direct operational assistance with managing damage or threats associated with ring-billed gulls in the State. From FY 2004 through FY 2009, WS conducted eight technical assistance projects that addressed damage or threats associated with ring-billed gulls in the State. No ring-billed gulls were reported as taken pursuant to depredation permits issued by the USFWS for the take of ring-billed gulls to alleviate damage or threats in the State from 2004 through 2008. In 2009, other entities reported the take of 30 ring-billed gulls to alleviate damage or threats of damage in the State. No take of ring-billed gulls has occurred by WS from FY 2004 through FY 2009. However, based on the increasing population trends and the increasing number of airports requesting assistance with reducing threats associated with wildlife species, up to 50 ring-billed gulls could be lethally taken when authorized by a depredation permit issued by the USFWS.

Although no population estimates are available for the number of ring-billed gulls overwintering in the State, based on the increasing trends in the number of ring-billed gulls observed in the State, the magnitude of WS' take of up to 50 ring-billed gulls would likely be low. Take would only occur by WS after receipt of a depredation permit issued by the USFWS and take would only occur at levels allowed under the depredation permit but would not exceed 50 ring-billed gulls annually. The permitting of the take would ensure take by WS and take by other entities when authorized would occur within allowable levels to meet desired population objects established by the USFWS.

Eurasian Collared-Dove Population Impact Analysis

The Eurasian collared-dove was first introduced to North American when several were released in the Bahamas in the mid-1970s and have quickly expanded their range with established populations in the southeastern United States and localized populations elsewhere (Romagosa 2002). Since collared-doves are considered an introduced, non-native species in the United States, they are afforded no protection under the MBTA (70 FR 12710-12716). Collared-doves can be found nearly statewide in Georgia throughout the year (Romagosa 2002).

The current population of collared-doves in Georgia is currently unknown but has been estimated at 6,000 doves based on BBS data (Rich et al. 2004). Since 1966, BBS data indicates Eurasian collared-dove populations have increased annually at an estimated rate of 35.2% in Georgia with noticeable increases in the number of birds observed beginning in the mid- to late-1980s (Sauer et al. 2008). Since 1980, collared-doves are showing an estimated increase of 31.9% annually according to BBS data (Sauer et al. 2008). However, BBS data for the Eurasian collared-doves in Georgia has been designated as having an

important data deficiency (Sauer et al. 2008), likely due to doves only being observed on relatively few routes. CBC data indicates collared-doves were first observed in Georgia during that survey in 1994 when one dove was documented on one route (NAS 2002). In 2010, CBC data shows collared-doves were observed on 18 routes with a total of 374 doves observed (NAS 2002).

Since Eurasian collared-doves are afforded no protection from take under the MBTA, take can occur by any entity in Georgia without a depredation permit issued by the USFWS. Therefore, the take of collared-doves by entities other than WS for damage management purposes in unknown but is likely of low magnitude since doves are not associated with causing extensive damage to resources, except doves do pose threats to aircraft at airports. From FY 2004 through FY 2009, WS has lethally taken five Eurasian collared-doves in the State to alleviate damage. Eurasian collared-doves are similar in appearance to mourning doves and are often harvested during the regulated hunting season for mourning doves. Mourning doves can be harvested under frameworks established by the USFWS and implemented by the GDNR. However, since Eurasian collared-doves are considered a non-native species, no frameworks for the harvest of collared-doves exists. Therefore, the annual take of Eurasian collared-doves during the annual hunting season for mourning doves is not currently available.

Based on the increasing population trends of Eurasian collared-doves observed on BBS routes and the CBC along with the likelihood that collared-doves are likely to form mixed species flocks with mourning doves, the take of collared-doves to alleviate damage by WS would also likely occur. Based on the previous activities conducted by WS to alleviate damage associated with collared-doves and mourning doves, up to 100 Eurasian collared-doves could be lethally taken by WS annually in the State to alleviate damage or threats of damage.

Based on the best available information, WS' take of up to 100 doves annually, would represent 1.7% of the 6,000 collared-doves estimated in Georgia during the breeding season. Since Eurasian collared-doves are a non-native species in Georgia, take can occur without a depredation permit from the USFWS. However, the take of collared-doves could be viewed as benefiting native wildlife species since non-native species often compete with native species for resources, such as food and nesting habitat. Executive Order 13112 states that each Federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law; 1) reduce invasion of exotic species and the associated damages, 2) monitor invasive species populations, provide for restoration of native species and habitats, 3) conduct research on invasive species and develop technologies to prevent introduction, and 4) provide for environmentally sound control and promote public education on invasive species. WS' take of Eurasian collared-doves to reduce damage and threats would be in compliance with Executive Order 13112.

Mourning Dove Population Impact Analysis

Mourning doves are migratory game birds with substantial populations throughout much of North America. Mourning doves are the most abundant dove species in North America and are expanding their range northward (Ehrlich et al. 1988). Doves can be found throughout the year in Georgia (Otis et al. 2008). Due to the abundance of doves, many States have regulated annual hunting seasons for mourning doves. Georgia allows a hunting season each year with generous bag limits.

According to trend data provided by Sauer et al. (2008) from 1966 through 2007, the number of mourning doves observed on routes surveyed has shown a decreasing trend in the State estimated at -1.6% annually, which is a statistically significant trend. During call-count surveys conducted in the eastern United States in 2010, the number of mourning doves heard per route in Georgia averaged over 21 doves (Sanders and Parker 2010). The number of doves heard during the annual dove survey has shown a decreasing trend in Georgia from 1966 through 2009 estimated at -0.5% (Sanders and Parker 2010). Between 2009 and

2010, the number of doves heard during the call-count surveys decreased -7.2% in the State. A similar trend has been observed for the ten-year average from 2001 through 2010 which is showing a downward trend estimated -0.8% annually in the State (Sanders and Parker 2010). The numbers of mourning doves observed during the CBC have shown a general increasing trend in the State since 1966 (NAS 2002). Based on BBS data, Rich et al. (2004) estimated that statewide breeding population at 2.5 million mourning doves.

The number of doves addressed by WS and other entities is shown in Table 4.9. From FY 2004 through FY 2009, WS has addressed 3,712 doves in the State to alleviate damage and threats. Of those doves addressed by WS in the State from FY 2004 through FY 2009, 1,189 were addressed using lethally methods while 2,523 doves were addressed using non-lethal methods. No take by other entities occurred in the State from 2004 through 2008. In 2009, a total of 149 doves were lethally taken in the State by all entities to alleviate damage or threats of damage. The number of doves addressed by WS to alleviate damage and threats has increased annually from FY 2004 through FY 2008. Requests for assistance often arise from airports where the gregarious flocking behavior of doves can pose risks to aircraft at or near airports. Based on the number of requests to manage damage associated with doves received previously and based on the increasing need to address damage and threats associated with doves in the State, up to 2,000 mourning doves could be lethally taken by WS annually in the State to addressing damage or threats.

Table 4.9 – Number of mourning doves addressed in Georgia from 2004 to 2009

Year	Dispersed by WS[1]	Take by Entity	
		WS[1]	All Entities[2]
2004	0	0	0
2005	23	48	0
2006	200	212	0
2007	522	340	0
2008	1,003	525	0
2009	775	64	149
TOTAL	**2,523**	**1,189**	**149**

[1]The number of bird dispersed by WS and WS' take are reported by federal fiscal year

[2]Take by other entities is reported by calendar year

As mentioned previously, mourning doves maintain sufficient population levels to sustain an annual harvest. Annual hunting seasons are established by the GDNR under frameworks developed by the USFWS pursuant to the MBTA. Under those frameworks, an estimated 17.4 million mourning doves were harvested in the United States in 2008 with a similar number of doves harvested in 2009 (Raftovich et al. 2010). In Georgia, an estimated 718,700 doves were harvested in the State during the 2008 hunting season for doves while an estimated 857,200 doves were harvested during the 2009 hunting season in the State (Raftovich et al. 2010).

If WS had taken 2,000 mourning doves in 2008 and 2009, the take by WS would have represented 0.3% of the number of doves harvested in the State during 2008 and 0.2% of the estimated dove harvest in the State during 2009. An annual take by WS of up to 2,000 mourning doves would represent 0.08% of the estimated statewide breeding population of 2.5 million doves based on a stable population trend. Local populations of mourning doves in the State are likely augmented by migrating birds during the migration periods and during the winter months. Like other native bird species, the take of mourning doves by WS to alleviate damage would only occur when permitted by the USFWS pursuant to the MBTA through the issuance of depredation permits. Therefore, the take of mourning doves by WS would only occur when permitted by the USFWS and only at levels authorized which ensures WS' take and take by all entities,

including hunter harvest, are considered to achieve the desired population management levels of doves in the State.

American Crow Population Impact Analysis

American Crows have a wide range and are extremely abundant, being found across the United States (Verbeek and Caffrey 2002). Crows are found in both urban and rural environments and sometimes form large communal roosts in cities. In the United States, some crow roosts may reach a half-million birds (Verbeek and Caffrey 2002). American crows are found throughout the State and can be found throughout the year (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. Those large flocks disperse to different feeding areas during the day. Crows can fly from 6 to 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.
The American crow population in Georgia has been estimated at 830,000 crows statewide based on BBS data (Rich et al. 2004). From 1966 through 2007, trend data from the BBS indicates the number of crows observed in the State during the survey has increased at an annual rate of 0.5% (Sauer et al. 2008). The number of crows observed in the State in areas surveyed during the CBC has shown a general increasing trend since 1966 (NAS 2002).

As discussed previously, blackbirds, including crows, can be taken without 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 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 GDNR.

From FY 2004 through FY 2009, WS has addressed 1,063 crows in the State to manage damage or reduce threats. Of those 1,063 crows addressed by WS, 31 crows were lethally taken to alleviate damage or threats while 1,032 crows were addressed using non-lethal methods. As discussed previously, crows can be taken under the blackbird depredation order to alleviate damage or threats and reporting of take is not currently required under the depredation order. Therefore, the take of crows during the hunting season or to alleviate damage is currently unknown. The highest level of crow take by WS occurred in FY 2008 when 22 crows were addressed using lethal methods in the State. WS also addressed 620 crows in FY 2008 using non-lethal methods. Based on previous requests for assistance and in anticipation of an increase in the need to address an increasing number of requests for crow damage management, up to 200 American crows could be lethally taken annually by WS to alleviate damage in the State.

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. If crow populations have remained at least stable in the State, WS' annual take of up to 200 American crows would represent 0.02% of the estimated statewide crow population. 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. Similarly, the take of crows during the annual hunting season is likely of low magnitude when compared to the statewide population. Given that the number of American crows observed during statewide surveys are showing increasing trends (NAS 2002, Sauer et al. 2008), the population of crows have not declined since those population estimated were calculated and have likely remained at least stable despite the take of crows by WS and other entities under the depredation order and during the annual hunting season.

American Robin Population Impact Analysis

The conspicuous nature of the American robin and the close association of robins with human habitation, make the robin one of the most recognizable birds in the United States (Sallabanks and James 1999). Robins are often the harbinger of spring in many parts of the northern latitudes of North America as large flocks of robins begin arriving (Sallabanks and James 1999). Robins feed primarily on invertebrates and fruits throughout the year depending on food availability.

Robins can be found year-round in Georgia with populations increasing as northern birds migrate to wintering grounds in the southern United States, including Georgia. As the spring migration nears, robins often form large conspecific flocks that can be observed roosting and feeding together (Sallabanks and James 1999). Large flocks of robins during the spring migration period can pose a strike hazard to aircraft at airports.

The current population of robins in Georgia is unknown but likely fluctuates throughout the year depending on the season and the status of migration. Robins overwintering in Georgia have remained relatively stable since 1966 (NAS 2002). Similar to the overwintering populations of robins in Georgia, BBS data shows a stable breeding population in Georgia with a slight increase since 1966 estimated at 0.2% annually (Sauer et al. 2008). Since 1980, the breeding population of robins in Georgia has shown a stable to slightly declining trend estimated at -0.1% annually (Sauer et al. 2008). Rich et al. (2004) estimated the population of robins in Georgia to be one million birds based on statewide BBS data.

The take of American robins in Georgia to alleviate damage or threats by all entities is shown in Table 4.10. The only take of robins by the WS program in Georgia occurred in FY 2007 when 70 robins were lethally taken to address the threat of damages associated with large flocks of robins at or near airports. As part of damage management activities conducted in FY 2007 by WS, non-lethal methods were employed by WS to disperse 8,685 robins in the State to alleviate damage and threats of damage. No lethal take of robins has occurred in the State by other entities from 2006 through 2008. However, 200 robins were taken each year in the State to alleviate damage in 2004 and 2005 along with two robins reported taken in 2009 to alleviate damage or threats of damage.

Based on requests for assistance previously received by WS and to address increasing requests for assistance, the annual take of up to 200 robins could occur by WS to alleviate damage or reduce threats in the State. Using the population estimate of one million robins and based on a stable population, WS' take of up to 200 robins would represent 0.02% of the estimated population in Georgia. Although the take of robins by other entities has not occurred in the State since 2005, to address the potential impacts of cumulative take, the analyses would estimate that 200 robins are also taken by other entities in the State on an annual basis. If 200 robins were taken annually in the State by other entities in addition to the 200 robins taken by WS annually, the combined take would represent 0.04% of the estimated statewide population of robins if the population of robins remains stable.

Table 4.10 – Number of American robins addressed in Georgia from 2004 to 2009

Year	Dispersed by WS[1]	Take by Entity	
		WS[1]	Other Entities[2]
2004	0	0	200
2005	2,790	0	200
2006	0	0	0
2007	8,685	70	0
2008	0	0	0
2009	0	0	2
TOTAL	**11,475**	**70**	**402**

[1]The number of bird dispersed by WS and WS' take are reported by federal fiscal year

[2]Take by other entities is reported by calendar year

All take of robins by WS would occur only after a depredation permit has been issued by USFWS and only at levels allowed under the permit. Therefore, the cumulative take of robins in the State occurs at the discretion of the USFWS to meet desired population objectives for robins. Any take by WS and other entities pursuant to depredation permits would occur within take limits to ensure the take of robins occurs within the allowable limits.

Red-winged Blackbird Population Impact Analysis

The red-winged blackbird is one of the most abundant bird species in North America and is a commonly recognized bird that can be found in a variety of habitats (Yasukawa and Searcy 1995). The breeding habitat of red-winged blackbirds includes marshes and upland habitats from southern Alaska and Canada southward to Costa Rica extending from the Pacific to the Atlantic Coast along with the Caribbean Islands (Yasukawa and Searcy 1995). Primarily associated with emergent vegetation in freshwater wetlands and upland habitats during the breeding season, red-winged blackbirds also nest in marsh vegetation in roadside ditches, saltwater marshes, rice paddies, hay fields, pasture land, fallow fields, suburban habitats, and urban parks (Yasukawa and Searcy 1995). Northern breeding populations of red-winged blackbirds migrate southward during the migration periods but red-winged blackbirds are common year-round residents in States along the Gulf Coast and parts of the western United States (Yasukawa and Searcy 1995). During the migration periods, red-winged blackbirds often form mixed species flocks with other blackbird species.

In Georgia, red-winged blackbirds are considered year-round residents of the State (Yasukawa and Searcy 1995) with a breeding population estimated at 1.2 million birds (Rich et al. 2004). Trend data from the BBS indicates the number of red-winged blackbirds observed in the State during the breeding season has shown a declining trend since 1966 estimated at -3.0% annually which is a statistically significant trend (Sauer et al. 2008). More recent trend data from 1980 through 2007 also indicates a downward trend estimated at -3.7% annually (Sauer et al. 2008). Across all survey routes in the southeastern United States (USFWS Region 4), the number of red-winged blackbirds observed has shown downward trends since 1966 estimated at -1.6% annually (Sauer et al. 2008). The number of red-winged blackbirds observed during the CBC in the State has shown a highly cyclical pattern since 1966 (NAS 2002). Between 2001 and 2010, the average number of red-winged blackbirds observed in areas surveyed during the CBC has totaled nearly 1.5 million red-winged blackbirds. The highest number of red-winged blackbirds recorded during the CBC conducted in Georgia between 2001 and 2010 occurred in 2007 when nearly 5.5 million red-winged blackbirds were recorded (NAS 2002). The lowest number of red-winged blackbirds observed in the State during the CBC conducted between 2001 and 2010 occurred in 2010 when 19,500 red-winged blackbirds were recorded (NAS 2002) which provides an indication of the cyclical pattern of the number of blackbirds present in the State during the winter period.

As mentioned previously, CBC data is best interpreted as an indication of long-term trends in the number of birds observed wintering in the State and is not intended to represent population estimates of wintering bird populations. Data from the CBC would be considered a minimum population estimate given the survey parameters of the CBC and the survey only covering a small portion of the State.

Between FY 2004 and FY 2009, the WS program in Georgia dispersed nearly 28,000 blackbirds in mixed species flocks to alleviate damage or threats of damage in the State. As was mentioned previously, red-winged blackbirds often form mixed species flocks with other blackbird species and determining the number of birds of each species present in mixed species flocks can be difficult. Therefore, of the 28,000 blackbirds dispersed in mixed species flocks of blackbirds by WS, the number of red-winged blackbirds present in those flocks is unknown. The highest number of blackbirds addressed occurred in FY 2005 when 20,330 blackbirds in mixed species flocks were addressed by WS. The only lethal take of blackbirds by WS occurred in FY 2010 when 13 blackbirds were taken by firearms. The number of red-winged blackbirds taken was unknown. Since the take of blackbird species, including red-winged blackbirds, can occur without the need for a depredation permit when committing or about to commit damage, the number of red-winged blackbirds lethally taken by other entities in the State is unknown since reporting of take to the USFWS is currently not required.

Based on the number of blackbirds addressed by WS previously using non-lethal methods and the number of red-winged blackbirds present in the State during the breeding and migration season, WS could be requested to lethally take up to 100 red-winged blackbirds annually in the State to alleviate damage or threats of damage. With a breeding population estimated at 1.2 million red-winged blackbirds, the take of up to 100 red-winged blackbirds by WS annually would represent 0.01% of the estimated breeding population in the State. Using data from the CBC gathered in the State from 2001 through 2010, the take of up to 100 red-winged blackbirds by WS would have represented 0.01% of the average number of red-winged blackbirds observed in the State of 1.5 million red-winged blackbirds. The take of up to 100 red-winged blackbirds by WS would represent a low of 0.002% to a high of 0.5% of the number of red-winged blackbirds observed in the State during the CBC. The take of red-winged blackbirds by other entities is expected to be of low magnitude when compared to the statewide estimated population for Georgia.

Eastern Meadowlark Population Impact Analysis

The eastern meadowlark epitomizes the open habitats of the eastern United States, where the conspicuous nature and call of the meadowlark is easily recognizable (Lanyon 1995). Eastern meadowlarks can be found throughout the eastern United States in suitable habitat where it can be found year-round in many parts of their range which can be highly dependent on weather. In Georgia, eastern meadowlarks can be found year-round in the open, grassy areas of the State where they feed primarily on invertebrates and some plant material, such as weed seeds, grains, and some fruits (Lanyon 1995).

The open areas found at airports makes those areas ideal for meadowlarks to forage and nest while providing able perching areas. Most requests for assistance to reduce threats associated with meadowlarks occur at airports in Georgia. Meadowlarks found on and adjacent to airport property can pose a hazard to aircraft from being struck which can cause damage to the aircraft and potentially threatening passenger safety.

Data from the CBC indicates the numbers of meadowlarks observed in Georgia during the survey have been showing a declining trend since 1966 (NAS 2002). BBS data also shows a declining trend for meadowlarks observed during the survey in Georgia. Since 1966, meadowlarks are showing a declining trend estimated at -4.4% annually in Georgia according to BBS route data which is statistically significant

(Sauer et al. 2008). Based on BBS data, the statewide population of meadowlarks was estimated at 130,000 meadowlarks (Rich et al. 2004).

The numbers of eastern meadowlarks addressed by WS annually from FY 2004 through FY 2009 to alleviate damage or threats are shown in Table 4.11. The take of meadowlarks by other entities in the State did not occur from 2004 through 2008. A total of 157 meadowlarks were lethally taken in the State by all entities during 2009. No take of meadowlarks occurred by WS in FY 2004. From FY 2005 through FY 2009, WS employed lethal methods to take 110 meadowlarks in the State to alleviate damage or threats of damage. In addition, WS employed non-lethal methods to disperse 1,414 meadowlarks from FY 2005 through FY 2009.

Table 4.11 – Number of eastern meadowlarks addressed in Georgia from 2004 to 2009

Year	Dispersed by WS[1]	Take by Entity	
		WS[1]	All Entities[2]
2004	0	0	0
2005	508	27	0
2006	125	27	0
2007	210	24	0
2008	511	30	0
2009	60	2	157
TOTAL	**1,414**	**110**	**157**

[1]The number of bird dispersed by WS and WS' take are reported by federal fiscal year

[2]Take by other entities is reported by calendar year

On average, 18 meadowlarks were lethally addressed by WS from FY 2005 through FY 2009 while on average, 236 meadowlarks were addressed annually by WS using non-lethal methods during the same time frame. WS' highest take of meadowlarks occurred in FY 2008 when 30 meadowlarks were lethally taken. In addition, the highest number of meadowlarks addressed by WS using non-lethal methods also occurred in FY 2008 when 511 meadowlarks were addressed.

Based on the number of meadowlarks addressed by WS previously and based on an anticipation for the need to address an increasing number of requests for assistance, up to 200 meadowlarks could be taken annually by WS in the State. Using the best available population estimate for meadowlarks in the State, WS' take of up to 200 meadowlarks would represent 0.2% of the 130,000 meadowlarks present in the State during the breeding season. No take of meadowlarks occurred by other entities in the State from 2004 through 2008. Under depredation permits issued during 2009, a total of 157 meadowlarks were reported as taken to alleviate damage or threats of damage in the State. Although take could occur by other entities when authorized by the USFWS through the issuance of a depredation permit, the take of meadowlarks would not likely reach a magnitude where adverse affects to meadowlarks populations would occur from take to alleviate damage or threats.

The permitting of the take by the USFWS through the issuance of depredation permits pursuant to the MBTA ensures cumulative take of meadowlarks would be considered as part of population management objectives for meadowlarks.

Common Grackle Population Impact Analysis

Another blackbird species commonly found in mixed species flocks in Georgia is the common grackle. Common grackles are a semi-colonial nesting species often associated with human activities. Characterized by yellow eyes and iridescent bronze or purple plumage, common grackles are a common

conspicuous bird species found in urban and residential environments (Peer and Bollinger 1997). The breeding range of the common grackle includes Canada and the United States east of the Rocky Mountains with grackles found throughout the year in the United States except for the far northern and western portion of the species range in the United States (Peer and Bollinger 1997). Common grackles have likely benefited from human activities, such as the clearing of forests in the eastern United States which provides suitable nesting habitat and the planting of trees in residential areas which has led to an expansion of the species range into the western United States (Peer and Bollinger 1997).

Common grackles can be found throughout the year in Georgia (Peer and Bollinger 1997) with an estimated breeding population calculated at 2 million grackles (Rich et al. 2004). The number of grackles observed along routes surveyed in the State has shown a statistically significant downward trend between 1966 and 2007 estimated at -3.1% annually (Sauer et al. 2008). Between 1980 and 2007, the number of grackles observed during the BBS conducted in the State has also shown a downward trend estimated at -4.3% annually (Sauer et al. 2008). Downward trends have also been estimated for the number of grackles observed during the BBS conducted along routes in the southeastern United States (USFWS Region 4) estimated at -2.5% annually since 1966 as well as a downward trend across all routes surveyed in the United States estimated at -1.0% annually since 1966 (Sauer et al. 2006). Similar to other blackbird species, the number of common grackles observed in areas surveyed during the CBC has shown a cyclical pattern between 1966 and 2010 (NAS 2002). During surveys conducted from 2001 through 2010, the average number of grackles observed during the CBC conducted in the State has been nearly 94,000 grackles. The lowest number of grackles observed during the CBC from 2001 through 2010 occurred in 2001 when 3,044 grackles were recorded. The highest number of grackles recorded in the State during the CBC between 2001 through 2010 occurred in 2010 when 603,515 grackles were observed (NAS 2002).

Between FY 2004 and FY 2009, a total of 41 common grackles were dispersed using pyrotechnics by WS in the State which occurred in FY 2008. Since common grackles could be present in mixed species flocks of blackbirds, WS could be requested to employ lethal methods to take up to 100 common grackles annually. As was addressed previously, WS has dispersed nearly 28,000 blackbirds in mixed species flocks to address damage or threats of damage in the State between FY 2004 and FY 2009. The number of common grackles present in those flocks is unknown. In addition, 13 blackbirds were lethally taken in FY 2009 using a firearm. The species composition of those blackbirds taken is also unknown. Like other blackbird species, the take of common grackles can occur under the blackbird depredation order which allows blackbirds, including common grackles, to be taken when committing damage or about to commit damage without the need for a depredation permit from the USFWS. Therefore, the number of common grackles taken annually by other entities in the State is unknown.

If up to 100 common grackles are taken annually by WS, the take would represent 0.01% of the estimated 2 million common grackles breeding within the State. Using the data from the CBC, the take of up to 100 common grackles by WS would represent 0.1% of the average number of grackles observed in areas surveyed from 2001 through 2010. Using the range of grackles observed during the CBC from 2001 through 2010, a take of up to 100 grackles by WS would range from 0.02% to 3.3% of the number of grackles observed in the State. The take of common grackles by other entities is expected to be of low magnitude when compared to the statewide estimated population for Georgia.

Boat-tailed Grackle Population Impact Analysis

Boat-tailed grackles are a large, conspicuous blackbird found in the freshwater and saltwater marshes of the coastal regions of eastern North America usually breeding within 50 km of the tidewater (Post et al. 1996). Boat-tailed grackles can be found year-round along the coastal regions of Georgia and are often associated with human activities where they are omnivorous and opportunistic feeders (Post et al. 1996).

The mating system of the boat-tailed grackle has been identified as harem polygyny, where male grackles defend aggregated females from other male grackles and not territories (Post et al. 1996).

From 1966 through 2007, the number of boat-tailed grackles observed in the State on BBS routes has shown an increasing trend estimated at 14.3% annually (Sauer et al. 2008). However, important data deficiencies may be present in the data for boat-tailed grackles in Georgia (Sauer et al. 2008), likely based on the relatively few routes that grackles are observed on given their preference for breeding habitat located within 50 km of the tidewater. Trend data from the CBC indicates the number of grackles observed during the survey has shown a slight increase since 1972, but has shown recent cyclical trends (NAS 2002). Using BBS data, Rich et al. (2004) estimated the statewide population of boat-tailed grackles at 20,000 grackles.

Like other blackbirds, boat-tailed grackles can be lethally taken without a depredation permit when committing or about to commit damage or posing a human health and safety threat under the blackbird depredation order. Therefore, take of boat-tailed grackles to alleviate damage is not currently required to be reported to the USFWS annually. No take of boat-tailed grackles occurred by WS from FY 2004 through FY 2008. During FY 2009, a total of five boat-tailed grackles were lethally taken by WS to alleviate damage or to prevent damage from occurring. Since take by other entities is currently not required to be reported to the USFWS, the take of boat-tailed grackles by other entities is unknown. However, take by other entities to alleviate damage associated with boat-tailed grackles is likely nonexistent to minimal and is not anticipated to reach a magnitude where cumulative take would adversely affect grackle populations in the State.

Like other blackbird species, boat-tailed grackles often form gregarious flocks during the spring and fall migration periods that can pose hazards to aircraft at airports and result in agricultural damage from their feeding habits. As the number of airports requesting assistance from WS increases, the number of grackles addressed by WS to alleviate damage and threats is also likely to increase in the State. Based on the potential for an increase in requests for assistance to manage damage or threats associated with boat-tailed grackles, WS could take up to 100 grackles in the State to alleviate damage or threats of damage.

The take of up to 100 boat-tailed grackles annually by WS would represent 0.5% of the estimated population of 20,000 grackles. As mentioned previously, the take of grackles by other entities to alleviate damage or threats is likely non-existent to minimal in the State. The take of boat-tailed grackles by other entities is expected to be of low magnitude when compared to the statewide estimated population and the trend information available for Georgia.

Brown-headed Cowbird Population Impact Analysis

Brown-headed cowbirds are another species of the blackbird family commonly found in mixed species flocks during migration periods. Cowbirds are a common summer resident across the United States and southern Canada (Lowther 1993). Breeding populations in the northern range of the cowbird are migratory with cowbirds present year-round in much of the eastern United States and along the west Coast (Lowther 1993). Likely restricted to the range of the bison (*Bison bison*) before the presence of European settlers, cowbirds were likely a common occurrence on the short-grass plains where they fed on insects disturbed by foraging bison (Lowther 1993). Cowbirds expanded their breeding range as people began clearing forests for agricultural practices (Lowther 1993). Cowbirds are still commonly found in open grassland habitats but also inhabit urban and residential areas. Somewhat unique in their breeding habits, cowbirds are known as brood parasites meaning they lay their eggs in the nests of other bird species (Lowther 1993). Female cowbirds can lay up to 40 eggs per season with eggs reportedly being laid in the nests of over 220 species of birds, of which, 144 species have actually raised cowbird young

(Lowther 1993). No parental care is provided by cowbirds with the raising of cowbird young occurring by the host species.

In Georgia, the number of cowbirds observed in areas surveyed during the BBS has shown an increasing trend estimated at 0.4% annually between 1966 and 2007 (Sauer et al. 2008). From 1980 through 2007, the number of cowbirds observed in the State has shown a declining trend estimated at -0.3% annually (Sauer et al 2008). Rich et al. (2004) estimated the statewide breeding population of cowbirds at 370,000 cowbirds based on data from the BBS. In the southeastern United States (USFWS Region 4), cowbirds have shown a declining trend since 1966 estimated at -0.9% annually which is a statistically significant trend (Sauer et al. 2008). Across all BBS routes surveyed in the United States since 1966, the number of cowbirds has shown a declining trend estimated at -0.8% which is also a statistically significant downward trend (Sauer et al. 2008). Similar to other blackbird species, the number of cowbirds observed during the CBC conducted annually in the State has shown a cyclical pattern (NAS 2002). Observers on the CBC have recorded on average a total of 3,594 cowbirds each year from 2001 through 2010 (NAS 2002). During 2001, a total of 242 cowbirds were observed during the CBC conducted in the State which was the lowest number observed from 2001 through 2010 (NAS 2002). The highest number of cowbirds observed during the CBC conducted from 2001 through 2010 has been 12,078 cowbirds which were recorded during the CBC conducted during 2010 (NAS 2002).

WS has not previously received requests for assistance directly associated with brown-headed cowbirds in the State. No lethal take has occurred by WS between FY 2004 through FY 2009 and no cowbirds were dispersed. As was discussed previously, WS has dispersed blackbirds using non-lethal methods and employed lethal methods to take a total of 13 blackbird species in mixed species flocks. The number of cowbirds present in those mixed flocks of blackbirds addressed by WS is currently unknown. However, since cowbirds could be present in mixed species flocks of blackbirds, WS could lethally take up to 100 cowbirds annually in the State to alleviate damage or threats of damage. Like other blackbird species, the take of cowbirds can occur pursuant to the blackbird depredation order without the need for a depredation permit from the USFWS; therefore, the number of cowbirds taken annually by other entities to alleviate damage or threats of damage in the State is currently unknown. However, the take of cowbirds by other entities to alleviate damage or threats is likely non-existent to minimal in the State. The take of brown-headed cowbirds by other entities is expected to be of low magnitude when compared to the statewide estimated population and the trend information available for Georgia.

Based on a statewide breeding population estimated at 370,000 cowbirds, the take of up to 100 cowbirds by WS to alleviate damage or threats of damage would represent 0.03% of the estimated population. The take of up to 100 cowbirds by WS would represent 2.9% of the average number of cowbirds observed annually during the CBC conducted from 2001 through 2010. The take of cowbirds by other entities to alleviate damage or threats of damage under the blackbird depredation order is not likely to reach a level where cumulative adverse affects to the species' population would occur. Although cowbirds can cause damage or pose threats of damage, most take of cowbirds by WS would be the result of addressing flocks of mixed species flocks of blackbirds. That take is not likely to reach a level where adverse affects on the species' population would occur and will be of low magnitude when compared to the statewide population of cowbirds and trend data.

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

Bird 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 birds 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 bird 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 persons 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 birds in the State could lethally take birds despite WS' lack of direct involvement in the management action. Therefore, under this alternative the number of birds lethally taken would likely be similar to the other alternatives since take could occur through the issuance of a depredation permit by the USFWS, the take of blackbirds could occur under the blackbird depredation order without the need for a permit, the take of cormorants could occur under depredation orders without the need for a permit, take of non-native bird species could occur without the need for a depredation permit from the USFWS, and take would continue to occur during the harvest season for certain species. WS' participation in a management action would not be additive to an action that could occur in the absence of WS' participation.

With the oversight of the USFWS and the GDNR, it is unlikely that bird populations would be adversely impacted by implementation of this alternative. Under this alternative, WS would not be directly involved with damage management actions and direct operational assistance could be provided by other entities, such as the GDNR, 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 – No Bird Damage Management Conducted by WS

Under this alternative, WS would not conduct bird damage management activities in the State. WS would have no direct involvement with any aspect of addressing damage caused by birds and would provide no technical assistance. No take of birds by WS would occur in the State. Birds could continue to be lethally taken to resolve damage and/or threats occurring either through depredation permits issued by the USFWS, under depredation orders for blackbirds and cormorants, during the regulated hunting seasons, or in the case of non-native species, take can occur anytime using legally available methods. Management actions taken by non-federal entities would be considered the *environmental status quo*.

Local bird populations could decline, stay the same, or increase depending on actions taken by those persons experiencing bird 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 birds would still be taken under this alternative, the potential effects on the populations of those bird species in the State could 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. Therefore, any actions to resolve damage or reduce threats associated with birds could occur by other entities despite WS' lack of involvement under this alternative.

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 - Continuing the Current Integrated Approach to Managing Bird 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. Auditory and visual dispersal methods used to reduce damage or threats caused by birds 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 would 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 and the GDA 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 birds, except for Avitrol and mesurol, are derived from natural ingredients that pose a very low risk to non-targets when exposed to or when ingested.

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 birds under this alternative would include shooting and DRC-1339. In addition, birds could also be euthanized once live-captured by other methods. Lethal take of live-captured birds could occur from the use of cervical dislocation or by carbon dioxide. Available methods and the application of those methods to resolve bird 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 with the use of DRC-1339 is the potential non-target risks. All label requirements of DRC-1339 would 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 limit the likelihood that non-target species would 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 non-target 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 bird species 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 would retrieve all dead birds to the extent possible, following treatment with DRC-1339 to minimize secondary hazards associated with scavengers feeding on bird carcasses.

DRC-1339 Primary Hazard Profile - DRC-1339 was selected for reducing bird 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})[14] 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 estimated for over 55 species of birds (Eisemann et al. 2003). DRC-1339 is toxic to mourning doves, pigeons, quails (*Coturnix coturnix*), chickens, and ducks (*Anas* spp.) at ≥5.6 mg/kg (DeCino et al. 1966).

[14]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.

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 the 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 bioaccumulate 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 dogs to search for dead non-target animals and found no non-target carcasses that exhibited histological signs consistent

with DRC-1339 poisoning. The other studies also failed to detect any non-target 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 may travel from 100 meters (Kilham 1989) 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 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.

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 birds, 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 birds in Georgia is expected to be extremely low to non-existent. No non-targets have been taken by WS during prior bird damage management activities in the State. WS would monitor annually the take of non-target species to ensure program activities or methodologies used in bird damage management do not adversely impact non-targets. Methods available to resolve and prevent bird damage or threats when employed by trained, knowledgeable personnel are selective for target species. WS would annually report to the USFWS and/or the GDNR 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 bird damage management could benefit many other wildlife species that are impacted by predation or competition for habitat. For example, crows are generally very aggressive nesting area colonizers and would force other species from those prime nesting areas. American crows often feed on the eggs, nestlings, and fledglings of other bird species. This alternative has the greatest possibility of successfully reducing bird 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 other measures. Minimization 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 Georgia 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 would 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 (S. Tucker, USFWS pers. comm. 2010).

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

Alternative 2 - Bird 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, 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 if the person is familiar with the identifying characteristics of the target bird species.

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 and take other actions, the potential impacts to non-targets could be higher 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 birds 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 3 since WS would be available to provide information and advice.

Alternative 3 – No Bird Damage Management Conducted by WS

Under this alternative, WS would not be directly involved with bird 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, under depredation permits issued by USFWS, and under the depredation order for blackbirds and cormorants. No depredation permit is required to take non-native species. Risks to non-targets and T&E species would continue to occur from those who implement bird 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 bird 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 birds to other wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing damage management actions under this alternative.

Issue 3 - Effects of Damage 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 - Continuing the Current Integrated Approach to Managing Bird 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 birds 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 birds. 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 in the other alternatives. 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, lasers, and propane cannons, when used appropriately and in consideration of those risks, they can be used with a high degree of safety.

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

WS' employees who conducted bird damage management activities are knowledgably 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 birds. 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 would be conducted based on property ownership. If locations where methods would 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 or near 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 birds are typically walk-in style traps where birds enter but are unable to exit or involve nets. Therefore, human safety concerns associated with live traps used to capture birds 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 firearm use when employed to reduce damage and threats. To help ensure safe use and awareness, WS' employees who use firearms to conduct official duties are required to attend an approved firearm safety training course and to remain certified for firearm use, WS' employees must attend a re-certification safety training course in accordance with WS Directive 2.615. WS' employees who carry and use firearms as a condition of employment, are required to sign a form certifying that they have not been convicted of a misdemeanor crime of domestic violence. A thorough safety assessment would be conducted before firearms are deemed appropriate to alleviate or reduce damage and threats to human safety when conducting activities. WS would work closely with cooperators requesting assistance to ensure all safety issues 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 would be properly trained in the use of those methods. Training and adherence to agency directives would ensure the safety of employees applying chemical methods. Birds euthanized by WS or taken using chemical methods would be disposed of by deep burial or incinerated to ensure the risks to human safety are minimal (WS Directive 2.515). All euthanasia would 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 birds in the State could occur under the proposed action as part of an integrated approach to managing bird 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 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 T&E species. Mesurol is currently not registered for this purpose in Georgia but will be evaluated in this assessment as a repellent that could be employed under the proposed action 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 three 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 and 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 Georgia is DRC-1339 (3-chloro-p-toluidine hydrochloride) that could be used for

bird 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. 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 not 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 (*i.e.*, 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 November until the end of February the following calendar year with no daily take limit and no possession limit (GDNR 2010). 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 the 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, like other blackbirds, often stage (congregate) in an area prior to entering a roost location. The staging behavior often 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 within 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 (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 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 or 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. Residue of 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 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. Although no information is currently available on the number of people that might consume crows in Georgia, very few, if any, people are likely consuming crows harvested in Georgia or elsewhere. Crows are primarily harvested for recreational purposes and to alleviate damage in the State and are not harvested for subsistence (B. Rutledge, GDNR pers. comm. 2010). Thirdly, the tissue consumed would have to contain chemical residues of DRC-1339. 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 (*e.g.*, breast meat) in some bird species that have consumed DRC-1339, 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 which would not be achievable under normal baiting procedures.

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 birds be harvested during the regulated hunting season which is established by the GDNR 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 bird populations which could then reduce damage or threats would not increase risks to human safety. Safety requirements established by the GDNR for the regulated hunting season would further minimize risks associated with hunting. Although hunting accidents do occur, the recommendation of allowing hunting to reduce localized populations of birds would not increase those risks.

No adverse affects to human safety have occurred from WS' use of methods to alleviate bird damage in the State from FY 2004 through FY 2009. 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 2 - Bird 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 bird 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 mesurol 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 birds in the State. 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 birds 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 birds 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 birds be harvested during the regulated hunting season which is established by the GDNR would not increase risks to human safety above those risks already inherent with hunting birds. Recommendations of allowing hunting on property owned or managed by a cooperator to reduce bird populations which could then reduce bird damage or threats would not increase risks to human safety. Safety requirements established by the GDNR for the regulated hunting season would further minimize risks associated with hunting. Although hunting accidents do occur, the recommendation of allowing hunting to reduce localized bird populations would not increase those risks.

The recommendation of shooting with firearms either as a method of direct lethal take or harassment could occur under this alternative. Safety issues due arise related to misusing firearms and the potential human hazards associated with firearm 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 bird damage would be available under any of the alternatives and the use of firearms by those persons experiencing bird 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 birds, 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 bird damage could threaten human safety. However, when used appropriately methods available to alleviate damage would not threaten human safety.

Alternative 3 – No Bird Damage Management Conducted by WS

Under the no bird damage management alternative, WS would not be involved with any aspect of managing damage associated with birds in the State, including technical assistance. Due to the lack of involvement in managing damage caused by birds, no impacts to human safety would occur directly from WS. This alternative would not prevent those entities experiencing threats or damage from birds 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 mesurol would not be available under this alternative to those experiencing damage or threats from birds. Since most methods available to resolve or prevent bird damage or threats are available to anyone, the threats to human safety from the use of those methods are similar between the alternatives. However, methods employed by those not experienced in the use of methods or are not trained in their proper use, could increase threats to human safety. Overall, the methods available to the public, when applied correctly and appropriately, pose minimal risks to human safety.

Issue 4 - Effects on the Aesthetic Values of Birds

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

Alternative 1 - Continuing the Current Integrated Approach to Managing Bird 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 birds to resolve damage and threats. In some instances where birds are dispersed or removed, the ability of interested persons to observe and enjoy those birds would 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 would 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 birds to address or prevent damage and threats. The goal under the proposed action is to respond to requests for assistance and to manage those birds responsible for the resulting damage. Therefore, the ability to view and enjoy birds would still remain if a reasonable effort is made to locate

birds outside the area in which damage management activities occurred. Those birds 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 birds 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 bird densities.

Since those birds removed by WS under this alternative could be removed with a depredation permit issued by the USFWS, under blackbird and cormorant depredation orders, or the regulated hunting seasons, WS' involvement in taking those birds would not likely be additive to the number of birds that could be taken in the absence of WS' involvement.

WS' take of birds from FY 2004 through FY 2009 has been of low magnitude compared to the total mortality. WS' activities are not likely additive to the birds that would be taken in the absence of WS' involvement. Although birds removed by WS are no longer present for viewing or enjoying, those birds would likely be taken by the property owner or manager under a depredation permit, under the depredation orders, or during the annual harvest season. In the case of non-native species, take can occur at any time without the need for a depredation permit. Given the limited take proposed by WS under this alternative when compared to the known sources of mortality of birds and population information, WS' bird damage management activities conducted pursuant to the proposed action would not adversely affect the aesthetic value of birds. The impact on the aesthetic value of birds and the ability of the public to view and enjoy birds under the proposed action would be similar to the other alternatives and is likely low.

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

If those persons seeking assistance from WS were those persons likely to conduct bird damage management activities in the absence of WS' involvement, then technical assistance provided by WS would not adversely affect the aesthetic value of birds in the State similar to Alternative 1. Birds could be lethally taken under this alternative by those entities experiencing bird damage or threats which would result in localized reductions in the presence of birds at the location where damage was occurring. The presence of birds 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 birds 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 birds since any activities conducted to alleviate bird damage could occur in the absence of WS' participation in the action, either directly or indirectly.

Alternative 3 – No Bird Damage Management Conducted by WS

Under the no bird damage management by WS alternative, the actions of WS would have no impact on the aesthetic value of birds in the State. Those experiencing damage or threats from birds would be responsible for researching, obtaining, and using all methods as permitted by federal, state, and local laws and regulations. Birds 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, through depredation permits, and through the depredation orders.

Since birds would continue to be taken under this alternative, despite WS' lack of involvement, the ability to view and enjoy birds would likely be similar to the other alternatives. The lack of WS' involvement would not lead to a reduction in the number of birds dispersed or taken since WS' has no authority to

regulate take or the harassment of birds in the State. The USFWS and the GDNR with management authority over birds would continue to adjust all take levels based on population objectives for those bird species in the State. Therefore, the number of birds lethally taken annually through hunting, depredation permits, and under the depredation orders are regulated and adjusted by the USFWS and the GDNR.

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

Issue 5 - 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 bird damage and threats. The issues of method humaneness relating to the alternatives are discussed below.

Alternative 1 - Continuing the Current Integrated Approach to Managing Bird 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 would 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 bird damage and threats. Lethal methods would include shooting, DRC-1339, and euthanasia after birds are live-captured. WS' use of euthanasia methods under the proposed action would follow those required by WS' directives (WS Directive 2.505) 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 birds 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 bird damage or threats to human safety would 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 above 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 birds 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 bird 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 2 - Bird 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 requester employing those methods, the issue of humaneness would be similar to the proposed action.

WS would instruct and demonstrate the proper use and placement of methodologies to increase effectiveness in capturing target bird species and to ensure methods are used in such a way as to minimize pain and suffering. However, the efficacy of methods employed by a cooperator would be based on the skill and knowledge of the requestor in resolving the threat to safety or damage situation despite WS' demonstration. Therefore, a lack of understanding of the behavior of birds or improperly identifying the damage caused by birds 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 – No Bird Damage Management Conducted by WS

Under this alternative, WS would have no involvement in any aspect of bird damage management in Georgia. Those experiencing damage or threats associated with birds 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 birds.

Issue 6 – Effects of Bird Damage Management Activities on the Regulated Harvest of Birds

A common concern when addressing wildlife species with regulated hunting seasons is the potential for wildlife damage management activities to limit the ability to harvest those species during those seasons. Mourning doves and American crows maintain sufficient population densities in the State to sustain annual hunting seasons. Annual hunting seasons for mourning doves and American crows have been established by the USFWS pursuant to the MBTA through frameworks that are implemented by the GDNR.

Alternative 1 - Continuing the Current Integrated Approach to Managing Bird Damage (Proposed Action/No Action)

The magnitude of take of birds addressed in the proposed action would be low when compared to the population data and mortality of those species from all known sources. When WS' proposed take of birds 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 bird populations by the USFWS and the GDNR, the number of birds allowed to be taken by WS would not limit the ability of those interested to harvest those bird species during the regulated season. All take by WS would be reported to the USFWS and the GDNR annually to ensure take by WS is incorporated into population management objectives established for bird populations. Based on the limited take proposed by WS and the oversight by the USFWS and the GDNR, WS' take of birds annually would have no effect on the ability of those interested to harvest birds during the regulated harvest season.

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

WS would have no impact on regulated hunting since WS would not lethally remove birds under this alternative. However, resource/property owners could remove birds under depredation permits, depredation orders, and the regulated hunting seasons resulting in impacts similar to the proposed action and Alternative 3. 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 birds in the damage management area. However, the recommendation of harassment techniques to disperse birds could increase opportunities to harvest birds by dispersing those birds from areas where hunting is prohibited or restricted. However, the populations of those bird species would be unaffected by WS under this alternative.

Alternative 3 – No Bird Damage Management Conducted by WS

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

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 would continue to coordinate bird damage management activities and would report all take of birds to the USFWS and GDNR annually. WS would also annually monitor program activities to ensure those activities are within the scope analyzed in this EA.

Issue 1 - Effects of Damage Management Activities on Target Bird Populations

Evaluation of activities relative to target species indicated that program activities would likely have no cumulative adverse affects on bird 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 birds
- Human-induced mortality of birds 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 bird 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 bird population, the USFWS and the GDNR can adjust take levels, including the take of WS, to ensure population objectives for birds are achieved. Consultation and reporting of take by WS would ensure the USFWS and the GDNR considers any activities conducted by WS.

WS' take of birds in Georgia from FY 2004 through FY 2009 was of a low magnitude when compared to the total known take and when compared to available population information. The USFWS and the GDNR considers all known take when determining population objectives for birds and can adjust the number of birds that can taken during the regulated hunting season and the number of birds taken for damage management purposes to achieve the population objectives. Any take by WS would occur at the discretion of the USFWS and the GDNR. Any bird population declines or increases would be the collective objective for bird populations established by the USFWS and the GDNR through the regulation of take. Therefore, the cumulative take of birds annually or over time by WS would occur at the desire of the USFWS and the GDNR as part of management objectives for birds in the State.

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

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

Bird 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 bird populations and that WS' activities are considered as part of management goals established by those agencies. Historically, WS' activities to manage birds in Georgia have not reached a magnitude that would cause adverse impacts to bird population in the State.

2. SOP and strategies built into the WS program

SOPs and minimization measures are designed to reduce the potential negative effects of WS' actions on birds, 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 SOPs and mitigation measures, and implementation is insured through monitoring, in accordance with the WS' Decision Model (Slate et al. 1992, USDA 1997).

3. Current status of potentially affected wildlife species

Natural and human-induced mortality patterns for birds are expected to remain essentially unchanged in Georgia. 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 Georgia.

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

Potential effects on non-target species from conducting bird 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 birds has the potential to exclude, disperse, or capture non-target wildlife. However, the effects of non-lethal methods are often temporary and often do not involve the take (killing) of non-target wildlife species. When using exclusion devices and/or repellents, both target and non-target wildlife can be prevented from accessing the resource being damaged. Since exclusion does not involve lethal take, cumulative impacts on non-target species from the use of exclusionary methods would not occur but would likely disperse those individuals to other areas. Exclusionary methods are often expensive and require constant maintenance to ensure effectiveness. Therefore, the use of exclusionary devices would be somewhat limited to small, high-value areas and not used to the extent that non-targets are excluded from large areas that would cumulatively impact populations from the inability to access a resource, such as potential food sources or nesting 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. With all live-capture devices, non-target wildlife captured can be released on site if determined to be able to survive following release. Minimization measures 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 would 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. The use of DRC-1339 requires pre-baiting and monitoring of potential bait sites for non-target activity. All chemicals would be used according to product label which ensure that proper use would 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 with WS' Directives and relevant federal, state, and local 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 would 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 non-target birds are observed feeding on bait, those sites are abandoned. WS would retrieve all dead birds to the extent possible, following treatment with DRC-1339 to minimize secondary hazards associated with scavengers feeding on bird carcasses.

Repellents may also be used or recommended by the WS program in Georgia to manage bird 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 birds in Georgia, 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 Georgia 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 in Georgia during bird damage management activities from FY 2004 through FY 2009. Based on the methods available to resolve bird damage and/or threats, WS does not anticipate the number of non-targets taken to reach a magnitude where declines in those species' populations would occur. Therefore, take of non-targets under the proposed action would not cumulatively impact non-target

species. WS' has reviewed the T&E species listed by the GDNR, the USFWS, and the National Marine Fisheries Services and has determined that bird damage management activities proposed by WS would not likely adversely affect T&E species. Cumulative impacts would be minimal on non-targets from any of the alternatives discussed**.**

Issue 3 - Effects of Damage 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 would have no effect on human safety. All methods are agreed upon by the requesting entities which are made aware of the safety issues of those methods when entering into a MOU, cooperative service agreement, or other comparable document between WS and the cooperating entity. SOPs 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 would continue to be trained to be proficient in the use of those methods to ensure safety of the applicator and to the public. Based on the use patterns of non-chemical methods, those methods would not cumulatively impact human safety.

Repellents to disperse birds 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.

Bird 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 birds in Georgia. 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 bird damage management programs in Georgia, 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. DRC-1339 has not been used by the WS program in Georgia from FY 2004 through FY 2009 to manage bird 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 Georgia.

WS has received no reports or documented any adverse affects to human safety from WS' bird damage management activities conducted from FY 2004 through FY 2009. 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 bird damage in the State.

Issue 4 - Effects on the Aesthetic Values of Birds

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

WS has no direct impact on the status of the bird population since all take by WS occurs at the discretion of the USFWS and the GDNR. Since those persons seeking assistance could remove birds from areas where damage is occurring with a permit from the USFWS or the GDNR, WS' involvement would have no effect of the aesthetic value of birds in the area where damage was occurring. When damage caused by birds has occurred, any removal of birds by the property or resource owner would likely occur whether WS was involved with taking the birds 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 - 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) would 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 birds would be applied according to AVMA guidelines for free-ranging wildlife. Shooting would occur in limited situations and personnel would be trained in the proper use of firearms to minimize pain and suffering of birds 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 birds in the State, the cumulative impacts on the issue of method humaneness are minimal.

Issue 6 – Effects of Bird Damage Management Activities on the Regulated Harvest of Birds

As discussed in this EA, the magnitude of WS' bird take for damage management purposes from FY 2004 through FY 2009 was low when compared to the total take of birds and when compared to the estimated statewide populations of those species. Since all take of birds is regulated by the USFWS and the GDNR, the take of birds by WS that would occur annually and cumulatively would occur pursuant to bird population objectives established in the State. WS' take of birds (combined take) annually to alleviate damage would be a minor component of the known annual take that occurs during the harvest seasons for mourning doves and American crows.

With oversight of bird take, the USFWS and the GDNR maintains the ability to regulate take by WS to meet management objectives for birds in the State. Therefore, the cumulative take of birds is considered as part of the USFWS and the GDNR objectives for bird populations in the State.

CHAPTER 5 - LIST OF PREPARERS AND PERSONS CONSULTED

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APPENDIX A
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APPENDIX B

BIRD DAMAGE MANAGEMENT (BDM) METHODS AVAILABLE FOR USE OR RECOMMENDATION BY THE GEORGIA WS' PROGRAM

In selecting damage management techniques for specific damage situations, consideration is given to the responsible species and the magnitude, geographic extent, duration and frequency, and likelihood of wildlife damage. Consideration is also given to the status of target and potential non-target species, local environmental conditions and impacts, social and legal aspects, and relative costs of damage reduction options. The cost of damage reduction may sometimes be a secondary concern because of the overriding environmental, legal, and animal welfare considerations. Those factors are evaluated in formulating damage management strategies that incorporate the application of one or more techniques.

A variety of methods are potentially available to the WS program in Georgia relative to the management or reduction of damage caused by birds. Various federal, State, and local statutes and regulations and WS directives govern WS' use of damage management tools and substances. WS develops and recommends or implements damage management strategies based on resource management, physical exclusion, and wildlife management approaches. Within each approach there may be available a number of specific methods or tactics. The following methods and materials are recommended or used in technical assistance and direct damage management efforts of the WS program in Georgia.

NON-LETHAL METHODS - NONCHEMICAL

Agricultural producer and property owner practices. These consist primarily of non-lethal 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 BDM. Wildlife production and/or presence are 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 BDM 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, blackbirds, and starlings 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 physical barriers 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:

- X Bird-proof barriers
- X Electronic guards
- X Propane exploders
- X Pyrotechnics
- X Distress Calls and sound producing devices
- X Chemical frightening agents
- X Repellents
- X Scare crows
- X Mylar tape
- X Lasers
- X 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 (Arhart 1972, Rossbach 1975, Conover 1982, Shirota and Masake 1983, Schmidt and Johnson 1984, Mott 1985, Graves and Andelt 1987, Bomford 1990). 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 birds 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 birds from feeding, loafing, staging, or roosting at that site. A few people would find exclusionary devices such as netting unsightly, trashy, 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 (Arhart 1972, Rossbach 1975, Shirota and Masake 1983, Schmidt and Johnson 1984, Mott 1985, Bomford 1990). 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. 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.

Lasers are a non-lethal technique recently evaluated by the NWRC (Glahn et al. 2000*b*, Blackwell et al. 2002). For best results and to disperse numerous birds from a roost, the laser is most effectively used in periods of low light, such as after sunset and before sunrise. In the daytime, the laser can also be used during overcast conditions or in shaded areas to move individual and small numbers of birds, although the effective range of the laser is much diminished. Blackwell et al. (2002) tested lasers on several bird species and observed varied results among species. Lasers were ineffective at dispersing pigeons and mallard with birds habituating in approximately 5 minutes and 20 minutes, respectively (Blackwell et al. 2002). As with other BDM tools lasers are most effective when used as part of an integrated management program.

Live traps (although live traps are non-lethal, birds may be euthanized upon capture). In most situations live trapped birds 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 or a veterinarian.

Nest box traps may be used by WS for corrective damage management and are effective in capturing local breeding and post breeding European Starlings and other targeted secondary cavity nesting birds (DeHaven and Guarino 1969, Knittle and Guarino 1976).

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 1950s 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.

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.

Lure crops/alternate foods. When damage 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.

NON-LETHAL METHODS - CHEMICAL

Avitrol is a chemical frightening agent (repellent) that is effective in a single dose when mixed with untreated baits, normally in a 1:9 ratio. Avitrol, however, is not completely non-lethal in that a small portion of the birds are generally killed (Johnson and Glahn 1994). Prebaiting is usually necessary to achieve effective bait acceptance by the target species. This chemical is registered for use on pigeons, crows, blackbirds, starlings, and House Sparrows in various situations. Avitrol treated bait is placed in an area where the targeted birds are feeding. When a treated particle is consumed affected bird begins to broadcast distress vocalizations and display abnormal flying behavior, thereby frightening the remaining flock away.

Avitrol is a restricted use pesticide that can only be sold to certified applicators and is available in several bait formulations where only a small portion of the individual grains carry the chemical. It can be used during anytime of the year, but is used most often during winter and spring. Any granivorous bird associated with the target species could be affected by Avitrol. Avitrol is water soluble, but laboratory studies demonstrated that Avitrol is strongly absorbed onto soil colloids and has moderately low mobility. Biodegradation is expected to be slow in soil and water, with a half-life ranging from three to 22 months. However, Avitrol may form covalent bonds with humic materials, which may serve to reduce its availability for intake by organisms from water, is non-accumulative in tissues and rapidly metabolized by many species (Schafer 1991).

Avitrol is acutely toxic to avian and mammalian species, however, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning and during field use only magpies and crows appear to have been affected (Schafer 1991). However, a laboratory study by Schafer et al. (1974) showed that magpies exposed to two to 3.2 times the published LD_{50} in contaminated prey for 20 days were not adversely affected and three American kestrels that were fed contaminated blackbirds for seven to 45 days were not adversely affected. Some hazards may occur to predatory species consuming unabsorbed chemical in the GI tract of affected or dead birds (Schafer 1981, Holler and Shafer 1982). A formal Risk Assessment found no probable risk is expected for pets and the public, based on low concentrations and low hazards quotient value for non-target indicator species tested on this compound (USDA 1997).

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. Methyl anthranilate (MA) (artificial grape flavoring food additive) has been shown to be a promising repellent for many bird species, including waterfowl (Dolbeer et al. 1993*b*). Cummings et al. (1995) found effectiveness of MA declined significantly after 7 days. Belant et al. (1996) found MA ineffective as a bird grazing repellent, even when applied at triple the recommended label rate. MA is also under investigation as a potential bird taste repellent. MA 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[15]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[16]), 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 U.S. Food and Drug Administration (FDA) (Dolbeer et al. 1992).

Water surface and turf applications of MA 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, MA 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 MA 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 non-irritating 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.

MA 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 FDA.

Mesurol was recently registered by WS to repel crows and ravens from bird 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

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[15] 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.

[16] 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.

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 would 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.

Particulate feed additives have been investigated for their bird-repellent characteristics. In pen trials, European Starlings rejected grain to which charcoal particles were adhered. If further research finds this method to be effective and economical in field application, it might become available as a bird repellent on livestock feed. Charcoal feed additives have been explored for use in reducing methane production in livestock and should have no adverse effects on livestock, on meat or milk production, or on human consumers of meat or dairy products.

Other chemical repellents. A number of other chemicals have shown bird repellent capabilities. Anthraquinone, 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). Compounds extracted from common spices used in cooking and applied to perches in cage tests have been shown to have repellent characteristics against roosting European Starlings (Clark 1997). Naphthalene (moth balls) was found to be ineffective in repelling European Starlings (Dolbeer et al. 1988).

Tactile repellents. 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.

Alpha-chloralose is a central nervous system depressant used as an immobilizing agent to capture and remove pigeons, waterfowl and other birds. It is labor intensive and in some cases, may not be cost effective (Wright 1973, Feare et al. 1981). Alpha-chloralose is typically delivered in a contained bait in small quantities with minimal hazards to pets and humans; single bread or corn baits are fed directly to the target birds. WS' personnel are present at the site of application during baiting to retrieve the immobilized birds. Unconsumed baits are removed from the site following each treatment. Alpha-chloralose was eliminated from more detailed analysis in USDA (1997) based on critical element screening; therefore, environmental fate properties of this compound were not rigorously assessed. However, the solubility and mobility are believed to be moderate and environmental persistence is believed to be low. Bioaccumulation in plants and animal tissue is believed to be low. Alpha-chloralose is used in other countries as an avian and mammalian toxicant. The compound is slowly metabolized, with recovery occurring a few hours after administration (Schafer 1991). The dose used for

immobilization is designed to be about two to 30 times lower than the LD_{50}. Mammalian data indicate higher LD_{50} values than birds. Toxicity to aquatic organisms is unknown (Woronecki et al. 1990) but the compound is not generally soluble in water and therefore should remain unavailable to aquatic organisms. Factors supporting the determination of this low potential included the lack of exposure to pets, non-target species and the public, and the low toxicity of the active ingredient. Other supporting rationale for this determination included relatively low total annual use and a limited number of potential exposure pathways. The agent is currently approved for use by WS as an Investigative New Animal Drug by the FDA rather than a pesticide.

Egg oiling is a method for suppressing reproduction of nuisance birds by spraying a small quantity of food grade vegetable oil or mineral 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.

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 non-lethal 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 BDM 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 and use training program within 3 months of their appointment and a refresher course every 2 years afterwards (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 GDNR 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 a humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of poultry and other small birds

(Beaver et al. 2001). Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and is rapidly accomplished (Beaver et al. 2001).

Snap traps are modified rat snap traps used to remove individual European Starlings, and other cavity using birds. The trap treadle is baited with peanut butter or other food attractants and attached near the damage area caused by the offending bird. These traps pose no imminent danger to pets or the public, and are usually located in positions inaccessible to people and most non-avian animals. They are very selective because they are usually set in the defended territory of the target birds.

LETHAL METHODS - CHEMICAL

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

CO_2 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. CO_2 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 (Beaver et al. 2001). CO_2 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 CO_2 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 bird 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 (Decino et al. 1966, Besser et al. 1967, West et al. 1967). 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 1984, 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.

APPENDIX C

THREATENED AND ENDANGERED SPECIES THAT ARE FEDERALLY LISTED (OR CANDIDATE SPECIES) IN THE STATE OF GEORGIA

Animals -- 42

Status	Species/Listing Name
E	Acornshell, southern (*Epioblasma othcaloogensis*)
T	Bankclimber, purple (mussel) (*Elliptoideus sloatianus*)
E	Bat, gray (*Myotis grisescens*)
E	Bat, Indiana (*Myotis sodalis*)
E	Beetle, American burying (*Nicrophorus americanus*)
T	Chub, spotfin (*Erimonax monachus*)
E	Clubshell, ovate (*Pleurobema perovatum*)
E	Clubshell, southern *(Pleurobema decisum)*
E	Combshell, upland *(Epioblasma metastriata)*
E	Darter, amber *(Percina antesella)*
E	Darter, Cherokee *(Etheostoma scotti)*
E	Darter, Etowah (*Etheostoma etowahae)*
T	Darter, goldline *(Percina aurolineata)*
T	Darter, snail *(Percina tanasi)*
E	Hornsnail, rough (*Pleurocera foremani*)
E	Kidneyshell, triangular *(Ptychobranchus greenii)*
E	Lampmussel, Georgia *(Lampsilis virescens)*
E	Lioplax, cylindrical (*Lioplax cyclostomaformis*)
E	Logperch, Consauga *(Percina jenkinsi)*
E	Manatee, West Indian *(Trichechus manatus)*
T	Moccasinshell, Alabama *(Medionidus acutissimus)*
E	Moccasinshell, Coosa *(Medionidus parvulus)*
E	Moccasinshell, Gulf *(Medionidus penicillatus)*
E	Moccansinshell, Ochlocknee *(Medionidus simpsonianus)*
E	Mussel, oyster (*Epioblasma capsaeformis*)
E	Panther, Florida (*Puma concolor coryi*)
E	Pigtoe, Georgia (*Pleurobema hanleyianum*)
E	Pigtoe, oval *(Pleurobema pyriforme)*
E	Pigtoe, southern *(Pleurobema georgianum)*
T	Plover, piping except Great Lakes watershed *(Charadrius melodus)*
T	Pocketbook, finelined *(Lampsilis altilis)*
E	Pocketbook, shinyrayed *(Lampsilis subangulata)*
E	Rocksnail, interrupted (*Leptoxis foremani*)
E	Riversnail, Anthony's (*Athearnia anthonyi*)
T	Salamander, frosted flatwoods *(Ambystoma cingulatum)*
E	Salamander, Reticulated flatwoods *(Ambystoma bishopi)*
E	Sawtooth, smalltooth *(Pristis pectinata)*
T	Sea turtle, green except where endangered *(Chelonia mydas)*
E	Sea turtle, hawksbill *(Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley *(Lepidochelys kempii)*
E	Sea turtle, leatherback *(Dermochelys coriacea)*
T	Sea turtle, loggerhead *(Caretta caretta*)
T	Shiner, blue *(Cyprinella caerulea)*
T	Snake, eastern indigo *(Drymarchon corais couperi)*
E	Stork, wood AL, FL, GA, SC *(Mycteria americana)*
T	Sturgeon, gulf (*Acipenser oxyrinchus desotoi*)
E	Sturgeon, shortnose *(Acipenser brevirostrum)*
T	Tern, roseate Western Hemisphere except NE U.S. *(Sterna dougalii dougalii)*

E	Three-ridge, fat (mussel) *(Amblema neislerii)*
E	Whale, finback *(Balaenoptera physalus)*
E	Whale, humpback *(Megaptera novaeangliae)*
E	Whale, right *(Balaena glacialis (incl.australis))*
E	Wolf, gray (*Canis lupus*)
E	Woodpecker, red-cockaded *(Picoides borealis)*

Plants -- 24

Status	**Species/Listing Name**
T	Amphianthus, little *(Amphianthus pusillus)*
T	Button, Mohr's Barbara *(Marshallia mohrii)*
T	Campion, fringed *(Silene polypetala)*
E	Chaffseed, American *(Schwalbea americana)*
E	Coneflower, smooth *(Echinacea laevigata)*
E	Dropwort, Canby's *(Oxypolis canbyi)*
E	Grass, Tennessee yellow-eyed *(Xyris tennesseensis*)
E	Harperella *(Ptilimnium nodosum)*
E	Leather flower, Alabama *(Clematis socialis)*
E	Meadowrue, Cooley's *(Thalictrum cooleyi)*
T	Pink, swamp *(Helonias bullata)*
E	Pitcher-plant, green *(Sarracenia oreophila)*
T	Pogonia, *small* whorled *(Isotria medeoloides)*
E	Pondberry *(Lindera melissifolia)*
E	Quillwort, black spored *(Isoetes melanospora)*
E	Quillwort, mat-forming *(Isoetes tegetiformans)*
E	Rattleweed, hairy *(Baptisia arachnifera)*
T	Skullcap, large-flowered *(Scutellaria montana)*
T	Spiraea, Virginia *(Spiraea virginiana)*
E	Sumac, Michaux's *(Rhus michauxii)*
E	Torreya, Florida *(Torreya taxifolia)*
E	Trillium, persistant *(Trillium persistens)*
E	Trillium, relict *(Trillium reliquum)*
T	Water-plantain, Kral's *(Sagittaria secundifolia)*

APPENDIX D

STATE LISTED THREATENED AND ENDANGERED SPECIES (OR CANDIDATE SPECIES) IN THE STATE OF GEORGIA

391-4-10-.09 Protected Species of Plants and Animals. Amended.

Mammals:

***Corynorhinus rafinesquii*:** Rafinesque's Big-eared Bat (rare)
***Eubalaena glacialis*:** North Atlantic Right Whale (endangered)
Geomys pinetis: Southeastern Pocket Gopher (threatened)
***Megaptera novaeangliae*:** Humpback Whale (endangered)
***Myotis grisescens*:** Gray Bat (endangered)
***Myotis sodalis*:** Indiana Bat (endangered)
***Neofiber alleni*:** Round-tailed Muskrat (threatened)
***Puma concolor coryi*:** Florida Panther (endangered)
***Sylvilagus obscurus*:** Appalachian Cottontail (rare)
Trichechus manatus: West Indian Manatee (endangered)

Birds:

***Aimophila aestivalis*:** Bachman's Sparrow (rare)
Ammodramus henslowii: Henslow's Sparrow (rare)
***Calidris canutus*:** Red Knot (rare)
***Campephilus principalis*:** Ivory-billed Woodpecker (endangered)
***Charadrius melodus*:** Piping Plover (threatened)
***Charadrius wilsonia*:** Wilson's Plover (threatened)
***Corvus corax*:** Common Raven (rare)
***Dendroica cerulea*:** Cerulean Warbler (rare)
***Dendroica kirtlandii*:** Kirtland's Warbler (endangered)
***Elanoides forficatus*:** Swallow-tailed Kite (rare)
***Falco peregrinus*:** Peregrine Falcon (rare)
***Falco sparverius paulus*:** Southeastern Kestrel (rare)
***Haematopus palliatus*:** American Oystercatcher (rare)
***Haliaeetus leucocephalus*:** Bald Eagle (threatened)
***Mycteria americana*:** Wood Stork (endangered)
***Picoides borealis*:** Red-cockaded Woodpecker (endangered)
***Rynchops niger*:** Black Skimmer (rare)
***Sterna antillarum*:** Least Tern (rare)
***Sterna nilotica*:** Gull-billed Tern (threatened)
***Vermivora chrysoptera*:** Golden-winged Warbler (endangered)

Reptiles:

***Caretta caretta*:** Loggerhead Sea Turtle (endangered)
***Chelonia mydas*:** Green Sea Turtle (threatened)
***Clemmys guttata*:** Spotted Turtle (unusual)
***Dermochelys coriacea*:** Leatherback Sea Turtle (endangered)
***Drymarchon couperi*:** Eastern Indigo Snake (threatened)
***Eretmochelys imbricata*:** Hawksbill Sea Turtle (endangered)

***Glyptemys muhlenbergii*:** Bog Turtle (endangered)
***Gopherus polyphemus*:** Gopher Tortoise (threatened)
***Graptemys barbouri*:** Barbour's Map Turtle (threatened)
***Graptemys geographica*:** Common Map Turtle (rare)
***Graptemys pulchra*:** Alabama Map Turtle (rare)
Heterodon simus: Southern Hognose Snake (threatened)
***Lepidochelys kempii*:** Kemp's Ridley Sea Turtle (endangered)
***Macrochelys temminckii*:** Alligator Snapping Turtle (threatened)
***Malaclemys terrapin*:** Diamondback Terrapin (unusual)
***Ophisaurus mimicus*:** Mimic Glass Lizard (rare)

Amphibians:

***Ambystoma cingulatum*:** Flatwoods Salamander (threatened)
***Amphiuma pholeter*:** One-toed Amphiuma (rare)
***Aneides aeneus*:** Green Salamander (rare)
***Cryptobranchus alleganiensis*:** Hellbender (threatened)
***Gyrinophilus palleucus*:** Tennessee Cave Salamander (threatened)
***Haideotriton wallacei*:** Georgia Blind Salamander (threatened)
***Notophthalmus perstriatus*:** Striped Newt (threatened)
***Plethodon petraeus*:** Pigeon Mountain Salamander (rare)
***Rana capito*:** Gopher Frog (rare)

Fishes:

***Acipenser brevirostrum*:** Shortnose Sturgeon (endangered)
***Alosa alabamae*:** Alabama Shad (threatened)
***Ameiurus serracanthus*:** Spotted Bullhead (rare)
***Cyprinella caerulea*:** Blue Shiner (endangered)
***Cyprinella callitaenia*:** Bluestripe Shiner (rare)
***Cyprinella xaenura*:** Altamaha Shiner (threatened)
***Elassoma okatie*:** Bluebarred Pygmy Sunfish (endangered)
***Enneacanthus chaetodon*:** Blackbanded Sunfish (endangered)
***Erimystax insignis*:** Blotched Chub (endangered)
***Etheostoma brevirostrum*:** Holiday Darter (endangered)
***Etheostoma chlorobranchium*:** Greenfin Darter (threatened)
***Etheostoma chuckwachatte*:** Lipstick Darter (endangered)
***Etheostoma ditrema*:** Coldwater Darter (endangered)
***Etheostoma duryi*:** Black Darter (rare)
***Etheostoma etowahae*:** Etowah Darter (endangered)
***Etheostoma parvipinne*:** Goldstripe Darter (rare)
***Etheostoma rupestre*:** Rock Darter (rare)
***Etheostoma scotti*:** Cherokee Darter (threatened)
***Etheostoma tallapoosae*:** Tallapoosa Darter (rare)
***Etheostoma trisella*:** Trispot Darter (endangered)
***Etheostoma vulneratum*:** Wounded Darter (endangered)
***Fundulus bifax*:** Stippled Studfish (endangered)
***Fundulus catenatus*:** Northern Studfish (rare)
***Hemitremia flammea*:** Flame Chub (endangered)
***Hybopsis lineapunctata*:** Lined Chub (rare)
***Ichthyomyzon bdellium*:** Ohio Lamprey (rare)

***Lucania goodei*:** Bluefin Killifish (rare)
***Macrhybopsis* sp.:** Coosa Chub (endangered)
***Micropterus notius*:** Suwannee Bass (rare)
***Moxostoma carinatum*:** River Redhorse (rare)
***Moxostoma robustum*:** Robust Redhorse (endangered)
***Moxostoma* sp.:** Sicklefin Redhorse (endangered)
***Notropis ariommus*:** Popeye Shiner (endangered)
***Notropis asperifrons*:** Burrhead Shiner (threatened)
***Notropis hypsilepis*:** Highscale Shiner (rare)
***Notropis photogenis*:** Silver Shiner (endangered)
***Notropis scepticus*:** Sandbar Shiner (rare)
***Noturus eleutherus*:** Mountain Madtom (endangered)
***Noturus munitus*:** Frecklebelly Madtom (endangered)
***Percina antesella*:** Amber Darter (endangered)
***Percina aurantiaca*:** Tangerine Darter (endangered)
***Percina aurolineata*:** Goldline Darter (endangered)
***Percina jenkinsi*:** Conasauga Logperch (endangered)
***Percina lenticula*:** Freckled Darter (endangered)
***Percina sciera*:** Dusky Darter (rare)
***Percina shumardi*:** River Darter (endangered)
***Percina* sp.:** Halloween Darter (threatened)
***Percina* sp.:** Muscadine Darter (rare)
***Percina* sp.:** Upland Bridled Darter (endangered)
***Percina squamata*:** Olive Darter (endangered)
***Percina tanasi*:** Snail Darter (endangered)
***Phenacobius crassilabrum*:** Fatlips Minnow (endangered)
***Phenacobius uranops*:** Stargazing Minnow (threatened)
***Phoxinus tennesseensis*:** Tennessee Dace (endangered)
***Pteronotropis euryzonus*:** Broadstripe Shiner (rare)
***Pteronotropis welaka*:** Bluenose Shiner (threatened)
***Typhlichthys subterraneus*:** Southern Cavefish (endangered)

Invertebrates:

***Alasmidonta arcula*:** Altamaha Arcmussel (threatened)
***Alasmidonta triangulata*:** Southern Elktoe (endangered)
***Amblema neislerii*:** Fat Threeridge (endangered)
***Anodonta heardi*:** Apalachicola Floater (rare)
***Anodontoides radiatus*:** Rayed Creekshell (threatened)
***Cambarus coosawattae*:** Coosawattee Crayfish (endangered)
***Cambarus cryptodytes*:** Dougherty Plain Cave Crayfish (threatened)
***Cambarus cymatilis*:** Conasauga Blue Burrower (endangered)
***Cambarus doughertyensis*:** Dougherty Burrowing Crayfish (endangered)
***Cambarus englishi*:** Tallapoosa Crayfish (rare)
***Cambarus extraneus*:** Chickamauga Crayfish (threatened)
***Cambarus fasciatus*:** Etowah Crayfish (threatened)
***Cambarus georgiae*:** Little Tennessee Crayfish (endangered)
***Cambarus harti*:** Piedmont Blue Burrower (endangered)
***Cambarus howardi*:** Chattahoochee Crayfish (threatened)
***Cambarus parrishi*:** Hiwassee Headwaters Crayfish (endangered)
***Cambarus scotti*:** Chattooga River Crayfish (threatened)

***Cambarus speciosus*:** Beautiful Crayfish (endangered)
***Cambarus strigosus*:** Lean Crayfish (threatened)
***Cambarus truncatus*:** Oconee Burrowing Crayfish (threatened)
***Cambarus unestami*:** Blackbarred Crayfish (threatened)
***Cordulegaster sayi*:** Say's Spiketail (threatened)
***Distocambarus devexus*:** Broad River Burrowing Crayfish (threatened)
***Elliptio arca*:** Alabama Spike (endangered)
***Elliptio arctata*:** Delicate Spike (endangered)
***Elliptio purpurella*:** Inflated Spike (threatened)
***Elliptio spinosa*:** Altamaha Spinymussel (endangered)
***Elliptoideus sloatianus*:** Purple Bankclimber (threatened)
***Epioblasma metastriata*:** Upland Combshell (endangered)
***Epioblasma othcaloogensis*:** Southern Acornshell (endangered)
***Fusconaia masoni*:** Atlantic Pigtoe (endangered)
Gomphus consanguis: Cherokee Clubtail (threatened)
***Hamiota altilis*:** Fine-lined Pocketbook (threatened)
***Hamiota subangulata*:** Shinyrayed Pocketbook (endangered)
***Leptoxis foremani*:** Interrupted Rocksnail (endangered)
***Medionidus acutissimus*:** Alabama Moccasinshell (threatened)
***Medionidus parvulus*:** Coosa Moccasinshell (endangered)
***Medionidus penicillatus*:** Gulf Moccasinshell (endangered)
***Medionidus simpsonianus*:** Ochlockonee Moccasinshell (endangered)
***Ophiogomphus edmundo*:** Edmund's Snaketail (endangered)
***Pleurobema decisum*:** Southern Clubshell (endangered)
***Pleurobema georgianum*:** Southern Pigtoe (endangered)
Pleurobema hanleyianum: Georgia Pigtoe (endangered)
***Pleurobema pyriforme*:** Oval Pigtoe (endangered)
***Procambarus gibbus*:** Muckalee Crayfish (threatened)
***Procambarus verrucosus*:** Grainy Crayfish (rare)
***Procambarus versutus*:** Sly Crayfish (rare)
***Ptychobranchus greenii*:** Triangular Kidneyshell (endangered)
***Strophitus connasaugaensis*:** Alabama Creekmussel (endangered)
***Strophitus subvexus*:** Southern Creekmussel (endangered)
***Toxolasma pullus*:** Savannah Lilliput (threatened)

Plants:

***Allium speculae*:** Flatrock Onion (threatened)
***Alnus maritima georgiensis*:** Georgia Alder (threatened)
***Amorpha georgiana*:** Georgia Indigo-bush (endangered)
***Amphianthus pusillus*:** Pool Sprite (threatened)
***Arabis georgiana*:** Georgia Rockcress (threatened)
***Arnoglossum diversifolium*:** Variable-leaf Indian-plantain (threatened)
***Asclepias purpurascens*:** Purple Milkweed (rare)
***Asplenium heteroresiliens*:** Marl Spleenwort (threatened)
***Astragalus michauxii*:** Sandhill Milk-vetch (threatened)
***Aureolaria patula*:** Spreading Yellow Foxglove (threatened)
***Balduina atropurpurea*:** Purple Honeycomb Head (rare)
***Baptisia arachnifera*:** Hairy Rattleweed (endangered)
Berberis canadensis: American Barberry (endangered)
***Brickellia cordifolia*:** Heartleaf Brickellia (threatened)

***Calamagrostis porteri*:** Porter's Reed-grass (rare)
***Calamintha ashei*:** Ohoopee Wild Basil (threatened)
***Carex baltzellii*:** Baltzell's Sedge (endangered)
***Carex biltmoreana*:** Granite Dome Sedge (threatened)
***Carex dasycarpa*:** Velvet Sedge (rare)
***Carex misera*:** Wretched Sedge (threatened)
***Carex radfordii*:** Radford's Sedge (threatened)
***Carya myristiciformis*:** Nutmeg Hickory (rare)
***Ceratiola ericoides*:** Sandhill Rosemary (threatened)
***Chamaecyparis thyoides*:** Atlantic White-cedar (rare)
***Chelone cuthbertii*:** Cuthbert's Turtlehead (threatened)
***Clematis fremontii*:** Fremont's Leatherflower (endangered)
***Clematis socialis*:** Alabama Leatherflower (endangered)
***Convallaria majuscula*:** American Lily-of-the-valley (rare)
***Coreopsis integrifolia*:** Floodplain Tickseed (threatened)
***Coreopsis latifolia*:** Broadleaf Tickseed (rare)
***Crataegus triflora*:** Three-flowered Hawthorn (threatened)
***Croomia pauciflora*:** Croomia (threatened)
***Cuscuta harperi*:** Harper's Dodder (endangered)
***Cymophyllus fraserianus*:** Fraser's Sedge (threatened)
***Cypripedium acaule*:** Pink Ladyslipper (unusual)
***Cypripedium kentuckiense*:** Kentucky Ladyslipper (endangered)
***Cypripedium parviflorum*:** Yellow Ladyslipper (rare)
***Desmodium ochroleucum*:** Cream-flowered Tick-trefoil (threatened)
***Dicanthelium hirstii*:** Hirst's Witch Grass (endangered)
***Dicerandra radfordiana*:** Radford's Mint (endangered)
***Draba aprica*:** Sun-loving Draba (endangered)
***Echinacea laevigata*:** Smooth Purple Coneflower (endangered)
***Elliottia racemosa*:** Georgia Plume (threatened)
***Epidendrum conopseum*:** Greenfly Orchid (unusual)
***Eriocaulon koernickianum*:** Dwarf Hatpins (endangered)
***Evolvulus sericeus*:** Silky Morning-glory (endangered)
***Fimbristylis perpusilla*:** Harper's Fimbry (endangered)
***Forestiera godfreyi*:** Godfrey's Wild Privet (endangered)
***Forestiera segregata*:** Florida Wild Privet (rare)
***Fothergilla gardenii*:** Dwarf Witch-alder (threatened)
***Fothergilla major*:** Mountain Witch-alder (threatened)
***Gentianopsis crinita*:** Fringed Gentian (threatened)
***Gymnoderma lineare*:** Rock Gnome Lichen (endangered)
Habenaria quinqueseta: Michaux's Spider Orchid (threatened)
***Hartwrightia floridana*:** Hartwrightia (threatened)
***Helianthus verticillatus*:** Whorled Sunflower (endangered)
***Helonias bullata*:** Swamp Pink (threatened)
***Hydrastis canadensis*:** Goldenseal (endangered)
***Hymenocallis coronaria*:** Shoals Spiderlily (threatened)
***Illicium floridanum*:** Florida Anise (endangered)
***Isoetes melanospora*:** Black-spored Quillwort (endangered)
***Isoetes tegetiformans*:** Mat-forming Quillwort (endangered)
***Isotria medeoloides*:** Small Whorled Pogonia (threatened)
***Jamesianthus alabamensis*:** Alabama Warbonnet (endangered)
***Jeffersonia diphylla*:** Twinleaf (rare)

***Kalmia carolina*:** Carolina Bog Laurel (threatened)
***Leavenworthia exigua* var. *exigua*:** Least Gladecress (threatened)
***Leiophyllum buxifolium*:** Sand-myrtle (threatened)
***Leitneria floridana*:** Corkwood (threatened)
***Lilium michiganense*:** Michigan Lily (rare)
***Lilium philadelphicum*:** Wood Lily (endangered)
***Lindera melissifolia*:** Pond Spicebush (endangered)
***Litsea aestivalis*:** Pond Spice (rare)
***Lotus helleri*:** Carolina Trefoil (endangered)
***Lysimachia fraseri*:** Fraser's Loosestrife (rare)
***Lythrum curtissii*:** Curtiss' Loosestrife (threatened)
***Macbridea caroliniana*:** Carolina Bogmint (rare)
***Macranthera flammea*:** Hummingbird Flower (threatened)
***Marshallia mohrii*:** Coosa Barbara Buttons (threatened)
***Marshallia ramosa*:** Pineland Barbara Buttons (rare)
***Matelea alabamensis*:** Alabama Milkvine (threatened)
***Matelea pubiflora*:** Trailing Milkvine (rare)
***Megaceros aenigmaticus*:** Bighorn Hornwort (threatened)
***Monotropsis odorata*:** Sweet Pinesap (threatened)
***Morella inodora*:** Odorless Bayberry (threatened)
***Myriophyllum laxum*:** Lax Water Milfoil (rare)
***Najas filifolia*:** Narrowleaf Naiad (endangered)
***Nestronia umbellula*:** Indian Olive (rare)
***Neviusia alabamensis*:** Alabama Snow-wreath (threatened)
***Oxypolis canbyi*:** Canby Dropwort (endangered)
***Pachysandra procumbens*:** Allegheny-spurge (rare)
***Packera millefolia*:** Blue Ridge Golden Ragwort (threatened)
***Paronychia virginica*:** Yellow Nailwort (endangered)
***Pedicularis lanceolata*:** Swamp Lousewort (endangered)
***Pediomelum piedmontanum*:** Dixie Mountain Breadroot (endangered)
***Penstemon dissectus*:** Cutleaf Beardtongue (rare)
***Pinguicula primuliflora*:** Clearwater Butterwort (threatened)
***Pityopsis pinifolia*:** Sandhill Golden-aster (rare)
***Platanthera integrilabia*:** Monkeyface Orchid (threatened)
***Prenanthes barbata*:** Barbed Rattlesnake Root (rare)
***Pteroglossaspis ecristata*:** Crestless Plume Orchid (threatened)
***Ptilimnium nodosum*:** Harperella (endangered)
***Quercus oglethorpensis*:** Oglethorpe Oak (threatened)
***Rhododendron prunifolium*:** Plumleaf Azalea (threatened)
***Rhus michauxii*:** Dwarf Sumac (endangered)
***Rhynchospora solitaria*:** Solitary Beakrush (endangered)
Rudbeckia auriculata: Swamp Black-eyed Susan (endangered)
***Rudbeckia heliopsidis*:** Little River Black-eyed Susan (threatened)
***Sabatia capitata*:** Cumberland Rose Gentian (rare)
***Sageretia minutiflora*:** Climbing Buckthorn (threatened)
***Sagittaria secundifolia*:** Kral's Water-plantain (threatened)
***Salix floridana*:** Florida Willow (endangered)
***Sanguisorba canadensis*:** Canada Burnet (threatened)
***Sapindus marginatus*:** Soapberry (rare)
***Sarracenia flava*:** Yellow Flytrap (unusual)
***Sarracenia leucophylla*:** Whitetop Pitcherplant (endangered)

***Sarracenia minor*:** Hooded Pitcherplant (unusual)
***Sarracenia oreophila*:** Green Pitcherplant (endangered)
***Sarracenia psittacina*:** Parrot Pitcherplant (threatened)
***Sarracenia purpurea*:** Purple Pitcherplant (endangered)
***Sarracenia rubra*:** Sweet Pitcherplant (threatened)
***Schisandra glabra*:** Bay Star-vine (threatened)
***Schwalbea americana*:** Chaffseed (endangered)
***Scutellaria montana*:** Large-flowered Skullcap (threatened)
***Scutellaria ocmulgee*:** Ocmulgee Skullcap (threatened)
***Sedum nevii*:** Nevius Stonecrop (threatened)
***Sedum pusillum*:** Granite Stonecrop (threatened)
***Shortia galacifolia*:** Oconee Bells (endangered)
***Sibbaldiopsis tridentata*:** Mountain Cinquefoil (endangered)
***Sideroxylon macrocarpum*:** Ohoopee Bumelia (rare)
***Sideroxylon thornei*:** Swamp Buckthorn (rare)
***Silene ovata*:** Ovate Catchfly (rare)
***Silene polypetala*:** Fringed Campion (endangered)
***Silene regia*:** Royal Catchfly (endangered)
***Solidago simulans*:** Cliffside Goldenrod (endangered)
***Spiraea virginiana*:** Virginia Spirea (threatened)
***Spiranthes magnicamporum*:** Great Plains Ladies-tresses (endangered)
***Stewartia malacodendron*:** Silky Camellia (rare)
***Streptopus lanceolatus*:** Rosy Twisted Stalk (threatened)
***Stylisma pickeringii* var. *pickeringii*:** Pickering's Morning-glory (threatened)
***Symphyotrichum georgianum*:** Georgia Aster (threatened)
***Thalictrum cooleyi*:** Cooley Meadowrue (endangered)
***Thalictrum debile*:** Trailing Meadowrue (threatened)
***Thaspium pinnatifidum*:** Glade Meadowparsnip (endangered)
***Torreya taxifolia*:** Florida Torreya (endangered)
***Trientalis borealis*:** Starflower (endangered)
***Trillium persistens*:** Persistent Trillium (endangered)
***Trillium pusillum*:** Dwarf Trillium (endangered)
***Trillium reliquum*:** Relict Trillium (endangered)
***Tsuga caroliniana*:** Carolina Hemlock (endangered)
***Veratrum woodii*:** Ozark Bunchflower (rare)
***Viburnum bracteatum*:** Limerock Arrowwood (endangered)
***Waldsteinia lobata*:** Barren Strawberry (rare)
***Xerophyllum asphodeloides*:** Eastern Turkeybeard (rare)
***Xyris tennesseensis*:** Tennessee Yellow-eyed Grass (endangered)