ENVIRONMENTAL ASSESSMENT
(Pre-decisional Draft)

Managing Damage and Threats of Damage Caused by Nonnative Reptiles and Amphibians in the State of Florida

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July 2023

EXECUTIVE SUMMARY

Wildlife are an important public resource that can provide economic, recreational, emotional, and esthetic benefits to many people. However, wildlife can cause damage to agricultural resources, natural resources, property, and threaten human safety. When people experience damage caused by wildlife or when wildlife threatens to cause damage, people may seek assistance from other entities. The United States Department of Agriculture, Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program is the lead federal agency responsible for managing conflicts between people and wildlife. Therefore, people experiencing damage or threats of damage associated with wildlife could seek assistance from WS. In Florida, WS has and continues to receive requests for assistance to reduce and prevent damage associated with several species of nonnative reptiles and amphibians.

The National Environmental Policy Act (NEPA) requires federal agencies to incorporate environmental planning into federal agency actions and decision-making processes. Therefore, if WS provided assistance by conducting activities to manage damage caused by nonnative reptile and amphibian species, those activities would be a federal action requiring compliance with the NEPA. The NEPA requires federal agencies to have available and fully consider detailed information regarding environmental effects of federal actions and to make information regarding environmental effects available to interested persons and agencies. To comply with the NEPA, WS prepared this Environmental Assessment (EA) to determine whether the potential environmental effects caused by several alternative approaches to managing damage caused by nonnative reptiles and amphibians might be significant, requiring the preparation of an Environmental Impact Statement (EIS). WS developed this EA under the 1978 NEPA regulations and existing APHIS NEPA implementing procedures because WS initiated this EA prior to the NEPA revisions that went into effect on September 14, 2020.

Chapter 1 discusses the need for action and the scope of analysis associated with requests for assistance that WS receives involving several species of nonnative reptiles and amphibians in Florida. Chapter 2 identifies and discusses the issues that WS identified during the scoping process for this EA and through consultation with state and federal agencies. Issues are concerns regarding potential effects that might occur from proposed activities. Federal agencies must consider such issues during the decision-making process required by the NEPA. Chapter 2 also discusses the alternative approaches that WS developed to meet the need for action and to address the issues identified during the scoping process.

Issues of concern addressed in detail include: 1) effects on target reptile and amphibian populations, 2) effects on nontarget species, including threatened and endangered species, 3) effects of management methods on human health and safety, and 4) humaneness and animal welfare concerns of methods. Alternative approaches evaluated to meet the need for action and to address the issues include: 1) continuing the current integrated methods approach to managing damage, 2) using an integrated methods approach using only nonlethal methods, 3) addressing requests for assistance through technical assistance only, and 4) no involvement by WS. Depending on the alternative approach, several methods would be available to manage damage caused by reptiles or amphibians in the state. Appendix B discusses the methods that WS could consider when responding to a request for assistance.

Chapter 3 provides information needed for making informed decisions by comparing the environmental consequences of the four alternative approaches to determine the extent of actual or potential impacts on each of the issues. WS will use the analyses in this EA to help inform agency decision-makers of the significance of the environmental effects, which will aid the decision-makers with determining the need to prepare an EIS or concluding the EA process with a Finding of No Significant Impact.

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ACRONYMS

APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
CFR	Code of Federal Regulations
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
FFWCC	Florida Fish and Wildlife Conservation Commission
FY	Federal Fiscal Year
GPS	Global Positioning System
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
USC	United States Code
USDA	United States Department of Agriculture
WS	Wildlife Services

CHAPTER 1: NEED FOR ACTION AND SCOPE OF ANALYSIS

1.1 INTRODUCTION

Wildlife are an important public resource greatly valued by people. In general, people regard wildlife as providing economic, recreational, emotional, and esthetic benefits. Knowing that wildlife exist in the natural environment provides a positive benefit to many people. Wildlife can also be important to the culture and beliefs of Native American Tribes. However, the behavior of animals may result in damage to agricultural resources, natural resources, and property, and threaten human safety. Therefore, wildlife can have either positive or negative values depending on the perspectives and circumstances of individual people.

Wildlife damage management is the alleviation of damage or other problems caused by or related to the behavior of wildlife and can be an integral component of wildlife management (Berryman 1991, Reidinger and Miller 2013, The Wildlife Society 2017) and the North American Model of Wildlife Conservation (Organ et al. 2010, Organ et al. 2012). Resolving damage caused by wildlife requires consideration of both sociological and biological carrying capacities. 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).

Carrying capacity are especially important because they define the sensitivity of a person or community to a wildlife species. There may be varying thresholds of tolerance exhibited by those people directly and indirectly affected by the species and any associated damage. Those damage thresholds determine the wildlife acceptance capacity. While the biological carrying capacity of the habitat may support higher populations of wildlife, in many cases the wildlife acceptance capacity is lower or already met. Once the wildlife acceptance capacity is met or exceeded, people begin to implement population or damage management to alleviate damage or address threats to human health and safety. Therefore, the wildlife acceptance capacity helps define the range of wildlife population levels and associated damages acceptable to individuals or groups (Decker and Purdy 1988, Decker and Brown 2001).

Animals have no intent to do harm. They use habitats (*e.g.*, feed, shelter, reproduce) where they can find a niche. If their activities result in lost value of resources or threaten human safety, people often characterize this as damage. When damage exceeds or threatens to exceed an economic threshold and/or pose a threat to human safety, people often seek assistance. The threshold triggering a person to seek assistance with alleviating damage or threats of damage is often unique to the individual person requesting assistance and many factors (*e.g.*, economic, social, esthetics) can influence when people seek assistance. What one person considers damage, another person may not consider as damage. However, the term "*damage*" is consistently used to describe situations where the individual person has determined the losses associated with an animal or animals is actual damage requiring assistance (*i.e.*, has reached an individual threshold). Many people define "*damage*" as economic losses to resources or threats to human safety; however, "*damage*" could also occur from a loss in the esthetic value of property and other situations where the behavior of wildlife was no longer tolerable to an individual person. The threat of damage or loss of resources is often sufficient for people to initiate individual actions and the need for damage management could occur from specific threats to resources.

When people experience damage caused by wildlife or when wildlife threatens to cause damage, people may seek assistance from other entities. The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program is the lead federal agency responsible for managing conflicts between people and wildlife (USDA 2019*a*) (see WS Directive

1.201)[1]. The primary statutory authority for the WS program is the Act of March 2, 1931 (46 Stat. 1468, 7 USC 8351-8352) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 USC 8353). WS' directives define program objectives and guide WS' activities when managing wildlife damage (see WS Directive 1.201, WS Directive 1.205, WS Directive 1.210). Therefore, people experiencing damage or threats of damage associated with wildlife could seek assistance from WS.

1.2 NEED FOR ACTION

Across the world, as human populations have expanded, people have accidentally or purposefully introduced wildlife species into new areas and have transformed the land to meet human needs. Those changes often increase the potential for conflicts between wildlife and people, which can result in damage to resources and threaten human health and safety. One encroachment on native ecosystems is the introduction of nonnative, invasive species into native environments. Invasive species often compete with native plants and wildlife and can threaten biodiversity. The number of invasive species introduced in the history of the United States has been estimated at 50,000 species (Pimentel et al. 2000, Pimentel et al. 2005). Some introduced nonnative species benefit society, such as corn, wheat, cattle, poultry, and other food items. Other invasive species have caused considerable economic and environmental damage in the United States and worldwide. Pimentel et al. (2005) estimated invasive species cause nearly $120 billion in environmental damages and losses in the United States annually.

Because of its unique and favorable subtropical climate, as well as its rich diversity of flora and fauna and abundance of natural and unique ecological habitats, the State of Florida has become home to many invasive nonnative wildlife species. The occurrence of these invasive animal species results most frequently from accidental escape or deliberate release from human captivity. Some natural migration may also play a small role in the insurgence of invasive species, but human activity is by far the most frequent and blatant cause. The introduction, escape, or release of many of these nonnative species to other cooler or less favorable portions of the country has not resulted in substantial ecological damage. Most invasive wildlife species cannot survive the cold winters nor establish themselves reproductively as successfully as they have in Florida and in other nearby or warm climate states.

The booming pet trade in Florida and the accidental escape or the deliberate release of nonnative pets has led to several invasive reptile species becoming established in the State of Florida. Krysko et al. (2016) considered four nonnative frog species, five nonnative turtle species, one nonnative crocodilian species, 48 nonnative lizard species, and five nonnative snake species had established populations in Florida, and more are being discovered or introduced on a regular basis. The number of nonnative reptile and amphibians established in Florida has increased from 23 nonnative species in the 1960s to 63 nonnative reptile and amphibian species in 2015 (Krysko et al. 2016). Campbell (2007) stated, "*There are now more nonnative lizards established in South Florida than there are native lizards in the entire southeastern United States and whole assemblages of nonnative lizards (anoles, geckos, iguanids, teiids, etc.) can be observed at some locations."* Krysko et al. (2016) stated, "*Florida has the largest number of established* [nonnative reptile and amphibian] *species in the world*…" and "…*75% of the*…*lizard species in Florida are* [not native].

In Florida, WS has and continues to receive requests for assistance to reduce and prevent damage associated with several nonnative reptile and amphibian species. WS has identified those species most likely to be responsible for causing damage in Florida based on previous requests for assistance and in anticipation of receiving requests for assistance in the future. Those species include spectacled caiman (*Caiman crocodilus*), Argentine black and white tegu (*Salvator merianae*), red-headed agama (*Agama*

[1]At the time of preparation, WS' Directives occurred at the following web address: https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/SA_WS_Program_Directives.

agama), Peter's rock agama (*Agama picticauda*), savannah monitor (*Varanus exanthematicus*), Nile monitor (*Varanus niloticus*), green iguana (*Iguana iguana*), black spiny-tailed iguana (*Ctenosaura similis*), northern curlytail lizard (*Leiocephalus carinatus*), brown basilisk (*Basiliscus vittatus*), Burmese python (*Python molurus bivittatus*), northern African python (*Python sebae*), and reticulated python (*Python reticulatus*).

As discussed in Section 1.1, when people seek assistance with managing wildlife damage, they may seek assistance from WS. Therefore, the need for action to manage damage and threats associated with target species in Florida arises from requests for assistance[2] that WS could receive to reduce and prevent damage from occurring. The target species found in Florida can cause damage to agricultural resources, natural resources, property, and pose threats to human safety. Table 1.1 shows the reptile and amphibian species associated with requests for assistance that WS could receive and the resource types those species could damage in Florida.

Table 1.1 – Primary species that WS could address and the resource types damaged or threatened

	Resource*					Resource*			
Species	**A**	**N**	**P**	**H**	**Species**	**A**	**N**	**P**	**H**
Spectacled Caiman		X		X	**Black Spiny-tailed Iguana**	X	X	X	X
Argentine Black & White Tegu	X	X	X	X	**Northern Curlytail Lizard**		X	X	
Red-headed Agama		X	X		**Brown Basilisk**		X		X
Peter's Rock Agama		X	X		**Burmese Python**		X	X	X
Savannah Monitor		X		X	**Northern African Python**		X		X
Nile Monitor		X		X	**Reticulated Python**		X	X	X
Green Iguana	X	X	X	X					

*A=Agriculture, N =Natural Resources, P=Property, H=Human Safety (includes aviation safety)

In addition to those species, WS could also receive requests for assistance to manage damage and threats of damage associated with several other nonnative reptile and amphibian species, but requests for assistance associated with those species would occur infrequently and/or requests would involve a small number of individuals of a species. Damages and threats of damages associated with those species would primarily be a human health and safety concern. Appendix E contains a list of species that WS could address in low numbers and/or infrequently when those species cause damage or pose a threat of damage. The following subsections provide additional information regarding the need to manage damage caused by nonnative reptile and amphibian species in Florida.

1.2.1 Need to Resolve Nonnative Reptile and Amphibian Damage to Agricultural Resources

Agriculture is an important industry in Florida. During 2017, the National Agricultural Statistics Service (NASS) reported 9.73 million acres were devoted to agricultural production in Florida with a market value of agricultural products sold estimated at approximately $7.3 billion (NASS 2017). Florida is one of the leading producers of cucumbers, grapefruits, oranges, squash, sugarcane, fresh market snap beans, fresh market tomatoes bell peppers, strawberries, watermelons, fresh market cabbage, peanuts, and fresh market sweet corn in the United States.

During 2017, there were over 1.6 million cattle in the state, with an estimated $521.8 million in sales (NASS 2017). There were over 15,000 domestic swine across 1,810 farms in Florida, with an estimated

[2]WS would only conduct activities after receiving a request for assistance. Before initiating activities, WS and the property owner or manager requesting assistance must sign a work initiation document or another comparable document that lists all the methods the property owner or manager would allow WS to use on property they own and/or manage.

$3.9 million in sales (NASS 2017). There were also nearly 23 million poultry in the state during 2017, with an estimated $406 million in sales (NASS 2017).

Numerous wildlife species can cause damage to agricultural resources. Damage can occur through direct consumption of agricultural crops, the contamination of resources from fecal droppings, or the threat of predation or disease transmission to livestock and poultry. The economic losses caused by wildlife damage can often be substantial. During 2001, crop and livestock losses from wildlife in the United States totaled $944 million, with field crop losses totaling $619 million, livestock and poultry losses totaling $178 million, and losses of vegetables, fruits, and nuts totaling $146 million (NASS 2002). As shown in Table 1.1, many of the target species can cause damage to or pose threats to agricultural resources in Florida. In addition, some species in Appendix E could cause damage to agricultural resources in Florida.

Damage and Threats to Livestock Operations

Since 1962, 29 species of nonnative ticks have been introduced into the United States on imported reptiles, 20 of those tick species have been found in Florida. However, only nine of the 29 tick species have associations with diseases or infections. Four of these tick species are known to be vectors of heartwater, an acute tickborne disease of domestic and wild ruminants. Heartwater may cause mortality rates of 67 to 90% in susceptible hosts in the United States. The tropical bont tick (*Amblyomma variegatum*) is the most widespread natural vector of the four tick species, occurring in sub-Saharan Africa and the eastern Caribbean. The tropical bont tick can also transmit a skin disease in cattle called acute bovine dermatophilosis (Burridge and Simmons 2003).

In a study completed from 2003 to 2008, Corn et al. (2011) reported new distribution records for parasites in the United States on free-ranging nonnative reptiles include the following: the collection of the African tick (*Amblyomma latum*) from a wild-caught ball python (*Python regius*), the collection of a lizard scale mite (*Hirstiella stamii*) from wild-caught green iguana, collection of a lizard scale mite (*Geckobia hemidactyli*) from a tropical house gecko (*Hemidactylus mabouia*), collections of the Neotropical ticks (*Amblyomma rotundatum*) and (*Amblyomma dissimile*) from Burmese pythons, collections of *A. dissimile* from a savannah monitor and from green iguanas, and the collection of native chiggers (*Eutrombicula splendens* and *Eutrombicula cinnabaris*) from Burmese pythons. These reports may only suggest the diversity of reptile ectoparasites introduced and established in Florida and the new host-parasite relationships that have developed among nonnative and native ectoparasites and established nonnative reptiles.

Northern African pythons eat goats and poultry in their native ranges (Luiselli et al. 2001) while reticulated pythons eat all sizes of livestock and pets (except horses) in their native range (Reed and Rodda 2009). However, northern African pythons likely eat native mammals, birds, reptiles, and fish in Florida, but WS could respond to a request for assistance if a python or another large reptile species were identified feeding on livestock.

Damage to Agricultural Crops

Green iguanas can damage and destroy crops. Iguanas can damage yams, yautias, pumpkin, and melons (López-Torres et al. 2011). However, reports of the extent or economic damage to agricultural crops caused by iguanas is scarce. Damage caused by iguanas includes eating valuable landscape plants, shrubs, and trees, eating orchids and many other flowers, eating dooryard fruit like berries, figs, mangos, tomatoes, bananas, and lychees (Kern 2009). Tegus could potentially become an agricultural pest or a source of bacterial contamination of food crops (Johnson and McGarrity 2017). Although damage to agricultural crops caused by nonnative reptiles and amphibians is not common in Florida, WS could

respond to requests for assistance if WS received a request for assistance and if WS determined nonnative reptiles or amphibians were responsible for causing the damage.

1.2.2 Need to Resolve Threats that Nonnative Reptiles and Amphibians Pose to Human Safety

Many nonnative reptile and amphibian species listed in Table 1.1 and Appendix E can be closely associated with people and human structures. Nonnative reptiles and amphibians located on airfields can threaten the safety of air passengers if an aircraft strikes those animals. For example, an aircraft struck a Burmese python at Homestead Air Force Base in Florida during 2016. There have been three aircraft strikes involving green iguanas at a Naval Air Station in Key West. Most of those strikes resulted in little or no damage to the aircraft; however, due to the high rates of speed involved in takeoff and landing, there is the potential for catastrophic failure to occur when a plane strikes a reptile. Large snakes may stretch across roads and runways, which can pose a hazard to motorists or aircraft. In addition, high densities of nonnative reptiles and amphibians at airport and military facilities may act as attractants for predatory birds and mammals, when then pose threats to aircraft.

The close association of nonnative reptiles and amphibians with human activity can pose threats to human safety from disease transmission. Like most animals, imported reptiles carry with them the potential to bring in ticks, which in turn transmit diseases. As discussed previously, 29 species of nonnative ticks have been introduced into the United States on imported reptiles since 1962 and 20 of those nonnative ticks have been found in Florida. Nine of those tick species have been associated with diseases or infections of concern to people. The tropical bont tick is associated with the human rickettsial disease known as African tick-bite fever (Burridge and Simmons 2003).

Salmonella typically does not cause illness in reptile or amphibian hosts but can cause a serious or life-threatening infection in people called salmonellosis. *Salmonella* spp. are mainly transmitted by the fecal-oral route. The bacteria are carried in the intestines of many reptile and amphibian species and are continuously or intermittently shed in their feces. Salmonella is most commonly transferred between reptiles by contact with the contaminated feces of other reptiles or contaminated food, water, or soil. *Salmonella* spp. can survive for long periods in the environment, particularly where it is wet and warm, and can be isolated for prolonged periods from surfaces contaminated by reptile feces. *Salmonella* spp. can survive 89 days in tap water, 115 days in pond water, and up to 6 months in dried feces (Spickler 2013).

According to the Centers for Disease Control and Prevention (2020), in four outbreaks between June 1, 2019, and November 1, 2019, 26 people from 14 states were infected with Salmonella. Epidemiologic, laboratory, and traceback evidence indicated that contact with pet turtles was the likely source of this outbreak. In interviews, 16 (73%) of 22 ill people reported contact with a turtle. Although there were no deaths associated with those Salmonella outbreaks, eight people were hospitalized. All reptiles should be considered potential sources of Salmonella (Pasmans et al. 2002, Pasmans et al. 2003, Spickler 2013, Krysko et al. 2007). The Florida Fish and Wildlife Conservation Commission (FFWCC) reported green iguanas can also transmit the infectious bacterium Salmonella to people through contact with water or surfaces contaminated by their feces (FFWCC 2022*a*).

There have been several reports of boa and anaconda attacks in their native range, although they are often difficult to verify (Branch and Hacke 1980). There is no evidence that wild Burmese pythons hunt people; however, on several occasions large captive Burmese pythons have killed their owners. There have been no reported attacks on people in Florida; however, due to their size and predatory nature the potential exists. Furthermore, aggressive behavior can pose risks to human safety. For example, Nile monitors can harm people by biting, clawing, or tail whipping if they are cornered or threatened (Enge et

al. 2004*a*). In addition, reptiles may act aggressively toward people when people intentionally or unintentionally feed reptiles and they associated people with food.

1.2.3 Need to Resolve Nonnative Reptile and Amphibian Damage Occurring to Property

As shown in Table 1.1 and Appendix E, many of the target species can cause damage to property in Florida. Property damage can occur in a variety of ways. For example, aircraft strikes can cause substantial damage requiring costly repairs and aircraft downtime. 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 transportation industry (Conover et al. 1995). From 1990 through 2021, there are reports of civil aircraft striking caiman, iguanas, and several species of turtles and snakes within the United States (Dolbeer et al. 2022). In total, civil aircraft have struck at least 29 species of reptiles at airfields in the United States from 1990 through 2021 (Dolbeer et al. 2022). From January 1990 through mid-June 2023, the Federal Aviation Administration (2023) has received 162 reports of aircraft striking reptile species at airports in Florida, including snakes, turtles, and iguanas. In addition, nonnative reptiles and amphibians present on airfields can act as an attractant for other species, such as raptors, which also pose aircraft strike risks.

Because reporting rates of aircraft strikes have been historically low, these figures likely underestimate the total damage caused by wildlife strikes. In fact, civil wildlife strike reporting rates have been estimated to be as low as 20% (Linnell et al. 1999, Wright and Dolbeer 2005). However, reporting rates are increasing (Dolbeer 2015). However, not all reports provide notation as to whether or not there was damage and some strike reports to the Federal Aviation Administration that indicate there was an adverse impact on the aircraft from the strike do not include a monetary estimate of the damage caused. Additionally, most reports indicating damage to aircraft report direct damages and do not include indirect damage, such as lost revenue, cost of putting passengers in hotels, rescheduling aircraft, and flight cancellations. Thus, actual monetary losses from wildlife strikes are likely much higher than estimated losses.

In addition to threats to aircraft, many of the nonnative reptiles and amphibians also present other threats to property in Florida. For example, green iguanas can cause considerable damage to residential and commercial landscape vegetation. Green iguanas will eat most fruits (except citrus) and flowers, tender new growth, and almost anything planted in a vegetable garden (Kern 2009). Property owners or property managers often install wire mesh or electric fences around herbs, shrubs, and trees to protect them from green iguana predation (Krysko et al. 2007).

Green iguanas can also cause damage by burrowing into earthen water impoundments. Green iguana burrows can present a maintenance liability, potentially leading to both instability of the structure and bank erosion (Sementelli et al. 2008). Burrows can be over two meters (6.56 feet) deep with a diameter of 10 to 20 centimeters (3.94 to 7.88 inches). A simple commercial levee is roughly 6 meters (20 feet) wide (Steeby and Avery 2002). Iguana burrows could penetrate 30% of the levee structure, decreasing the width to approximately 4 meters (14 feet). Then add to this that the levee size can decrease to less than 5 meters (16 feet) usable width in 5 years from just small amounts of erosion (Steeby and Avery 2002), and the scope of the problem can begin to be understood. Costs to properly repair a burrow into a levee can be approximately $400. With a minimum of 6.2 burrows/hectare, the repair costs become $2,480/hectare to repair the canal levees (Sementelli et al. 2008). In the City of West Palm Beach, burrows from iguanas likely contributed to the need for $1.8 million in emergency repairs to an earthen dam (Palm Beach Post 2020). Burrows can also undermine sidewalks, seawalls, and foundations causing property owners time and money to repair those structures (Krysko et al. 2007). In addition, green

iguanas may cause power outages by shorting electrical equipment (The Guardian 2022) and leave droppings on docks, moored boats, seawalls, porches, decks, pool platforms and inside swimming pools.

Green and black spiny-tailed iguanas are herbivores primarily. They can feed on landscape vegetation. In one case, green iguanas ate prized orchids (Orchidaceae) and overgrazed the historic hibiscus (*Hibiscus* spp.) garden at Fairchild Tropical Botanic Garden in Miami (Krysko et al. 2007). Agamas can also cause damage to property by excessively feeding on landscaping plants, entering buildings, and burrowing into seawall structures, which can weaken those structures and facilitate an increase in erosion during storms. Agamas defecate in and around buildings, which can be esthetically displeasing to workers and visitors. Nile monitors could pose a threat to pets such as small dogs, cats, and poultry (Enge et al. 2004*a*, Campbell 2005). Such animals would be considered prey to a Nile monitor.

1.2.4 Need to Resolve Nonnative Reptile and Amphibian Damage Occurring to Natural Resources

WS could also receive requests for assistance to address nonnative reptiles and amphibians that pose a risk to natural resources. The introduction or release of invasive wildlife and plants into naïve ecosystems often has harmful consequences on native flora and fauna (Witmer et al. 1996, Pimentel et al. 2000, Long 2003, Pimentel et al. 2005, Witmer et al. 2005, Kraus 2015). Negative economic and environmental impacts are especially true if the invasive species exhibit generalist behaviors to which the native flora or fauna are not adapted. Thus, invasive species have been identified as the primary cause of endangerment of at least 40% of the species listed as threatened or endangered in the United States (Wilcove et al. 1998, Pimentel et al. 2000, Pimentel et al. 2005). Worldwide nearly 80% of wildlife populations at risk of extinction are threatened or negatively impacted by invasive species (Pimentel et al. 2005).

Many of the target species found in Florida can also negatively affect natural resources through habitat degradation, competition with other wildlife, through direct depredation on natural resources, introduction or harboring diseases and parasites, and through hybridization. Habitat degradation can occur when large concentrations of target species in a localized area negatively affect characteristics of the surrounding habitat, which can adversely affect other wildlife species and can be esthetically 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 target species feed on other wildlife species, which can negatively influence those species' populations, especially when depredation occurs on threatened and endangered species. Nonnative reptiles and amphibians accidentally or illegally released in Florida may introduce or harbor diseases and parasites that can threaten native wildlife, especially native reptiles and amphibians.

Spectacled caimans use the same habitat as native American alligators (*Alligator mississippiensis*) and American crocodiles (*Crocodylus acutus*); therefore, spectacled caimans often compete with American alligators and American crocodiles for food and other resources. Spectacled caimans are opportunistic predators that consume invertebrates, fish, amphibians, reptiles, birds, and mammals (Thorbjarnarson 1993). Spectacled caimans also eat plant material, such as seeds, leaves, or fruits (Platt et al. 2013).

Iguanas (both green and black spiny tailed) have the potential to negatively impact native flora and fauna. Iguanas have been identified as dispersal agents for invasive plants. They consume the fruits and deposit seeds throughout their home range (Jackson and Jackson 2007, Sementelli et al. 2008). The consequence is the expansion of invasive plant distribution, coupled by the expansion of the green iguana distribution (Sementelli et al. 2008). They have also been observed taking over the burrows of burrowing owls (*Athene cunicularia floridana*) (McKie et al. 2005) and gopher tortoises (*Gopherus polyphemus*) (Truglio et al. 2008). A black spiny-tailed iguana was found to have small bones and scutes from a juvenile gopher tortoise within its stomach (Avery et al. 2009). Spiny-tailed iguanas are known to usurp gopher tortoise burrows (Engeman et al. 2009) and compete with tortoises for food (Krysko et al. 2009).

Burmese pythons pose a threat to endangered wildlife in South Florida. Burmese pythons in Florida are known to eat a variety of native animal species, including wood storks and Key Largo woodrats, both federally endangered species. From 1999 to 2009, federal and state agencies spent $1.4 million on Key Largo woodrat recovery and $101.2 million on wood stork recovery (United States Fish and Wildlife Service 2012). A Burmese python was photographed in 2005 after it tried to consume an American alligator. Both died as a result. However, this brought to light the damage these snakes can do to the native populations. The giant constrictors are generalist predators. Generalist predators will alternate prey as they drive the vulnerable prey species to extinction, whereas specialist predators rarely thrive when their preferred prey become rare (Reed and Rodda 2009). A Burmese python was in Key Largo Hammock Botanical State Park while radio-tracking a Key Largo woodrat (*Neotoma floridana*), that was subsequently found in the snake's stomach (Greene et al. 2007). A growing wild population of pythons has the potential to create a major ecological problem.

Green anacondas have been documented eating deer in their native range, as well as caiman (Rivas 1999). An omnivorous species, the Argentine black and white tegu consumes a wide variety of invertebrates, fruits, seeds, eggs, and other vertebrates as they grow larger. This omnivorous diet poses a distinct threat to native wildlife in Florida. Tegus are likely to eat the eggs and young of ground-nesting birds, turtles, and alligators and could impact threatened and endangered species, including gopher tortoises (Johnson and McGarrity 2017), and other species of special concern or designated by the State of Florida as threatened, such as least terns, black skimmers, and American oystercatchers. With their high fecundity, Argentine black and white tegus pose a serious threat to Florida ecosystems (FFWCC 2022*b*).

Nile monitors are known to usurp burrows of other animals instead of digging their own (Edroma and Ssali 1983). This behavior could severely impact the gopher tortoise and burrowing owl populations in the Cape Coral area. Nile monitors are generalist feeders and will eat whatever they can put in their mouths making the species a potential threat to many native species in Florida (Engeman et al. 2011). Bird and reptile eggs have been documented in the stomachs of Nile monitors (Enge et al. 2004*a*, Campbell 2005). A resident of Cape Coral witnessed an attack on a burrowing owl. When she ran out into her yard, the lizard dropped the bird, which later died from its injuries (Campbell 2005). Nile monitors can excavate sea turtle nests (Enge et al. 2004*a*, Campbell 2005, FFWCC 2022*c*) and could consume hatchling alligators, as they eat hatchling crocodiles in their native lands (Luiselli et al. 1999).

Nonnative reptiles and amphibians may also have indirect effects on other wildlife in Florida, especially native reptiles and amphibians, through the introduction and spread of nonnative parasites and disease pathogens (Kraus 2015, Richgels et al. 2016, Farrel et al. 2019, Miller et al. 2020, Walden et al. 2020). For example, *Raillietiella orientalis* is a parasite native to southeastern Asia and Australia that was likely introduced into southern Florida from the release of Burmese pythons in the 1990s (Miller et al. 2018). Research has found this parasite in multiple native snake species (Miller et al. 2020) and likely the cause of death in at least two pygmy rattlesnakes (*Sistrurus miliarius*) (Farrell et al. 2019) and a southern watersnake (*Nerodia fasciata*) (Walden et al. 2020). Bogan et al. (2022) determined *R. orientalis* was the likely cause of death in an eastern indigo snake (*Drymarchon couperi*), which is a native snake species that the United States Fish and Wildlife Service has designated as a threatened species pursuant to the Endangered Species Act.

An emerging threat to amphibians in the United States is a new fungal pathogen identified as *Batrachochytrium salamandrivorans* that is likely native to Asia. People likely unintentionally introduced the pathogen to wild salamander populations in Europe through the commercial trade of amphibians (Gray et al. 2015, Richgels et al. 2016). This fungal pathogen has caused mass mortality events and severe population declines in European salamanders. The introduction of this pathogen into the United States would likely be devastating to native salamanders (Gray et al. 2015, Richgels et al.

2016). Once invasive pathogens become established in wildlife populations, they become more difficult to manage. Therefore, early detection through surveillance of high-risk areas is important and WS could be requested to conduct activities to monitor for invasives pathogens or conduct activities to contain and limit the spread of a pathogen.

Hybridization between native and nonnative wildlife species can have important implications for conservation (Simberloff 1996, Vuillaume et al. 2015, DeVos et al. 2022). Hybridization between the native green anole (*Anolis carolinensis*) and the morphologically similar nonnative Cuban green anole (*A. porcatus*) has occurred in south Florida (DeVos et al. 2022). Hybridization between endangered and threatened reptiles and amphibians and nonnative species can also be a concern (Vuillaume et al. 2015).

1.3 NATIONAL ENVIRONMENTAL POLICY ACT AND WS' DECISION-MAKING

The National Environmental Policy Act (NEPA) requires federal agencies to incorporate environmental planning into federal agency actions and decision-making processes (Public Law 9-190, 42 USC 4321 et seq.). Therefore, if WS provided assistance by conducting activities to manage damage caused by reptile or amphibian species, those activities would be a federal action requiring compliance with the NEPA. The NEPA requires federal agencies to fully consider detailed information regarding environmental effects of federal actions and to make information regarding environmental effects available to interested persons and agencies.

As part of the decision-making process associated with the NEPA, WS follows the Council on Environmental Quality regulations implementing the NEPA (40 CFR 1500 et seq.)[3] along with the implementing procedures of the USDA (7 CFR 1b) and the APHIS (7 CFR 372). The NEPA sets forth the requirement that federal agencies evaluate their actions in terms of their potential to significantly affect the quality of the human environment, and to avoid or, where possible, mitigate and minimize adverse impacts, make informed decisions, and include tribes, governmental agencies, and the public in their planning to support informed decision-making.

1.3.1 Complying with the National Environmental Policy Act

To comply with the NEPA and Council on Environmental Quality regulations, WS is preparing this Environmental Assessment (EA) to evaluate alternative approaches of achieving the objectives of WS and to determine whether the potential environmental effects caused by the alternative approaches might be significant, requiring the preparation of an Environmental Impact Statement (EIS). As described by the Council on Environmental Quality (2007), the intent of an EA is to provide brief but sufficient evidence and analysis to determine whether to prepare an EIS, aid in complying with the NEPA when an EIS is not necessary, and to facilitate preparation of an EIS when one is necessary. The Council on Environmental Quality (2007) further stated, "*The EA process concludes with either a Finding of No Significant Impact…or a determination to proceed to preparation of an EIS*". WS developed this EA under the 1978 NEPA regulations and existing APHIS NEPA implementing procedures because WS initiated this EA prior to the NEPA revisions that went into effect on September 14, 2020.

1.3.2 Rationale for Preparing an EA Rather Than an EIS

One comment that WS often receives during the public involvement process associated with the development of an EA is that WS should have prepared an EIS instead of an EA or that proposed

[3]WS developed this EA under the 1978 NEPA regulations and the associated APHIS NEPA implementing procedures because WS initiated this EA prior to the NEPA revisions that went into effect on September 14, 2020. Therefore, WS followed the Council on Environmental Quality regulations implementing the NEPA at 40 CFR 1500 et seq. that were in effect prior to the NEPA revisions that became effective on September 14, 2020.

activities require the development of an EIS. As discussed in Section 1.3.1, the primary purpose for developing an EA is to determine if the alternative approaches developed to meet the need for action could potentially have significant individual and/or cumulative impacts on the quality of the human environment that would warrant the preparation of an EIS. WS prepared this EA so that WS can make an informed decision on whether an EIS would be necessary if WS implemented the alternative approaches to meeting the need for action.

WS is preparing this EA to facilitate planning, promote interagency coordination, streamline program management, clearly communicate to the public the analysis of individual and cumulative impacts of proposed activities, and to evaluate and determine if there would be any potentially significant or cumulative effects from the alternative approaches developed to meet the need for action. The analyses contained in this EA are based on information derived from WS' Management Information System, available documents (see Appendix A), interagency consultations, and public involvement.

If WS determines that implementation of a selected alternative approach would have a significant impact on the quality of the human environment based on this EA, WS would publish a Notice of Intent to prepare an EIS. This EA would be the foundation for developing that EIS.

1.3.3 Using this EA to Inform WS' Decisions and the Decisions to be Made

Although WS only provides assistance when requested, WS is required to comply with the NEPA before making final decisions about actions that could have environmental effects. WS will use the analyses in this EA to help inform agency decision-makers, including a decision on whether the alternative approaches of meeting the need for action requires the preparation of an EIS or the EA process concludes with a Finding of No Significant Impact.

Another major purpose of the NEPA is to include other agencies and the public during the planning process to support informed decision-making. Prior to making and publishing the decision[4] to conclude this EA process, WS will make this EA available to the public, agencies, tribes, and other interested or affected entities for review and comment, which will assist with understanding applicable issues and reasonable alternative means to meeting the need for action (see Section 1.2) and to ensure that the analyses are complete for informed decision-making.

Based on agency relationships, Memorandums of Understanding, and legislative authorities, WS is the lead agency for this EA, and therefore, responsible for the scope, content, and decisions made. Section 1.5 discusses the roles and responsibilities of agencies related to activities discussed in this EA. As discussed in Section 1.2, WS receives requests for assistance associated with many nonnative reptile and amphibian species in Florida. The FFWCC has regulatory authority over wildlife species in Florida. In addition, tribes have authority over wildlife species on tribal lands. Therefore, WS would be subject to any conditions associated with the authorizations given by the FFWCC and, if a tribe requests WS' assistance, WS would be subject to conditions associated with the authorizations given by the tribe on their lands.

Based on the scope of this EA, a decision to be made is: Should WS conduct activities to alleviate damage and threats of damage caused by nonnative reptiles and amphibians in Florida? If so, how can WS best respond to the need to reduce damage in Florida, and would activities conducted in response to that need result in effects to the human environment requiring the preparation of an EIS?

[4]As discussed in Section 1.3, the EA process concludes with either a Finding of No Significant Impact or the publication of a Notice of Intent to prepare an EIS.

1.3.4 Tribal Outreach and Involvement

WS mailed a letter to all federally recognized Tribes in Florida inviting them to participate in the development of the EA and to offer consultation. WS will also mail a letter to all federally recognized Tribes in Florida inviting them to submit comments on the pre-decisional draft EA.

1.3.5 Public Involvement

Public outreach and notification methods for this EA will include posting a notice on the national WS program webpage and on the www.regulations.gov webpage. In addition, WS will send out direct mailings to local known stakeholders and an electronic notification to stakeholders registered through the APHIS Stakeholder Registry. WS will also publish a notice in the legal section of the *Tallahassee Democrat* newspaper. WS will provide for a minimum of a 30-day comment period for the public and interested parties to review the EA and provide their comments. WS will inform the public of the decision using the same venues.

WS will coordinate the preparation of this EA with consulting partner agencies and tribes to facilitate planning, promote interagency and tribal coordination, and incorporate agency and tribal expertise, which includes the FFWCC. WS has asked each consulting agency and tribes to review the draft EA and provide input and direction to WS to ensure proposed activities would comply with applicable federal, tribal, and state regulations and policies, federal land management plans, Memorandums of Understanding, and cooperative agreements.

1.3.6 Period for which this EA is Valid

If WS determines that the analyses in this EA indicate that an EIS is not warranted, this EA remains valid until WS determines that new or additional needs for action, changed conditions, new issues, and/or new alternative approaches having different environmental impacts need to be analyzed to keep the information and analyses current. At that time, this analysis and document would be reviewed and, if appropriate, supplemented, or a new EA prepared pursuant to the NEPA.

If WS provides assistance with managing damage caused by nonnative reptiles or amphibians, WS would monitor activities conducted by its personnel to ensure those activities and their impacts remain consistent with the activities and impacts analyzed in this EA and selected as part of the decision. Monitoring activities would ensure that WS' activities and the effects associated with those activities occurred within the limits of evaluated/anticipated activities. Monitoring involves review of the EA for all of the issues evaluated in Chapter 3 to ensure that the activities and associated impacts have not changed substantially over time.

1.4 SCOPE OF ANALYSIS

WS has decided that one EA analyzing potential effects of implementing the alternative approaches of meeting the need for action for the entire State of Florida provides a more comprehensive and less redundant analysis than multiple EAs covering smaller regions. This approach also provides a broader scope for the effective analysis of potential cumulative impacts and for using data and reports from wildlife management agencies, which typically report data for the entire state.

Many of the target species discussed in Section 1.2 occur throughout Florida or over large regions of the state. Sources cite the estimated range of invasive reptile species in Florida to be at least 2,200 km^2 (Krysko et al. 2003, Townsend et al. 2003*a*, Townsend et al. 2003*b*, Enge et al. 2004*b*, Meshaka et al. 2004, Hardin 2007, Reed et al. 2010) while the current known distribution of invasive reptile species in

Florida is the area of South Florida from Tampa to West Palm Beach and south, with individuals sometimes naturally dispersing outside of this area as well as being released in points further north

Damage and threats of damage caused by target species can occur wherever those species occur within the state. Target species could occur in and around commercial, industrial, public, and private buildings, facilities, and properties where invasive species may sleep, loaf, feed, nest, or otherwise occur. Examples of areas where target species occur include, but are not necessarily limited to, residential buildings, golf courses, athletic fields, recreational areas, swimming beaches, parks, corporate complexes, subdivisions, businesses, industrial parks, and schools. Activities could also occur in and around agricultural areas, wetlands, restoration sites, cemeteries, public parks, bridges, industrial sites, urban/suburban woodlots, hydro-electric dam structures, reservoirs and reservoir shore lands, hydro and fossil power plant sites, substations, transmission line rights-of-way, landfills, on ship fleets, military bases, or at any other sites where target species may occur. Target species could occur in and around agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, grain mills, and grain handling areas (*e.g.*, railroad yards) where target species destroy crops, feed on spilled grains, or contaminate food products for human or livestock consumption. Additionally, target species could occur at airports and surrounding properties where those species represent a threat to aviation safety.

Responding to requests for assistance falls within the category of actions in which the exact timing or location of individual requests for assistance can be difficult to predict with sufficient notice to describe accurately the locations or times in which WS could reasonably expect to be acting. Although WS could predict some of the possible locations or types of situations and sites where some requests for assistance could occur, WS cannot predict the specific locations or times at which affected resource owners would determine that damage had become intolerable to the point that they request assistance from WS. WS must be ready to provide assistance on short notice anywhere in Florida when receiving a request for assistance. Therefore, the geographic scope of the actions and analyses in this EA is statewide and this EA analyzes actions that could occur on federal, tribal, state, county, city, and private lands, when requested. However, WS would only provide assistance when the appropriate property owner or manager requested such assistance and only on properties where WS and the appropriate property owner or manager has signed a work initiation document.

WS recognizes that wildlife is a key component of Native American culture and beliefs. The exact nature of this relationship and role varies among tribes and individuals within tribes. WS would not conduct any activities on tribal lands without the written permission of the tribe.

The analyses in this EA would apply to any actions that WS may conduct to alleviate damage caused by those target species listed in this EA in any locale and at any time within Florida when WS receives a request for such assistance from the appropriate property owner or property manager. The standard WS Decision Model (see WS Directive 2.201; Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in the state (see Chapter 2 for a description of the WS Decision Model and its application). The WS Decision Model is an analytical thought process used by WS' personnel for evaluating and responding to requests for assistance. If WS determines that the analyses in this EA do not warrant the preparation of an EIS, the decisions made by WS' personnel using the model would be consistent with the alternative approach that WS selects to meet the need for action. In addition, decisions made using the model would be in accordance with WS' directives as well as relevant laws and regulations.

As discussed previously, the property owner or property manager would determine when assistance from WS was appropriate. WS would only conduct activities after receiving a request from the appropriate property owner or property manager. In addition, WS would only conduct activities after the appropriate property owner or manager signed a work initiation document or similar document allowing WS to

conduct activities on the property they own or manage. Therefore, this EA meets the intent of the NEPA with regard to site-specific analysis, informed decision-making, and providing the necessary timely assistance to those people requesting assistance from WS.

1.5 ROLES AND AUTHORITY OF FEDERAL, TRIBAL, AND STATE AGENCIES

If WS provides assistance to meet the need for action, several federal, tribal, and state agencies would have roles and authorities that would relate to WS conducting activities. Below are brief discussions of the roles and authorities of other federal, tribal, and state agencies, as those authorities relate to conducting wildlife damage management.

1.5.1 United States Environmental Protection Agency

The United States Environmental Protection Agency (EPA) is responsible for implementing and enforcing the Federal Insecticide, Fungicide, and Rodenticide Act, which regulates the registration and use of pesticides.

1.5.2 Tribal Agencies

Tribes in Florida are responsible for managing wildlife on their tribal lands, including managing the damage that wildlife cause. If WS conducts activities at the request of a tribe, WS would work with tribal authorities to obtain the necessary permits or authorizations to conduct activities.

1.5.3 Florida Fish and Wildlife Conservation Commission

The FFWCC was founded in 1999 as the result of a merger between the former Marine Fisheries Commission, the Division of Law Enforcement of the Florida Department of Environmental Protection, and the former Florida Game and Freshwater Fish Commission. The FFWCC exercises the regulatory and executive powers of the state with respect to wild animal life and aquatic life. The authority for management of resident wildlife species is the responsibility of FFWCC. The FFWCC collects and compiles information on wildlife population trends and take, then uses this information to manage wildlife populations.

1.5.4 Florida Department of Agriculture and Consumer Services

The Florida Department of Agriculture and Consumer Services enforces state laws pertaining to the use and application of pesticides. The Florida Department of Agriculture and Consumer Services requires the registration of pesticide products in the state, the licensing and certification of commercial and private applicators and pest control consultants, the proper handling, transportation, storage, and disposal of pesticides, and the licensing of dealers selling restricted use pesticides.

1.6 DOCUMENTS RELATED TO THIS EA

Additional documents relate to activities that WS could conduct to manage damage or threats of damage associated with target species in the state. A description of the relationship of those documents to this EA occurs below.

1.6.1 Florida 2019 State Wildlife Action Plan

Florida's State Wildlife Action Plan represents a comprehensive approach for conserving Florida's wildlife and natural areas for future generations. It outlines native wildlife and habitats in need, why they

are in need and, most importantly, conservation actions for protecting them. The Action Plan's purpose is to serve as a starting point for building a common framework for Florida's numerous wildlife conservation partners.

1.6.2 Florida Gap Analysis Project

The Florida Gap Analysis Project is a comprehensive report on land cover, vertebrate occurrences and natural history information, and land stewardship in Florida. The Florida Gap Analysis Project follows methods by the national Gap Analysis Program, which aims to determine the degree to which wildlife species and habitats are represented in the current mix of conservation lands. Wildlife species and habitats that are not well represented are considered conservation "*gaps*." The Florida Gap Analysis Project provides geographic and ecological information on the status of not only threatened or rare species, but the common species of Florida. The Florida Gap Analysis Project has four major components: land cover mapping, documentation of vertebrate species distributions, documentation of land stewardship practices with respect to conservation, and an integrated analysis of these three elements.

The majority of Florida is in Mesic-Hydric Pine Forest land cover (18%), forested swamp (14%) or agriculture (23%, including pasture). The agricultural land use is primarily converted pinelands. The proportion of Mesic-Hydric Pine Forest that is in plantation farming was not determined. The combined forested swamp classes are Tropical/subtropical Swamp Forest, Bay/Gum/Cypress, Loblolly Bay Forest, Swamp Forest, and Cypress Forest. Xeric shrub, Sandhill and sand pine comprise another 4% of the state, urban classes and freshwater marsh, primarily in southern Florida, contribute another 8% each to the state's land covers. The small percentages of each of the individual land cover classes (there are 71 total classes) are indicative of the heterogeneity of Florida's landscape (Pearlstine et al. 2002).

1.6.3 WS' Environmental Assessments

WS has developed an EA that analyzed the need for action to manage damage associated with several bird species. In addition, WS has prepared a separate EA that analyzed the need for action to manage damage associated with several mammal species. Those EAs identified the issues associated with managing damage associated with several bird and mammal species in the state and analyzed alternative approaches to meet the specific need identified in the EA while addressing the identified issues.

1.7 FEDERAL, TRIBAL, AND STATE REGULATIONS THAT COULD APPLY TO WS' ACTIVITIES

In addition to the NEPA, several regulations and executive orders would be relevant to activities that WS could conduct when providing assistance. This section discusses several regulations and executive orders that would be highly relevant to WS' activities when providing assistance. All management actions conducted and/or recommended by WS would comply with appropriate federal, tribal, state, and local laws in accordance with WS Directive 2.210.

1.7.1 Federal and tribal regulations that could apply to WS' activities

If WS provides assistance with managing the damage that nonnative reptiles and amphibians can cause, several federal and tribal regulations could apply to the activities that WS conducts. The following are the primary federal regulations that could apply to WS' activities.

Endangered Species Act

Under the Endangered Species Act, all federal agencies shall seek to conserve threatened and endangered species and utilize their authorities in furtherance of the purposes of the Endangered Species Act (Section 2(c)). Evaluation of the alternative approaches in regard to the Endangered Species Act will occur in Section 3.1.2 of this EA.

Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act and its implementing regulations (Public Law 110-426, 7 USC 136 et seq.) require the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing the Federal Insecticide, Fungicide, and Rodenticide Act. All pesticides used by WS in Florida would be registered with and regulated by the EPA and the Florida Department of Agriculture and Consumer Services and used or recommended by WS in compliance with labeling procedures and requirements.

National Historic Preservation Act

The National Historic Preservation Act and its implementing regulations (see 36 CFR 800) require federal agencies to initiate the Section 106 process if an agency determines that its actions are undertakings as defined in Section 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.

The Native American Graves Protection 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 are to discontinue work until they have made a reasonable effort to protect the items and have notified the proper authority.

Consultation and Coordination with Indian Tribal Governments – Executive Order 13175

Executive Order 13175 directs federal agencies to provide federally recognized tribes the opportunity for government-to-government consultation and coordination in policy development and program activities that may have direct and substantial effects on their tribe. Its purpose is to ensure that tribal perspectives on the social, cultural, economic, and ecological aspects of agriculture, as well as tribal food and natural resource priorities and goals, are heard and fully considered in the decision-making processes of all parts of the federal government.

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

This law established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans. Funds were authorized for cost-sharing grants to states to develop their programs. Subsequent to federal approval of their plans, grants would be awarded for implementation purposes. In order to be eligible for federal approval, each state's plan was required to define boundaries of the coastal zone, identify uses of the area to be regulated by the state, determine the mechanism (criteria, standards or regulations) for controlling such uses, and develop broad guidelines for priorities of uses within the coastal zone. In addition, this law established a system

of criteria and standards for requiring that federal actions be conducted in a manner consistent with the federally approved plan. The standard for determining consistency varied depending on whether the federal action involved a permit, license, financial assistance, or a federally authorized activity.

Federal Food, Drug, and Cosmetic Act (21 USC 360)

This law places administration of pharmaceutical drugs, including those immobilizing drugs used for wildlife capture and handling, under the Food and Drug Administration.

Controlled Substances Act of 1970 (21 USC 821 et seq.)

This law requires an individual or agency to have a special registration number from the United States Drug Enforcement Administration to possess controlled substances, including controlled substances used for animal capture and handling.

Animal Medicinal Drug Use Clarification Act of 1994

The Animal Medicinal Drug Use Clarification Act and its implementing regulations (21 CFR 530) establish several requirements for the use of animal drugs, including those animal drugs used to capture and handle wildlife. Those requirements are: (1) a valid "*veterinarian-client-patient*" relationship, (2) well defined record keeping, (3) a withdrawal period for animals that have been administered drugs, and (4) identification of animals.

Environmental Justice in Minority and Low-income Populations - Executive Order 12898

Executive Order 12898 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. 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 minority and low-income persons or populations. This EA will evaluate activities addressed in the alternative approaches for their potential impacts on the human environment and compliance with Executive Order 12898.

Protection of Children from Environmental Health and Safety Risks - Executive Order 13045

Children may suffer disproportionately for many reasons from environmental health and safety risks, including their physical and mental development. Federal agencies must make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children. In addition, federal agencies must ensure agency policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

Advancing Racial Equity and Support for Underserved Communities Through the Federal Government - Executive Order 13985

Executive Order 13985 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. Advancing Racial Equity 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. Executive Order 13985 requires federal agencies to make Advancing Racial Equity 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 low-income persons or populations. APHIS implements Executive Order 13985 principally through its compliance with the NEPA.

Protecting Health and the Environmental and Restoring Science to Tackle the Climate Crisis – Executive Order 13990

Executive Order 13990 directs federal agencies to ensure access to clean air and water, limit exposure to dangerous chemicals and pesticides, reduce greenhouse gas emissions, bolster resilience to the impacts of climate change, restore and expand our national treasures and monuments, and prioritize both environmental justice and employment.

Tackling the Climate Crisis at Home and Abroad - Executive Order 14008

Executive Order 14008 makes climate considerations an essential element of United States foreign policy and national security. Executive Order 14008 establishes a policy to meet the challenges of climate change through a coordinated government-wide approach and engagement with stakeholders, including state, local, and tribal governments.

Invasive Species - Executive Order 13112 and Executive Order 13751

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 nonnative 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. Executive Order 13751 amended Executive Order 13112 by clarifying the operations of the National Invasive Species Council and by expanding its membership. In addition, Executive Order 13751 incorporated additional considerations into federal efforts to address invasive species and to strengthen coordinated, cost-efficient federal actions.

Tackling the Climate Crisis at Home and Abroad - Executive Order 14008

Executive Order 14008 makes climate considerations an essential element of United States foreign policy and national security. Executive Order 14008 establishes a policy to meet the challenges of climate change through a coordinated government-wide approach and engagement with stakeholders, including state, local, and tribal governments.

Tribal Regulations

As discussed in Section 1.5.2, the federally recognized tribes in Florida have the authority to manage wildlife on their tribal lands. WS would not conduct activities on tribal lands unless WS and the tribe sign a work initiation document or a similar written document allowing WS to conduct activities on their tribal lands. If a tribe requests WS' assistance, WS would work with tribal authorities to obtain the necessary permits or authorizations to conduct activities and WS would adhere to the regulations of the tribe in accordance with WS Directive 2.210.

1.7.2 State regulations that could apply to WS' activities

If WS provides assistance to manage damage or threat of damage, state regulations could also apply to the activities that WS conducts. The following are the primary state regulations that could apply to WS' activities.

Florida Administrative Code Rules Relating to Nonnative Species

Rule 68-5 of the Florida Administrative Code provides rules relating to nonnative species in Florida, including nonnative reptiles and amphibians. The purpose of Rule 68-5.001(1) "*…is to establish definitions, provide requirements for import permits, provide Conditional and Prohibited species lists, establish requirements for possession of Conditional and Prohibited species, establish criteria for amnesty for persons relinquishing nonnative fish and wildlife…*". Rule 68-5.001(2) of the Florida Administrative Code states "*Unless otherwise specifically provided in divisions 68A through 68E,* [Florida Administrative Code]*, all species of freshwater aquatic life and wild animal life not native to Florida may be taken throughout the year, without restrictions.*" Rule 68-5.003 addresses the introduction of nonnative species in the state. Rule 68-5.004 and Rule 68-5.005 identify conditional nonnative species and the possession of conditional nonnative species while Rule 68-5.006 and Rule 68-5.007 identify prohibited nonnative species and the possession of prohibited nonnative species.

CHAPTER 2: ISSUES AND ALTERNATIVE APPROACHES

WS has identified a need for action based on requests for assistance that WS receives to manage damage caused by nonnative reptiles and amphibians in the state (see Section 1.2). WS has identified several issues associated with the activities that WS could implement to meet the need for action. Issues are concerns regarding potential effects that might occur from proposed activities. Federal agencies must consider such issues during the decision-making process required by the NEPA. Section 2.1 of this EA discusses the issues that WS identified, which could occur from implementation of the alternative approaches to meet the need for action. Section 3.2 discusses additional issues that WS identified; however, the EA does not analyze those issues in detail for the reasons provided in Section 3.2.

WS developed four alternative approaches to meet the need for action that Section 1.2 of this EA identifies and to address the identified issues discussed in Section 2.1. Section 2.4.1 discusses the four alternative approaches that WS could implement to meet the need for action. Section 2.4.2 discusses the alternative approaches considered but not analyzed in detail and provides the rationale for not considering those alternative approaches in detail within this EA. In addition, WS' directives would provide guidance to WS' personnel conducting official activities (see WS Directive 1.101).

2.1 ISSUES USED TO DEVELOP THE ALTERNATIVE APPROACHES

This section describes the issues that WS identified during the scoping process for this EA. Section 3.1 analyzes the environmental consequences of each alternative in comparison to determine the extent of actual or potential impacts on the issues. WS evaluated, in detail, the following issues.

2.1.1 Issue 1 - Effects of Damage Management Activities on Populations of Target Species

A common issue when addressing damage caused by animals are the potential impacts of management actions on the populations of target species. Methods available to alleviate damage or threats of damage include both nonlethal and lethal methods. Nonlethal methods available can capture, exclude, disperse, or otherwise make an area unattractive to target species causing damage, which can reduce the presence of those species at the site and potentially the immediate area around the site where people use those

nonlethal methods. Lethal methods could also be available to remove an animal or those animals responsible for causing damage or posing threats to human safety. Therefore, if WS' personnel used lethal methods, the removal of an animal or animals could result in local population reductions in the area where damage or threats were occurring. Section 3.1.1 analyzes the effects on the populations of target species in the state from implementation of the alternative approaches.

2.1.2 Issue 2 - Effects on the Populations of Nontarget Wildlife Species, Including Threatened and Endangered Species and Species of Special Concern

The potential for effects on nontarget species arises from the use of nonlethal and lethal methods identified in the alternative approaches, including potential effects on threatened or endangered species and species of special concern. The use of nonlethal and lethal methods has the potential to inadvertently exclude, disperse, capture, or kill nontarget animals. A nontarget animal would be an animal that WS' personnel exclude, disperse, capture, or kill unintentionally while targeting a specific animal or group of animals. Appendix B describes the methods available for use under the alternative approaches. As part of the scoping process for this EA, WS consulted with the United States Fish and Wildlife Service pursuant to Section 7 of the Endangered Species Act during the development of this EA, which Section 3.1.2 discusses in further detail. WS would also consult with the FFWCC on potential effects to state threatened or state species of special concern when WS determines activities could adversely affect the populations of those species.

2.1.3 Issue 3 - Effects of WS' Activities on Human Health and Safety

An additional issue often raised is the potential risk to human health and safety associated with employing methods to manage damage caused by target species. WS' employees would use and recommend only those methods that are legally available, selective for target species, and effective at resolving the damage associated with the target species. Still, some concerns exist regarding the safety of methods despite their legality, selectivity, and effectiveness. As a result, this EA analyzes the potential for proposed methods to pose a risk to members of the public and employees of WS. Section 3.1.3 further evaluates the risks to human safety as this issue relates to the alternative approaches.

2.1.4 Issue 4 - Humaneness and Animal Welfare Concerns of Methods

Several nonlethal and lethal methods would be available to alleviate damage associated with target species. The use of nonlethal and lethal methods has the potential to disperse, exclude, capture, or kill target species. Section 3.1.4 discusses concerns regarding the humaneness of available methods and animal welfare concerns.

2.2 COMMON ACTIONS ASSOCIATED WITH DAMAGE MANAGEMENT ACTIVITIES

The following subsections discuss those actions WS identified that would continue to occur if WS implemented any of the alternative approaches identified in Section 2.4 that involve WS providing assistance.

2.2.1 WS' Co-managerial Approach to Making Decisions

Those entities experiencing damage associated with reptiles or amphibians could conduct activities on their own, they could contact a private business for assistance, they could seek assistance from another governmental agency, they could seek assistance from WS, if available, or they could take no action. In all cases, the person and/or entity experiencing damage or threats of damage would determine the

appropriate involvement of other people and/or entities and to what degree those people or other entities would be involved in the decision-making process.

If a person and/or entity requested assistance from WS and WS was able to provide assistance, WS would follow the "*co-managerial approach*" to alleviate damage or threats of damage as described by Decker and Chase (1997). Within this management model, WS would provide technical assistance regarding the biology and ecology of target species and effective, practical, and reasonable methods available to a local decision-maker(s) to reduce damage or threats. Generally, a decision-maker seeking assistance would be part of a community, municipality, business, governmental agency, and/or a private property owner.

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 was made. By involving decision-makers in the process, WS would present damage management recommendations to the appropriate decision-maker(s) to allow decisions on damage management to involve those individuals that the decision maker(s) represents. As addressed in this EA, WS would provide technical assistance to allow the decision-maker(s) to present information on damage management activities to those persons represented by the decision-maker(s), including demonstrations and presentations by WS at public meetings to allow for involvement of the community. Requests for assistance to manage damage caused by reptiles and amphibians 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) would be able to provide the information to local interests either through technical assistance provided by WS or through demonstrations and presentations by WS on activities to manage damage. This process would allow WS to recommend and implement activities based on local input.

The decision-maker for a local community would be officials or representatives that local residents elected to represent them and oversee the interests and business of the local community. Those officials or representatives could bring information back to a higher authority or the community for discussion and decision-making. In the case of private property owners, the decision-maker would be the individual who owns or manages the affected property. Decision-makers for local, state, or federal property would be the officials responsible for or authorized to manage the public land to meet interests, goals, and legal mandates for the property. Decision-makers for tribal lands would be officials responsible for or authorized to manage tribal lands and the lands/and or resources identified under treaty rights, to meet interests, goals, and legal mandates for the property. Involvement of tribal members or members of the surrounding community would be conducted in accordance with established regulations and procedures for the affected tribe(s). If WS implemented Alternative 4, WS would not provide any assistance with managing the damage that nonnative reptiles and amphibians can cause in the state; therefore, the co-managerial approach would not be applicable.

2.2.2 Availability of Methods to Manage Damage Caused by Target Species

Appendix B discusses several methods available to alleviate damage or threats of damage associated with reptiles and amphibians. Most methods discussed in Appendix B would be available to any entity for use when managing damage or threats of damage caused by nonnative reptiles or amphibians in the state. Therefore, despite the level of involvement by WS, most methods discussed in Appendix B would be available to other entities to manage damage or threats of damage associated with reptiles or amphibians, including the public, private businesses, tribal agencies, and other governmental agencies. The only methods that WS could use that would have limited availability or would not be available for use by other entities would be immobilizing drugs, euthanasia chemicals, toxicants (if registered), and trained dogs.

2.2.3 Effectiveness of Methods to Address Damage and Threats of Damage

Defining the effectiveness of damage management activities often occurs in terms of losses or risks potentially reduced or prevented. Effectiveness can be dependent upon how accurately practitioners diagnose the problem, the species responsible for the damage, and how people implement actions to correct or mitigate risks or damages. To determine that effectiveness, WS must be able to complete management actions expeditiously to minimize harm to nontarget animals and the environment, while at the same time, using methods as humanely as possible. 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 people using the method, and, for WS' personnel, the guidance provided by WS' directives and policies. For any management methods employed, the proper timing is essential in effectively managing damage. Employing methods soon after damage begins or soon after identifying damage threats increases the likelihood that 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 animal damage.

WS is considering several methods (see Appendix B) that WS' personnel could incorporate into alternative approaches (see Section 2.4) to meet the need for action. If WS provides assistance and depending on the alternative approach selected to meet the need for action (see Section 2.4), WS could consider the use of an individual method or consider the use of several methods in combination to address damage and threats of damage. When WS provides assistance, WS' personnel would use the WS Decision Model (see WS Directive 2.201) to identify methods (see WS Directive 2.101) appropriate to reducing damage or the threat of damage. In general, when providing assistance, WS' personnel would consider an adaptive approach that would integrate a combination of methods to resolve damage and reduce threats of damage (see WS Directive 2.105).

Often of concern with the use of lethal methods is that target animals removed or dispersed would only be replaced by other animals either during the application of those methods (from other animals that immigrate into the area) or by animals the following year (increase in reproduction that could result from less competition). WS does not conduct activities to manage a species population. As discussed in Section 1.1, WS is the lead federal agency responsible for managing conflicts between people and wildlife. Therefore, when WS uses lethal methods to reduce damage, the intent is to reduce the number of target animals present at a location where damage is occurring by targeting those animals causing damage or posing threats. Because the intent of lethal methods is to manage those animals causing damage and not to manage entire populations, WS considers those methods effective even if animals immigrate into the area during activities or return the following year.

If WS provides assistance, WS' personnel would evaluate the request for assistance and would consider the effectiveness of the methods available for that request based on how effective a method or methods were during previous requests for assistance and/or how effective methods were when used by those entities experiencing damage or threats of damage. WS' personnel would continue to evaluate effectiveness. Therefore, WS' personnel would consider method effectiveness as part of the decision-making process during their use of the WS Decision Model for each damage management request based on continual evaluation of methods and results.

In meeting the need for action, the objective would be to reduce damage, risks, and conflicts with nonnative reptiles or amphibians as requested. If WS excludes, removes, and/or disperses target species from an area where they were causing damage or posing a threat of damage, those animals would no longer be present at that location to cause damage or pose a threat. The removal and/or dispersal of reptiles or amphibians could be short-term because new individuals may immigrate to an area. Therefore,

the return of target animals to an area after removal and/or dispersal activities does not mean individual management actions or methods were unsuccessful, but that periodic management may be necessary.

Similar to the effectiveness of methods to reduce damage or reduce threats of damage is the cost effectiveness of methods. The cost of methods and/or the cost of implementing methods may sometimes be a secondary consideration because of overriding environmental, legal, human health and safety, humaneness, animal welfare, or other concerns. Therefore, the cost effectiveness of methods and/or a cost benefit analysis is not essential to making a reasoned choice among the alternative approaches that WS is considering. In addition, the Council on Environmental Quality does not require a formal, monetized cost benefit analysis to comply with the NEPA.

2.2.4 Research Methods and Information on the Life History of Target Species

Under any of the alternative approaches, WS would continue to research and develop methods to address target species damage through the National Wildlife Research Center, which functions as the research unit of WS by providing scientific information and developing methods to address damage caused by animals. Research biologists with the National Wildlife Research Center work closely with WS' personnel, wildlife managers, researchers, and others to develop and evaluate methods and techniques. For example, one of the research areas of the National Wildlife Research Center Field Station in Florida is population management of invasive species.

2.2.5 Authorization of Activities by a Tribe

WS would not conduct activities on tribal lands unless WS and the tribe sign a work initiation document or a similar document. A tribe may also require authorization (*e.g.*, a permit) before conducting damage management activities on their properties. If WS received a request for assistance from a tribal authority and WS received written permission to conduct activities on their tribal lands, WS would conduct activities within authorizations issued by the tribe.

2.2.6 Authorization from the FFWCC

The FFWCC is the state agency responsible for the management of animal life within Florida (see Section 1.5.3). As discussed in Section 1.7.2, unless specifically provided in the Florida Administrative Code, people can take all species of freshwater aquatic life and animal life not native to Florida throughout the year without restrictions on private lands.

2.2.7 Influence of Global Climate Change on Nonnative Reptile and Amphibian Populations

The State of the Climate in 2021 report indicates that global temperatures continue to increase (Blunden and Boyer 2022). Impacts of this change will vary throughout the United States, but some areas could experience air and water temperature increases, alterations in precipitation, and increased severe weather events. Temperature and precipitation often influence the distribution and abundance of a plant or animal species. According to the EPA (2016), as temperatures continue to increase, the ranges of many species will likely expand into northern latitudes and higher altitudes. Species adapted to cold climates may struggle to adjust to changing climate conditions (*e.g.*, less snowfall, range expansions of other species). Sheikh et al. (2007) stated, "*Wildlife species can be affected by several climatic variables such as increasing temperatures, changes in precipitation, and extreme weather events*". Sheikh et al. (2007) further stated that changes in climate could benefit some species of wildlife.

The impact of climate change on wildlife and their habitats is of increasing concern to land managers, biologists, and members of the public. Climate change may alter the frequency and severity of habitat-

altering events, such as wildfires, weather extremes, such as drought, presence of invasive species, and wildlife diseases. WS recognizes that climate change is an ongoing concern and may result in changes to the range and abundance of certain species. Climate change may also affect other factors, such as agricultural practices. Over time, climate change would likely lead to changes in the scope and nature of human-wildlife conflicts in the state. Because these types of changes are an ongoing process, WS has developed adaptive management strategies that allow WS and other agencies to monitor for and adjust to impacts of ongoing changes in the affected environment.

If WS selected an alternative approach to meet the need for action that allows WS to provide assistance (see Section 2.4), WS would monitor activities, in context of the issues analyzed in detail, to determine if the need for action and the associated impacts remain within the parameters established and analyzed in this EA. If WS determines that a new need for action, changed conditions, new issues, or new alternative approaches having different environmental impacts warrant a new or additional analysis, WS would supplement this analysis or conduct a separate evaluation pursuant to the NEPA. Through monitoring, WS can evaluate and adjust activities as changes occur over time.

WS' monitoring would also include reviewing the list of species the United States Fish and Wildlife Service and the National Marine Fisheries Service considers as threatened or endangered within the state pursuant to the Endangered Species Act. As appropriate, WS would consult with the United States Fish and Wildlife Service and/or the National Marine Fisheries Service pursuant to Section 7 of the Endangered Species Act to ensure the activities conducted by WS would not jeopardize the continued existence of threatened or endangered species or result in adverse modification to areas designated as critical habitat for a species within the state. Through the review of species listed as threatened or endangered and the consultation process with the United States Fish and Wildlife Service and/or the National Marine Fisheries Service, WS can evaluate and adjust activities conducted to meet the need for action. Accordingly, WS could supplement this analysis or conduct a separate evaluation pursuant to the NEPA based on the review and consultation process. If deemed necessary through the monitoring process, WS would adjust activities to assure that WS' actions do not significantly contribute to changes in the environmental status quo that occur because of climate change. Similarly, WS would monitor those species designated as state threatened and state species of special concern and would consult with the FFWCC when WS determines activities could adversely affect the populations of those species.

2.3 WS' DIRECTIVES AND STANDARD PROCEDURES WHEN PROVIDING ASSISTANCE

WS' directives define program objectives and guide WS' activities when managing wildlife damage (see WS Directive 1.201, WS Directive 1.205, WS Directive 1.210). WS' personnel would adhere to applicable WS' directives when responding to and providing assistance. WS' directives improve the safety, selectivity, and efficacy of activities that WS' personnel could conduct to alleviate or prevent damage. In addition, WS' personnel would follow the conditions and requirements associated with authorizations provided by the FFWCC and/or a tribal authority, including any requirements to report WS' activities. WS' implementation of the alternative approaches discussed in Section 2.4.1 would adhere to WS Directive 2.320, which provides guidelines for WS' actions when managing damage associated with invasive species.

2.4 ALTERNATIVE APPROACHES THAT WS CONSIDERED

This section discusses those alternative approaches that WS identified during the initial scoping process for this EA and provides a description of how WS would implement those approaches. WS developed the alternative approaches based on the need for action. The need for action identified by WS is associated with requests for assistance that WS receives to manage damage and threats of damage caused by

nonnative reptile and amphibian species in Florida (see Section 1.2). WS also developed the alternative approaches to address those issues identified in Section 2.1.

2.4.1 Alternative Approaches Considered in Detail within this EA

As discussed in Section 1.2, people experiencing damage or threats of damage associated with wildlife often seek assistance from other entities to alleviate that damage or to prevent damage from occurring. WS is the lead federal agency responsible for managing conflicts between people and wildlife (see Section 1.2); therefore, people seeking help with alleviating damage caused by nonnative reptiles and amphibians could request assistance from WS. This EA considers in detail the following four alternative approaches to meeting the need for action identified in Section 1.2 and those issues identified in Section 2.1.

Alternative 1 - WS would continue the current integrated methods approach to managing damage caused by nonnative reptiles and amphibians in Florida (Proposed Action/No Action)

If WS implements Alternative 1, WS would be available to provide assistance when people experience damage or threats of damage associated with those nonnative reptile and amphibian species addressed in this EA and, consequently, request assistance from WS. When responding to a request for assistance, WS' personnel would use the WS Decision Model (Slate et al. 1992; see WS Directive 2.201) to formulate a management strategy to address each request for assistance.

The general thought process and procedures of the WS Decision Model would include the following steps.

1. **Receive Request for Assistance:** WS would only provide assistance after receiving a request for such assistance. WS would not respond to public bid notices.
2. **Assess Problem:** First, WS would make a determination as to whether the assistance request is within the authority of WS. If an assistance request is within the authority of WS, WS' employees would gather and analyze damage information to determine applicable factors, such as what species are responsible for the damage, the type, extent, and magnitude of damage. Other factors that WS' employees could gather and analyze would include the current economic loss or current threat (*e.g.*, threat to human safety), the potential for future losses or damage, the local history of damage, what management methods, if any, were used to reduce past damage, and the results of implementing those methods.
3. **Evaluate Management Methods:** Once a problem assessment is completed, a WS' employee would conduct an evaluation of available management methods. Appendix B discusses those methods that WS' employees would consider when evaluating management methods to alleviate damage or threats of damage associated with nonnative reptile and amphibian species. The employee would evaluate available methods in the context of their legal and administrative availability and their acceptability based on biological, environmental, humaneness, social, and cultural factors, including culturally important species. When evaluating management methods and formulating a management strategy, WS' personnel would give preference to nonlethal methods when they determine those methods to be practical and effective (see WS Directive 2.101).
4. **Formulate Management Strategy:** A WS' employee would formulate a management strategy using those methods that the employee determines to be practical for use. The WS employee would also consider factors essential to formulating each management strategy, such as species important to tribes, available expertise, legal constraints on available methods, human safety, humaneness, nontarget animal risks, costs, and effectiveness.

5. **Provide Assistance:** After formulating a management strategy, a WS employee would provide technical assistance and/or direct operational assistance to the requester (see WS Directive 2.101). All management actions conducted and/or recommended by WS would comply with appropriate federal, state, and local laws in accordance with WS Directive 2.210.
6. **Monitor and Evaluate Results of Management Actions:** When providing direct operational assistance, it is necessary to monitor the results of the management strategy. Monitoring would be important for determining whether further assistance is required or whether the management strategy resolved the request for assistance. Through monitoring, a WS' employee would continually evaluate the management strategy to determine whether additional techniques or modification of the strategy is necessary.
7. **End of Project:** When providing technical assistance, a project would normally end after a WS' employee provided recommendations or advice to the requester. A direct operational assistance project would normally end when WS' personnel stop or reduce the damage or threat to an acceptable level to the requester or to the extent possible. Some damage situations may require continuing or intermittent assistance from WS' personnel and may have no well-defined termination point.

Therefore, if WS implements Alternative 1, WS would respond to requests for assistance by: 1) taking no action, if warranted, 2) providing only technical assistance to property owners or managers on actions they could take to reduce damage caused by nonnative reptiles or amphibians, or 3) providing technical assistance and direct operational assistance to a property owner or manager experiencing damage. WS would provide technical assistance to those entities requesting assistance as described for Alternative 3. Direct operational damage management assistance would include damage management activities that WS' personnel would conduct directly or supervise. WS' employees may initiate operational damage management assistance when technical assistance alone would not effectively alleviate the damage or the threat of damage and when WS and the entity requesting assistance have signed a work initiation document. Funding for WS' activities could occur from federal appropriations, state appropriations, and/or from cooperative service agreements with an entity requesting WS' assistance.

The initial investigation would define the nature, history, and extent of the problem; species responsible for the damage; and methods available to alleviate the problem. When evaluating management methods and formulating a management strategy, WS' personnel would give preference to nonlethal methods when they determine those methods to be practical and effective (see WS Directive 2.101). Appendix B discusses those methods that WS' employees would consider when evaluating management methods to alleviate damage or threats of damage associated with nonnative reptiles and amphibians. In general, the most effective approach to resolving damage would be to integrate the use of several methods simultaneously or sequentially while continuing to evaluate the effectiveness of the method or methods.

Alternative 1 would be an adaptive approach to managing damage that would integrate the use of the most practical and effective methods as determined by a site-specific evaluation for each request after applying the WS Decision Model. The philosophy behind an adaptive approach would be to integrate the best combination of methods while minimizing the potentially harmful effects on people, target and nontarget species, and the environment. WS' personnel would not necessarily use every method from Appendix B to address every request for assistance but would use the WS' Decision Model to determine the most appropriate approach to address each request for assistance, which could include using additional methods from Appendix B if initial efforts were unsuccessful at reducing damage or threats of damage adequately.

Alternative 2 - WS would continue the current integrated methods approach to managing damage caused by nonnative reptiles and amphibians in Florida using only nonlethal methods

Under this alternative, WS would implement an adaptive integrated methods approach as described under Alternative 1, including the use of the WS' Decision Model; however, WS would only consider nonlethal methods when formulating approaches to resolve damage associated with nonnative reptile and amphibian species. WS could provide technical assistance and/or direct operational assistance similar to Alternative 1. WS would provide technical assistance to those entities requesting assistance as described for Alternative 3. The only methods that WS would recommend and/or use would be nonlethal methods. Section I of Appendix B describes nonlethal methods that WS could consider when formulating a management strategy using the WS Decision Model.

WS would refer requests for information regarding lethal methods to the FFWCC and/or private entities. Although WS would not recommend or use lethal methods under this alternative, other entities, including private entities, could continue to use many of the lethal methods discussed in Section II of Appendix B to resolve damage or threats of damage.

Alternative 3 - WS would recommend an integrated methods approach to managing nonnative reptile and amphibian damage in Florida through technical assistance only

If WS implements Alternative 3, WS would continue to use the WS' Decision Model to respond to requests for assistance; however, WS would only provide technical assistance. Technical assistance would provide people with information, demonstrations, and recommendations on appropriate methods available to reduce damage caused by nonnative reptiles and amphibians. The implementation of methods and techniques to alleviate or prevent damage would be the responsibility of the requester with no direct involvement by WS. In some cases, WS may provide supplies or materials that were of limited availability for use by private entities (*e.g.*, loaning of live traps). Similar to Alternative 1 and Alternative 2, a key component of assistance provided by WS would be providing information to the requester about reptiles or amphibians and how to manage damage associated with target species.

Education would be an important component of technical assistance 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. When responding to a request for assistance, WS would provide those entities with information regarding the use of appropriate methods. WS would provide property owners or managers requesting assistance with information regarding the use of effective and practical techniques and methods. In addition to the routine dissemination of recommendations and information to individuals or organizations experiencing damage, WS could provide lectures, courses, and demonstrations to agricultural producers, homeowners, governmental entities, colleges and universities, and other interested groups. WS frequently cooperates with other entities in education and public information efforts. Additionally, WS' personnel may present technical papers at professional meetings and conferences so that other wildlife professionals and the public receive updates on recent developments in damage management technology, programs, laws and regulations, and agency policies.

Technical assistance would include collecting information, such as the number of individuals of the target species involved, the extent of the damage, and previous methods that the cooperator used to alleviate the problem. WS' personnel would then provide information on appropriate methods that the cooperator could consider to alleviate the damage themselves. Types of technical assistance projects may include a site visit to the affected property, written communication, telephone conversations, or presentations to groups such as homeowner associations or civic leagues.

Generally, WS' personnel would describe several management strategies to the requester for short and long-term solutions to managing damage based on the level of risk, need, and the practicality of their application. WS' personnel would recommend and loan only those methods legally available for use by the appropriate individual. Those methods described in Appendix B would be available to those people experiencing damage or threats associated with nonnative reptiles and amphibians in the state. However, the use of some methods would have limited availability to the public. For example, the use of immobilizing drugs and euthanasia chemicals would be limited to licensed veterinarians and persons under their supervision but could include personnel with the FFWCC or a tribal agency authorized to use those methods. Toxicants to manage nonnative reptiles and amphibians would likely be restricted use pesticides that would require a person to obtain a pesticide applicators license to purchase and use those products. Although those methods could have limited availability to the public, people could use other methods to achieve the same results.

Those entities seeking assistance with reducing damage could seek direct operational assistance from other governmental agencies, private entities, or conduct activities on their own. In situations where nonlethal methods were ineffective or impractical, WS could advise the property owner or manager of appropriate lethal methods to supplement nonlethal methods.

Alternative 4 – WS would not provide any assistance with managing damage caused by nonnative reptiles or amphibians in Florida

This alternative approach would preclude any activities by WS to alleviate damage or threats of damage associated with those target species addressed in the EA. WS would refer all requests for assistance to the FFWCC, to a tribal authority (if the request originated from persons on tribal lands), and/or to private entities. This alternative approach would not prevent other governmental agencies (*e.g.*, federal, tribal, state, and local agencies) and/or private entities from conducting damage management activities directed at alleviating damage and threats associated with reptiles or amphibians in the state. Therefore, under this alternative, entities seeking assistance with addressing damage caused by those species addressed in this EA could contact WS, but WS would immediately refer the requester to other entities. The requester could then contact other entities for information and assistance, could take actions to alleviate damage without contacting any entity, or could take no further action.

Many of the methods listed in Appendix B would be available for use by other governmental agencies and private entities to manage damage and threats associated with nonnative amphibian and reptile species. The only methods discussed in Appendix B that would have limited availability would be immobilizing drugs, euthanasia chemicals, toxicants (if registered), and trained dogs. However, other professional entities could provide assistance by using immobilizing drugs and euthanasia chemicals (*e.g.*, veterinarians, FFWCC personnel, tribal personnel) or trained dogs. In addition, if registered, toxicants could be available to private entities and personnel of other governmental agencies when licensed by the Florida Department of Agriculture and Consumer Services, if required.

2.4.2 Alternative Approaches and Strategies that WS Did Not Consider in Detail

In addition to those alternative approaches discussed in Section 2.4.1, WS identified several alternative approaches to meeting the need for action that did not receive detailed analysis in this EA for the reasons provided for each alternative approach. Those alternative approaches considered but not analyzed in detail include the following.

Implementation of Alternative 1 but WS must use all of the nonlethal methods identified in Appendix B before using lethal methods

Implementation of this alternative would be an adaptive integrated method approach similar to Alternative 1. However, this alternative would require that WS apply nonlethal methods or techniques described in Appendix B to all requests for assistance to reduce damage and threats to safety associated with target species in the state. If the use of nonlethal methods failed to alleviate the damage situation or reduce threats to human safety at each damage situation, WS' personnel would use lethal methods to alleviate the damage or threat occurring. WS' personnel would apply nonlethal methods to every request for assistance regardless of severity or intensity of the damage or threat until the employee deemed those nonlethal methods inadequate to resolve the damage or threat. This alternative would not prevent the use of lethal methods by other entities to alleviate damage or threats of damage.

People experiencing damage often employ nonlethal methods to reduce damage or threats prior to contacting WS. If WS implemented this alternative, WS would be required to implement nonlethal methods the entity requesting assistance had already used or would have to establish criteria to measure the efforts of the requesting entity to determine if the requesting entity applied nonlethal methods appropriately. Continuing to use methods already proven ineffective at alleviating the damage could prolong the amount of time damage occurs, which could increase economic losses or increase threats to human health and safety. Because many people that request assistance use nonlethal methods but continue to experience damage or threats of damage and because there is no standard that exists for the use of nonlethal methods, WS did not carry this alternative forward for further analysis in Chapter 3. In addition, implementation of Alternative 1 would be similar to a nonlethal before lethal alternative because WS' personnel would consider the use of nonlethal methods before considering the use of lethal methods (see WS Directive 2.101). Adding a nonlethal before lethal alternative and the associated analysis would not add additional information to the analyses in this EA.

WS would implement Alternative 1 but would only use lethal methods

This alternative approach would be similar to Alternative 1, but WS would use only those methods that lethally removed target species. Under WS Directive 2.101, WS must consider the use of nonlethal methods before lethal methods. Nonlethal methods have been effective in alleviating some damage caused by target species. In those situations where damage could be alleviated using nonlethal methods, WS' personnel could use those methods and/or recommend those methods as determined by the WS Decision Model. Therefore, WS did not consider this alternative in detail.

WS would develop a program that compensates people for damage

This alternative would require WS to establish a system to reimburse persons impacted by damages caused by target species. Under such an alternative approach, 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. Compensation would require large expenditures of money and labor to investigate and validate damage claims and to determine and administer appropriate compensation. Compensation would most likely be below full market value. Compensation for damages would give little incentive to resource owners to limit damage through improved cultural or other practices and management strategies and would not be practical for reducing threats to human health and safety. For the above listed reasons, WS did not carry this alternative forward for further analysis in Chapter 3.

WS would establish a bounty system for nonnative reptiles and amphibians

Most wildlife professionals have not supported payment of funds (bounties) for removing animals suspected of causing damage, or posing threats of damage, for many years (Latham 1960). WS concurs because of several inherent drawbacks and inadequacies in the payment of bounties. Bounties are often ineffective at controlling damage over a wide area, such as across the entire state. The circumstances surrounding the removal of animals are typically arbitrary and completely unregulated because it is difficult or impossible to assure animals claimed for bounty were not lethally removed from outside the area where damage was occurring. In addition, WS does not have the authority to establish a bounty program.

WS would implement Alternative 1 but would establish a loss threshold before allowing lethal methods

There is a concern that damage caused by animals should be a cost of doing business and/or that there should be a threshold of damage before allowing the use of lethal methods to manage damage. In some cases, cooperators likely tolerate some damage and economic loss until the damage reaches a threshold where the damage becomes an economic burden. The appropriate level of allowed tolerance or threshold before employing lethal methods would differ among cooperators and damage situations. In some cases, any loss in value of a resource caused by target species could be financially burdensome to some people. In addition, establishing a threshold would be difficult or inappropriate to apply to human health and safety situations. For example, nonnative reptiles that burrowing into embankments used to retain water can weaken the integrity of those impoundments. Burrows allow water to infiltrate embankments, which can allow water to seep through the embankments causing erosion. Erosion can lead to the failure of the embankment and the potential release of water. Therefore, addressing nonnative reptiles burrowing into water embankments prior to the embankment failing would be appropriate. Similarly, conducting activities to prevent an aircraft strike can reduce risks of damage to the aircraft and reduce risks to human safety. For those reasons, WS did not carry this alternative forward for further analysis in Chapter 3.

WS would require cooperators completely fund activities (no taxpayer money)

This alternative approach would be similar to Alternative 1 or Alternative 2 except WS would require the entity requesting assistance to pay for any activities conducted by WS. Therefore, no activities conducted by WS would occur through federal appropriations or state funding (*i.e*., no taxpayer money). However, WS is a federal agency that receives funding from federal appropriations. In addition, WS could receive funds through state appropriations, and/or through money received from the entity requesting assistance. In those cases where WS receives federal and/or state funding to conduct activities, federal, state, and/or local officials have made the decision to provide funding for damage management activities and have allocated funds for such activities. Additionally, damage management activities are an appropriate sphere of activity for government programs because managing wildlife is a government responsibility. Treves and Naughton-Treves (2005) and the International Association of Fish and Wildlife Agencies (2005) discuss the need for wildlife damage management and that an accountable government agency is best suited to take the lead in such activities because it increases the tolerance for wildlife by those people being impacted by their damage and has the least impacts on wildlife overall. Therefore, WS did not carry this alternative forward for further analysis in Chapter 3.

WS would implement Alternative 1 but would require cooperators fund the use of lethal methods

This alternative would be identical to Alternative 1 except WS would require people requesting assistance to pay for all the costs associated with using lethal methods to resolve their request for assistance. If WS used lethal methods to alleviate or prevent damage, the person requesting assistance would be responsible for paying for the costs associated with those activities. WS could use existing federal and/or state

funding to pay for the costs associated with using nonlethal methods to manage damage caused by target species. WS did not carry this alternative forward for further analysis because the environmental consequences associated with the use of this method would be identical to Alternative 1.

WS would refer requests for assistance to Private Nuisance Wildlife Control Agents

People experiencing damage or threats of damage associated with target species could contact private wildlife control agents and/or other private entities to reduce damage when they deem it appropriate. In addition, WS could refer persons requesting assistance to private wildlife control agents and/or other private entities if WS implemented any of the alternative approaches. WS Directive 3.101 provides guidance on establishing cooperative projects and interfacing with private businesses. WS only responds after receiving a request for assistance. If WS implemented Alternative 1 or Alternative 2, WS would inform requesters that other service providers, including private entities, might be available to provide assistance. Therefore, WS did not carry this alternative forward for further analysis.

WS would live capture and translocate target species

As discussed in Section 1.2, those reptile and amphibian species that WS could address as part of the need for action are not native to Florida; therefore, it would be inappropriate for WS to live capture and translocate those reptile and amphibian species to other areas.

CHAPTER 3: ENVIRONMENTAL EFFECTS

Chapter 3 provides information needed for making informed decisions by comparing the environmental consequences of the four alternative approaches. To determine if the real or potential effects are greater, lesser, or the same as the environmental baseline, Section 3.1 compares the environmental consequences associated with each of the four alternative approaches. A discussion occurs on the cumulative and unavoidable impacts, including direct and indirect effects, in relation to the issues for each of the alternative approaches. Impacts caused by implementation of an alternative approach and occur at the same time and place are direct effects. In contrast, impacts caused by implementing an alternative approach that occur later in time or further removed in distance, and are still reasonably foreseeable, are indirect effects. The analyses discuss the cumulative effects in relationship to each of the alternative approaches analyzed, with emphasis on potential cumulative effects from similar activities, and include summary analyses of potential cumulative impacts to target and nontarget species, including threatened or endangered species, threats to human health and safety, and the humaneness of methods.

3.1 ISSUES CONSIDERED IN DETAIL AND THEIR IMPACTS BY ALTERNATIVE APPROACH

WS developed the alternative approaches (see Section 2.4) to meet the need for action identified in Section 1.2 and to address the issues identified in Section 2.1. This section analyzes the environmental consequences of each alternative approach in comparison to determine the extent of actual or potential impacts on each of the issues. Therefore, Alternative 1 serves as the baseline for the analysis and the comparison of expected impacts among the alternative approaches. The analysis also takes into consideration mandates, directives, and the procedures of WS.

3.1.1 Issue 1 - Effects of Damage Management Activities on Populations of Target Species

If WS implemented Alternative 1, Alternative 2, or Alternative 3, WS could conduct and/or recommend activities that could disperse, exclude, capture, or lethally remove target species depending on the alternative approach WS selected and implemented. Appendix B identifies and discusses the methods

that WS could consider when formulating strategies to resolve damage caused by target species in Florida when someone requests such assistance. If WS implemented Alternative 4, WS would not conduct any activities in Florida involving those target species addressed in this EA. This section evaluates the magnitude of cumulative effects on the populations of target species that could occur if WS implemented one of the four alternative approaches.

- **Population Impact Analyses of the Alternative Approaches - Direct, Indirect, and Cumulative Effects**

Implementation of the alternative approaches could have direct, indirect, and cumulative effects on the populations of nonnative reptile and amphibians during damage management activities. Direct effects are impacts the action causes and occur at the same time and place. Indirect effects occur because of the action but are later in time or farther removed in distance. Indirect effects may include impacts related to actions that induced changes in population density, ecosystems, and land use changes. Cumulative impacts 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. The potential cumulative impacts analyzed below would occur from either WS' activities over time or from the aggregate effects of those activities combined with the activities of other agencies and private entities.

As discussed in Section 1.5.3, the FFWCC is responsible for managing animal life in Florida. Through ongoing communication with the FFWCC, WS can consider the activities of other agencies and private entities to the extent that those agencies know those activities occur. WS does not typically conduct direct damage management activities concurrently with other federal, tribal, state, or private entities at a location but may conduct damage management activities at adjacent sites within the same period.

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 target species
- Human-induced mortality through vehicle strikes, aircraft strikes, and illegal take
- Human-induced mortality of target species through private damage management activities
- Human-induced mortality through regulated harvest
- 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 target species populations. WS' employees use the WS Decision Model to evaluate damage occurring (including other affected elements and the dynamics of the damaging species) and to determine appropriate strategies to minimize effects on environmental elements. After WS' personnel apply damage management actions, they subsequently monitor and adjust/cease 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.

As stated previously, WS would not use or recommend those lethal methods available as population management tools over broad areas. WS would use and recommend lethal methods to reduce the number of individuals of target species present at a location where damage was occurring by targeting those target species causing damage or posing threats; therefore, the intent of lethal methods would be to manage those reptiles and amphibians causing damage and not to manage entire populations of target species.

The analysis for magnitude of impact from lethal take can be determined either quantitatively or qualitatively. Quantitative determinations may rely on population estimates, allowable removal levels, and actual removal data. Qualitative determinations may rely on population trend data, when available. Information on target species populations and trends are often derived from several sources, including published literature and harvest data. The potential impacts of conducting the alternative approaches on the populations of target species occur below for each alternative.

Alternative 1 - WS would continue the current integrated methods approach to managing damage caused by target species in Florida (Proposed Action/No Action)

Section 1.2 identifies those nonnative reptile species most likely to be responsible for causing damage in Florida based on previous requests for assistance received by WS. Table 3.1 provides general information about the biology, range, and population information for those species identified in Section 1.2. The reptile species identified in Section 1.2 and Table 3.1 are not native to Florida. Many of the nonnative reptiles were likely brought to Florida through the pet trade and then intentionally or unintentionally released into the wild by pet owners. Hurricane damage to enclosures and holding facilities has also likely allowed reptiles to escape into the wild. In addition, people have intentionally released nonnative reptiles to control agricultural pests. For example, people released northern curlytail lizards in Florida during the early 1940s to combat sugar cane pests.

Table 3.1 – Range, population information, and general biology of target nonnative reptile species in Florida

Species	Range in Florida	Population Estimate	General Biology
Spectacled Caiman	Localized populations in Dade and Broward Counties (FFWCC 2022*d*); may occur in other parts of Florida (United States Fish and Wildlife Service 2018)	Unknown; well-established and stable (FFWCC 2022*d*)	In Florida, Wilson and Porras (1983) indicated caiman of various sizes were first observed in a canal extending from Maule Lake, Miami-Dade County in the late 1950s. Spectacled caimans inhabit freshwater habitats, including flooded forests, swamps, rivers, lakes, and canals. Although less common, caimans can inhabit brackish waters; feeds on a variety of vertebrates
Argentine Black and White Tegu	Reproducing populations in Hillsborough, Miami-Dade, and Charlotte Counties; emerging population in St. Lucie County; may occur in other parts of Florida	Unknown	Wild individuals first reported in Florida in 2006; tegus inhabit dry, upland areas (*e.g.*, savannas, forest clearings, roadsides) with sandy soils, including natural, urbanized, and agricultural areas; omnivorous diet and will consume fruits, eggs, insects, and small animals and are efficient egg predators, including ground nesting bird eggs, alligator eggs, and gopher tortoise eggs.
Agama spp.	Miami north to Martin County	Unknown	First discovered in Florida in 1976; primarily found in residential areas and human-altered habitats; usually not far from shelter, such as rocks and shrubs (Enge et al. 2004*b*); feed mostly on ants, grasshoppers, crickets, beetles, and other insects. May also feed on small animals, such as snakes, lizards, birds, and mammals.

Species	Range in Florida	Population Estimate	General Biology
Savannah Monitor	Reported throughout the state from Key Largo to the vicinity of Pensacola	Unknown	First observed in Florida during 1992; primarily a ground-dwelling species that shelters in burrows; feeds on a variety of animals
Nile Monitor	Reports from throughout the state; established in Lee and Palm Beach Counties, with multiple observations in Broward County	Unknown	First observed in Lee County in 1990; semi-aquatic species; primarily found water edges; extensive canal system in southern Florida may aid in dispersal (Enge et al. 2004*a*); generalist feeders on the ground, below ground, in trees, and in fresh and saltwater. Diet includes crabs, crayfish, mussels, snails, slugs, termites, caterpillars, beetles, spiders, grasshoppers and crickets, fish, frogs, toads, lizards, turtles, snakes, young crocodiles, and other reptiles, birds and their eggs, and small mammals.
Green Iguana	Populations stretch along the Atlantic Coast in Broward, Martin, Miami-Dade, Monroe and Palm Beach Counties and along the Gulf Coast in Collier and Lee Counties. Reports as far north as Alachua, Highlands, Hillsborough, Indian River and St. Lucie Counties.	Unknown	First reported in Florida during 1960s; arboreal species that live high in the tree canopy; inhabits burrows, culverts, drainage pipes, rock piles, debris piles in cleared habitats, such as canal banks and vacant lots; extensive canal system in southern Florida may aid in dispersal (FFWCC 2022*a*); feed on a wide variety of vegetation, including shoots, leaves, blossoms and fruits of plant. Adult green iguanas can also feed on bird eggs and dead animals. Juvenile green iguanas feed on vegetation, insects, and tree snails
Black Spiny-tailed Iguana	Established populations in Dade, Lee, and Charlotte Counties; small population in Collier County on Keewaydin Island south of Naples; also occurs in Monroe County on at least one key	Unknown; well-established and expanding (FFWCC 2022*e*)	Inhabits coastal uplands, nonnative plant communities, low density suburban development; small towns, periphery of core urban areas, and agricultural habitats; will feed on a variety of plants and animals
Brown Basilisk	Primarily from Broward, Collier, Miami-Dade, Palm Beach, and St. Lucie Counties; may occur in other parts of Florida	Unknown	First documented in Florida during 1976 (Wilson and Porras 1983). Primarily found in bushes and lower branches of trees or thickets; found along parking lots and along canals, shores of lakes, and borrow pits; feeds on a variety of plants and animals
Northern Curlytail Lizard	Commonly found in Dade, Broward, and Palm Beach Counties, but may be residence in at least 10 counties in Florida (Sedore and DeLeon 2013)		Introduced to Florida in the early 1940s to combat sugar cane pests; in parking lots, along walls and old buildings, especially where there are cracks and pieces of rubble; feed primarily on insects, flowers, and fruits
Burmese Python	Range includes over a thousand square miles of southern Florida, including all of Everglades National Park and areas to the north	Unknown	Inhabit a range of habitats often near water, including lowland primary and secondary tropical wet forests, tropical wet montane forests, grasslands, swamps, marshes, plantations and cultivated areas, and

Species	Range in Florida	Population Estimate	General Biology
			suburban and urban areas; generalist predator that consumes native wildlife including reptiles, birds, and mammals
Northern African Python	Localized area in Miami-Dade County	Unknown	Inhabit marshy lowlands, drier uplands, and urban canals; generalist predator capable of consuming native wildlife
Reticulated Python	Not established in Florida; Reports as far north as Largo near Tampa but most sightings occur in southeastern Florida in and around Miami and Fort Lauderdale	Unknown	Inhabits a range of habitats, including lowland primary and secondary tropical wet forests, tropical open dry forests, tropical wet montane forests, rocky scrublands, swamps, marshes, plantations and cultivated areas, and suburban and urban areas; generalist predator capable of consuming native wildlife

If WS implements Alternative 1, WS would be available to provide both technical assistance and direct operational assistance to those persons requesting assistance with managing damage and threats caused by target species in Florida. The effects on the populations of target species associated with WS providing technical assistance during the implementation of Alternative 1 would be similar to those effects discussed for Alternative 3. Therefore, to reduce redundancy, the effects associated with WS providing technical assistance that would occur if WS implements Alternative 1 occur in the discussion for Alternative 3.

When providing direct operational assistance, WS could employ those methods described in Appendix B in an adaptive approach that would integrate methods to reduce damage and threats associated with target species effectively. WS' personnel would use the WS Decision Model (see WS Directive 2.201) to identify the most appropriate damage management strategies and their impacts. If WS implemented Alternative 1, WS' personnel could choose to use any of the methods discussed in Appendix B when using the WS Decision Model to formulate strategies. Therefore, implementation of Alternative 1 would allow WS' personnel to consider the widest range of methods available when formulating strategies to resolve requests for assistance associated with target species. WS' personnel would employ methods in an adaptive approach that would integrate methods to reduce damage and threats of damage associated with target species. WS would only use methods after WS and the appropriate entity requesting assistance signed a work initiation document allowing WS to use those methods on property they own or manage. When practical and effective, WS' personnel would give preference to nonlethal methods pursuant to WS Directive 2.101.

DIRECT, INDIRECT, AND CUMULATIVE POPULATION EFFECTS: NONLETHAL METHODS

If WS implemented Alternative 1, the potential effects on the populations of target species associated with WS' use of nonlethal methods would be similar to those potential effects discussed for Alternative 2 because the same nonlethal methods would be available for use by WS' personnel. To limit redundancy, a discussion on the potential effects associated with the use of nonlethal methods does not occur for Alternative 1 because those potential effects would be similar to those discussed for Alternative 2, but those potential effects could possibly occur if WS implemented Alternative 1. In general, the use of nonlethal methods to disperse, exclude, or capture target species from areas where they are causing damage or posing a threat of damage would have minimal effects on the overall population of a target species because those methods generally do not harm target species (see discussion for Alternative 2).

DIRECT, INDIRECT, AND CUMULATIVE POPULATION EFFECTS: LETHAL METHODS

The use of lethal methods could result in local population reductions in the area where damage or threats were occurring because those methods would remove target species from a population. Therefore, the evaluation of potential effects on the populations of target species for Alternative 1 will primarily focus on WS' use of lethal methods because WS' personnel could use lethal methods to remove an individual of a target species or a group of target species to alleviate damage. WS would only target an individual of a target species or a group of individuals of a target species identified as causing damage or posing a threat to human safety. Therefore, if WS implemented Alternative 1, WS could lethally remove target species, which could potentially have direct, indirect, and cumulative effects on the populations of target species.

The number of target species removed from a population using lethal methods would be dependent on the number of requests for assistance received, the number of target species involved with the associated damage or threat, and the efficacy of methods employed. Table 3.2 identifies the anticipated number of individuals that WS could lethally removal annually in the state to alleviate damage or threats of damage. The analysis includes WS' anticipated annual lethal take level for each species, which WS based on previous requests for assistance associated with the species and in anticipation of future requests for assistance. WS' anticipated annual lethal take level for each species is not a prescribed take level but is the take level that WS anticipates could occur annually to alleviate damage. In addition, take of those species likely occurs by other entities; however, the number of those species that other entities lethally remove annually is unknown.

However, because those species identified in Section 1.2 and Table 3.1 are not native species in Florida, maintaining a local and/or statewide population at the lowest level, including extirpation, could be the goal of tribal authorities, the FFWCC, and other governmental/organizational entities and to achieve those goals, the annual removal by WS could exceed the annual take level identified in Table 3.2. Most of the nonnative species identified in Section 1.2 and Table 3.2 have well established populations in Florida and activities to manage damage by WS and other entities is not likely to cumulative cause overall populations of those species to decline. Some localized extirpations could occur from intensive removal activities; however, without a wide-scale, intensive effort with dedicated and adequate funding levels, the extirpation of a species' population from the state is unlikely.

For example, in a 4-year study conducted between 2008 and 2011, the daily removal rate of black spiny-tailed iguanas on Gasparilla Island, Florida declined from 29.6 iguanas per day in 2008 to 1.9 iguanas per day in 2011 (Avery et al. 2014). However, Avery et al. (2014) stated, "*The* [black spiny-tailed iguana] *species has tremendous reproductive potential, with a single annual clutch containing 12-88 eggs (mean = 43)*" and "*Relaxation of control efforts will allow the iguana population to recover to pre- treatment levels*". Reticulated pythons were recently documented to be able to reproduce parthenogenetically, meaning that females do not need males to lay viable eggs (Booth et al. 2014). Thus, even just one female python could potentially create a population. Snow et al. (2007) indicated that the population of boa constrictors at the Charles Deering Estate in Florida was likely to persist even if an organized, intensive effort was made to eradicate boa constrictors because of the difficulties with detecting snakes in dense habitats and the terrain, and possible recolonization from nearby suburban and natural areas. When comparing an eradication effort for boa constrictors at the Charles Deering Estate to an eradication effort for Burmese pythons in southern Florida, Snow et al. (2007) stated, "[e]*radicating the much larger* [Burmese python] *population in southern Florida would be far more difficult*".

Damage management activities would target single animals or local populations at sites where their presence was causing unacceptable damage or threats to agriculture, human health and safety, natural resources, or property. As discussed in Section 1.4, WS would only provide assistance on properties where WS and the appropriate property owner or manager sign a work initiation document or similar

document and would only use methods the owner/manager agrees to allow WS to use. WS would only conduct activities on tribal lands after receiving a request from the appropriate tribal authority.

Table 3.2 –WS' anticipated annual lethal take of target nonnative reptile species in Florida

Nonnative Reptile Species	WS' Anticipated Annual Take
Spectacled Caiman	**500**
Argentine Black and White Tegu	**2,000**
Agama spp.	**8,000**
Savannah Monitor	**1,000**
Nile Monitor	**1,000**
Green Iguana	**5,000**
Black Spiny-tailed Iguana	**6,000**
Brown Basilisk	**2,000**
Northern Curlytail Lizard	**2,000**
Burmese Python	**1,500**
Northern African Python	**1,000**
Reticulated Python	**1,000**

Activities conducted by WS under the proposed action alternative would occur within the goals and strategies outlined for those populations by a tribal authority, the FFWCC, other governmental/organization entities, and the property owner. Maintaining a local and/or statewide population at the lowest level possible could be the goal of tribal authorities, the FFWCC, other governmental/organizational entities, and/or a property owner. WS' activities would occur pursuant to Executive Order 13112 and Executive Order 13751. Executive Order 13112 and Executive Order 13751 directs federal agencies to address invasive species to the extent practicable and permitted by law. WS Directive 2.320 provides guidelines for WS' actions in the management of invasive species in fulfillment of Executive Order 13112.

ADDITIONAL TARGET NONNATIVE REPTILE AND AMPHIBIAN SPECIES

WS could receive requests for assistance associated with other nonnative reptile species and nonnative amphibian species in Florida. Appendix E identifies examples of additional nonnative reptile species and nonnative amphibian species that WS could address in Florida. WS anticipates addressing those species infrequently and lethal removal would likely involve a small number of individuals from a species. Activities could include responding to requests to address individual nonnative reptiles and amphibians that people released intentionally and/or individuals escaped from captivity.

In addition, WS could address small, localized populations of nonnative reptiles and amphibians before they can become established. Therefore, WS could eliminate localized populations of nonnative reptiles and amphibians at the request of a tribal authority, the FFWCC, other governmental/organization entities, and/or a property owner. WS would only conduct activities on properties where the property owner or manager sign a work initiation document or similar document allowing WS to conduct activities on their property. WS would only conduct activities on tribal lands after receiving a request from the appropriate tribal authority.

WS' activities associated with additional nonnative reptile and amphibian species would occur pursuant to Executive Order 13112 and Executive Order 13751. Executive Order 13112 and Executive Order 13751 directs federal agencies to address invasive species to the extent practicable and permitted by law. WS Directive 2.320 provides guidelines for WS' actions in the management of invasive species in fulfillment of Executive Order 13112.

EFFECTS ON THE PUBLIC'S ESTHETIC ENJOYMENT OF TARGET SPECIES

Public opinion about the best ways to reduce conflicts between people and animals is highly variable, making the implementation and conduct of damage management programs extremely complex. Some people express concerns that proposed activities could interfere with their enjoyment of recreational activities and their esthetic enjoyment of target species. Another concern is WS' activities would result in the loss of esthetic benefits of target species to the public.

People generally regard animals as providing economic, recreational, and esthetic benefits (Decker and Goff 1987), and the mere knowledge that animals exists is a positive benefit to many people. Esthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, esthetics is truly subjective in nature, dependent on what an observer regards as beautiful. The human attraction to animals likely started when people began domesticating animals. The public today share a similar bond with animals and/or wildlife in general and in modern societies, a large percentage of households have indoor or outdoor pets. However, some people may consider individual wild animals as "*pets*" or exhibit affection toward those animals, especially people who enjoy viewing animals. Therefore, the public reaction can be variable and mixed to animal damage management because there are numerous philosophical, esthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between people and animals.

Animal populations provide a wide range of social and economic benefits (Decker and Goff 1987). Those benefits include direct benefits related to consumptive and non-consumptive uses, indirect benefits derived from vicarious wildlife related experiences, and the personal enjoyment of knowing animals exist and contribute 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 (*e.g.*, using parts of or the entire animal) or non-consumptive use (*e.g.*, viewing the animal in nature or in a zoo, photographing) (Decker and Goff 1987). Animals may provide similar benefits to people that enjoy viewing certain species and knowing they are part of natural ecosystems.

Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and originate from experiences, such as looking at photographs and films of animals, reading about animals, or benefiting from activities or contributions of animals (*e.g.*, 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 animals vary considerably. Some people believe that WS should capture and translocate all animals to another area to alleviate damage or threats those animals pose. In some cases, people directly affected by animals strongly support removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of animals from specific locations or sites. Some people totally opposed to animal damage management want WS to teach tolerance for damage and threats caused by animals, and that people should never kill animals. Some of the people who oppose removal of animals do so because of human-affectionate bonds with individual animals. Those human-affectionate bonds are similar to attitudes of a pet owner and result in esthetic enjoyment.

In some cases, the presence of overabundant reptiles and amphibians offends people, such as green iguanas or Cuban tree frogs. To such people, those species represent pests that are nuisances, which upset the natural order in ecosystems, and are carriers of diseases transmissible to people or other animals. In those situations, the presence of overabundant species can diminish their overall enjoyment of other

animals by what they view as a destructive presence of such species. They are offended because they feel that those species proliferate in such numbers and appear to remain unbalanced.

In the wild, few animals in the United States have life spans approaching that of people. Mortality is high among wildlife populations and specific individuals among a species may experience death early in life. Mortality in wildlife populations is a natural occurrence and people who form affectionate bonds with animals will experience loss of those animals over time. Several professionals in the field of psychology have studied human behavior in response to attachment to pet animals (Gerwolls and Labott 1994, Marks et al. 1994, Zasloff 1996, Ross and Baron-Sorensen 1998, Archer 1999, Meyers 2000). Similar observations are probably applicable to close bonds that could exist between people and wild animals. As observed by researchers in human behavior, normal human responses to loss of loved ones proceed through phases of shock or emotional numbness, sense of loss, grief, acceptance of the loss or what cannot be changed, healing, and acceptance and rebuilding, which leads to resumption of normal lives (Lefrancois 1999). Those people who lose companion animals, or animals for which they may have developed a bond and affection, can proceed through the same phases as with the loss of human companions (Gerwolls and Labott 1994, Boyce 1998, Meyers 2000). However, they usually establish a bond with other individual animals after such losses. Although they may lose the sense of enjoyment and meaning from the association with those animals that die or are no longer accessible, they usually find establishing an association with new individual animals or through other relational activities to be similarly meaningful (Weisman 1991). Through this process of coping with the loss and establishing new affectionate bonds, people may avoid compounding emotional effects resulting from such losses (Lefrancois 1999).

WS only conducts activities on properties where the property owner or property manager signs a work initiation document allowing WS' personnel to conduct activities and personnel would only target those species identified as causing damage or posing a threat of damage. In addition, other individuals of the same species would likely continue to be present in the affected area and people would tend to establish new bonds with those remaining target species. In addition, human behavior processes usually result in individuals ultimately returning to normalcy after experiencing the loss of association with a wild animal that an entity removed from a specific location.

Even in the absence of any involvement by WS, other entities could conduct activities to alleviate damage or threats of damage caused by target species. Because other entities could remove target species causing damage or posing a threat of damage, the involvement of WS in removing those target species would not likely be additive to the number of target species that could be removed in the absence of involvement by WS. In addition, activities that could occur under the alternatives by WS would occur on a relatively limited portion of the total area in Florida. In localized areas where WS removes an individual of a target species or a group of target species, dispersal of target species from adjacent areas typically contributes to repopulation of the area. The amount of time required to repopulate an area would vary and would depend on the level of removal and target species population levels in nearby areas. Most of the target species addressed in this EA are relatively abundant. As discussed previously, the effects on target species populations from damage management activities would be relatively low if WS implemented Alternative 1, and opportunities to view, hear, or see evidence of many of the target species would still be available over most of the land area of the state.

EFFECTS OF WS' ACTIVITIES ON BIODIVERSITY

WS operates in accordance with applicable federal and state laws and regulations enacted to ensure species viability. WS' personnel would use or recommend the use of lethal methods that target individuals of target species or groups of individuals of target species identified as causing damage or posing a threat of damage. Any reduction of a local population is frequently temporary because

immigration from adjacent areas or natural reproduction replaces those target species that an entity removes. WS operates on a small percentage of the land area in Florida and would only target those target species identified as causing damage or posing a threat. However, long-term objectives of the FFWCC or other entities could include the suppression or complete removal of certain localized target species populations from Florida. All target species addressed in this EA are not native to Florida. Any removal of nonnative target species, including complete removal of those populations of nonnative target species in Florida, would provide some benefit to the native environment by reducing predation and/or competition for food resources with native wildlife.

However, some of those nonnative reptiles and amphibians addressed in this EA may be preyed upon by native species. For example, Snow et al. (2007) identified American alligators, American crocodiles, eastern indigo snakes (*Drymarchon couperi*), large turtles, raptors, and medium- to large-sized mammalian carnivores as potential predators of boa constrictors and Burmese pythons, especially smaller constrictors and pythons. Smith et al. (2006) documented raccoons (*Procyon lotor*) feeding on juvenile green iguanas and found evidence that raccoons could suppress recruitment and the density of green iguanas. Meshaka et al. (2007) found that that removing raccoons from a state park in southern Florida resulted in a rapid increase in green iguanas at the state park indicating that raccoons were suppressing the green iguana population at the park. Other native predators of green iguanas include yellow-crowned night-herons (*Nyctanassa violacea*) (Engeman et al. 2005*a*), Florida burrowing owls (McKie et al. 2005), gray fox (*Urocyon cinereoargenteus*) (Smith et al. 2007), and a buteo raptor species (Smith et al. 2006).

Most of the nonnative reptile species identified in Section 1.2 and Table 3.2 have well established populations in Florida and activities to manage damage by WS and other entities is not likely to cumulatively cause overall populations of those species to decline. Although long-term objectives may be to suppress or completely remove nonnative reptiles or amphibians, it is unlikely native wildlife species are completely dependent on nonnative reptiles or amphibians as a food source. Many native species are opportunistic predators and feed upon a variety of prey species. WS does anticipate the take of nonnative reptile or amphibian species to occur at a magnitude that would have any impact on native wildlife species.

Alternative 2 - WS would continue the current integrated methods approach to managing damage caused by target species in Florida using only nonlethal methods

If WS implements Alternative 2, WS would be available to provide both technical assistance and direct operational assistance using only nonlethal methods to those persons requesting assistance with managing damage and threats caused by target species in Florida. The effects on the populations of target species associated with WS providing technical assistance during the implementation of Alternative 2 would be similar to those effects discussed for Alternative 3. Therefore, to reduce redundancy, the effects associated with WS providing technical assistance that would occur if WS implements Alternative 2 occur in the discussion for Alternative 3.

Under Alternative 2, WS would only use nonlethal methods to resolve damage or threats of damage associated with target species in Florida. No intentional lethal removal of target species would occur by WS. Nonlethal methods that WS could use and/or recommend are detailed in Appendix B. Nonlethal methods generally disperse, exclude, or live capture target species. Methods intended to disperse target species from areas where they are causing damage or posing a threat of damage are generally visual or auditory deterrents, such as lights, lasers, pyrotechnics, and propane cannons. Exclusion methods would prevent target species from accessing a resource and could disperse those target species to other areas where resources are unprotected. Exclusion methods could include fencing and netting. WS could also live capture target species. After WS live captured a target species, WS could relinquish custody of the animal over to another entity (*e.g.*, the FFWCC or an educational institution for research purposes) or

attach a radio and/or Global Positioning System (GPS) transmitter and release the target animal within the area of capture. The use of live-capture methods would have limited application if WS implements this alternative because the entity receiving the animals would need the appropriate permits to possess the target animal(s) and the appropriate facilities to house the animal(s). Therefore, WS would only live-capture target animals after receiving a request for live animals, which would likely be limited to a specific number of animals.

DIRECT EFFECTS ON TARGET POPULATIONS ASSOCIATED WITH IMPLEMENTING ALTERNATIVE 2

As discussed for Alternative 1, WS has used nonlethal methods to capture, disperse, or exclude target species. The use of nonlethal methods would generally have minimal effects on the overall population of a target species because those methods would not harm individual animals of a target species. WS' personnel would not employ nonlethal methods over large geographical areas or apply those methods at such an intensity that target species would be unable to access essential resources (*e.g.*, food sources, habitat) for extended durations.

The intent associated with the use of auditory and visual deterrents is to elicit a flight response by scaring target species from an area where damage is occurring or where damage could occur. Of concern are the possible negative physiological and/or behavioral effects that negative stimuli could cause, which could reduce the fitness of individual target species or the ability of a target animal to survive, especially if the exposure to the stressor was chronic. If stress occurs to a target animal from the scaring associated with hazing, the negative effects associated with causing a flight response could be exacerbated by other deleterious stressors already occurring (*e.g.*, disease, food availability). The stress from hazing could negatively affect the health of a target animal, interfere with the raising of young, and/or increase energy needs. A similar concern would occur when using exclusion methods, which could prevent target species from accessing a resource (*e.g.*, food source, nesting locations).

WS could also live capture target animals. When using methods to live capture a target species, injuries or death could occur during the process of capturing a target animal. Constantly monitoring and addressing captured target animal immediately after capture can reduce the likelihood of injuries and death. In addition, making appropriate modification to live capture methods can reduce injuries. After a target animal has been live captured, WS could then relinquish custody of the animal over to another entity (*e.g.*, a local animal control facility), or attach a radio and/or GPS transmitter and release the target animal at the same site of capture.

WS could attach identifying markers (*e.g.*, ear tags) for identification purposes when releasing or attaching a radio and/or GPS transmitter to a target animal. Live-capturing and attaching identifying markers would only occur after WS or another entity received the appropriate permits from the FFWCC to attach those identifying markers on target species (see Chapter 68-5 of the Florida Administrative Rules). Because the intent of using identifying markers is to monitor natural movement patterns and to identify individual target species, researchers have designed those methods to allow for natural movements and limit adverse effects on the target species. WS anticipates using identifying markers on a very limited basis because of the time and cost required to live capture target species.

Overall, the use of nonlethal methods by WS in Florida to exclude, capture, or haze target species would have no effect on the population of a target species. WS would not employ nonlethal methods over large geographical areas at such intensity levels that resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over a wide geographical scope. Therefore, direct effects that relate to a target species population would not occur by WS from implementation of Alternative 2. WS does not anticipate any cumulative effects to occur associated with WS' use of nonlethal methods even when considered with

the use of nonlethal by other entities. Although nonlethal methods can elicit a flight response or exclude target species, the cumulative use of nonlethal methods by all entities is not likely to rise to a level that would have any effect on the populations of target species.

INDIRECT EFFECTS ON TARGET SPECIES POPULATIONS ASSOCIATED WITH IMPLEMENTING ALTERNATIVE 2

As discussed previously, the use of nonlethal methods by WS in Florida to exclude, capture, or haze target species would have no effect on the populations of target species. WS would not employ nonlethal methods over large geographical areas at such intensity levels that resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over a wide geographical scope. Therefore, indirect effects that relate to the population of a target species would not occur by WS from implementation of Alternative 2.

Implementation of Alternative 2 by WS would not prevent other entities from using the lethal methods identified in Appendix B to take target species in Florida. WS anticipates the lethal take of target species would continue to occur by other entities if WS implements Alternative 2 and would likely occur at levels similar to the take that would occur if WS implemented Alternative 1. Therefore, WS anticipates the indirect effects associated with implementing Alternative 2 would be similar to those indirect effects discussed for Alternative 1 because the lethal take of target species could continue to occur by other entities.

CUMULATIVE EFFECTS ON TARGET SPECIES POPULATIONS FROM IMPLEMENTING ALTERNATIVE 2

WS does not anticipate any cumulative effects to occur associated with WS' use of nonlethal methods even when other entities utilize nonlethal methods. Although nonlethal methods would likely elicit a flight response, the cumulative use of nonlethal methods by all entities is not likely to rise to a level that would have an effect on the population of a target species. The continued use of many nonlethal methods can often lead to the habituation of target species to those methods (*i.e.*, showing no response or limited movements), which can decrease the effectiveness of those methods (Conover 2002).

Although implementation of this alternative would limit WS to using only nonlethal methods, entities other than WS could continue to use lethal methods. As discussed in Section 1.7.2, people can lethally remove all species of freshwater aquatic life and wild animal life not native to Florida through the year. The lethal take of target species could continue to occur by other entities if WS implements Alternative 2 and would likely occur at levels similar to the take that would occur if WS implemented Alternative 1. Therefore, WS anticipates the cumulative effects associated with implementing Alternative 2 would be similar to those cumulative effects discussed for Alternative 1 because the lethal take of target species in the state would continue to occur by other entities.

Alternative 3 - WS would recommend an integrated methods approach to managing damage caused by target species in Florida through technical assistance only

Under a technical assistance only alternative, WS would recommend an integrated method approach similar to Alternative 1 and Alternative 2; however, WS would not provide direct operational assistance under this alternative. Using information that a requester provides or from a site visit by an employee, WS' personnel would recommend methods and techniques based on their use of the WS Decision Model. In some instances, information provided to the requester by WS could result in tolerance/acceptance of the situation. In other instances, WS would discuss and recommend damage management options.

DIRECT, INDIRECT, AND CUMULATIVE EFFECTS ON TARGET SPECIES POPULATIONS ASSOCIATED WITH IMPLEMENTING ALTERNATIVE 3

If WS implements Alternative 3, WS would not directly affect target species populations in Florida. However, persons experiencing damage or threats from target species may implement methods based on WS' recommendations. WS' personnel could recommend and demonstrate the use of both nonlethal and lethal methods that were legally available for use to alleviate damage. Those individuals receiving technical assistance could implement those methods recommended by WS, could employ other methods not recommended by WS, could seek assistance from other entities, or take no further action. If WS implements Alternative 3, WS would have no direct effect on target species populations because WS' personnel would not provide direct operational assistance.

Despite WS not providing direct operational assistance to resolve damage and threats associated with target species, those people experiencing damage caused by target species could alleviate damage by employing those methods legally available or by seeking assistance from other entities. Implementation of Alternative 3 by WS would not prevent other entities from using lethal and nonlethal methods. The lethal take of target species could continue to occur by other entities if WS implements Alternative 3 and would likely occur at levels similar to the take that would occur if WS implemented Alternative 1 or Alternative 2. Therefore, WS anticipates the indirect and cumulative effects associated with implementing Alternative 3 would be similar to those indirect and cumulative effects discussed for Alternative 1 and Alternative 2 because the exclusion, dispersal, and lethal take of target species in the state would continue to occur by other entities.

Under this alternative, WS would not provide any assistance with managing damage caused by target species. However, if direct operational assistance is not available from WS or other entities, it is possible that frustration caused by the inability to reduce damage and associated losses could lead to an increase in the illegal use of methods and take. People have resorted to the illegal use of chemicals and methods to resolve wildlife damage issues (*e.g.*, see Allen et al. 1996, United States Department of Justice 2014, United States Department of Justice 2015).

Alternative 4 - WS would not provide any assistance with managing damage caused by target species in Florida

If WS implements Alternative 4, WS would have no direct involvement with any aspect of addressing damage caused by those target species addressed in this EA and would provide no technical assistance. When contacted about damage or the threat of damage associated with those target species addressed in this EA, WS would refer those people to other entities, such as the FFWCC and/or private entities.

DIRECT, INDIRECT, AND CUMULATIVE EFFECTS ON TARGET SPECIES POPULATIONS ASSOCIATED WITH IMPLEMENTING ALTERNATIVE 4

If WS implemented Alternative 4, WS would not have direct effects on target species populations because WS would not provide any assistance involving those target species addressed in this EA. However, like the other alternatives, other entities could continue to use nonlethal and lethal methods to address damage caused by target species. Implementation of Alternative 4 by WS would not prevent other entities from conducting damage management activities associated with the nonnative reptile and amphibian species addressed in this EA. Therefore, WS anticipates the indirect and cumulative effects associated with implementing Alternative 4 would be similar to those indirect and cumulative effects discussed for the other alternatives because other entities could continue to use nonlethal and lethal methods to alleviate damage caused by target species.

3.1.2 Issue 2 - Effects on the Populations of Nontarget Wildlife Species, Including Threatened and Endangered Species and Species of Special Concern

As discussed previously, a concern would be the potential impacts to nontarget species, including threatened and endangered species, from the use of methods to resolve damage caused by target species. When using methods, WS could unintentionally live capture, disperse, or kill nontarget animals. Discussion on the potential direct, indirect, and cumulative effects of the alternative approaches on the populations of nontarget animal species, including threatened and endangered species, occurs below for each of the alternative approaches identified in Section 2.4.1.

Alternative 1 –WS would continue the current integrated methods approach to managing damage caused by target species in Florida (Proposed Action/No Action)

If WS implements Alternative 1, WS could provide both technical assistance and direct operational assistance to those persons requesting assistance. When providing direct operational assistance, WS' employees could use lethal and/or nonlethal methods in an integrated methods approach to reduce damage and alleviate risks of damage associated with those target species addressed in this EA.

DIRECT, INDIRECT, AND CUMULATIVE EFFECTS ANALYSIS ON NONTARGET POPULATIONS

WS' personnel have experience and receive training in wildlife identification, which allows them to identify individual species and to identify damage or recognize damage threats associated with target species. In addition, WS' employees have knowledge in the use patterns of methods available to resolve animal damage, which allows them to select the most appropriate method(s) to address animal damage and minimize impacts on nontarget species.

WS' personnel use a decision-making process for evaluating and responding to requests for assistance detailed in the WS Decision Model (see WS Directive 2.201), which Slate et al. (1992) describes in more detail. Using the WS Decision Model, WS' personnel would formulate a management strategy, which would include the method or methods the employee determines to be practical for use to alleviate damage or reduce risks caused by the target species. When determining the appropriate method or methods, WS' personnel would consider risks to nontarget animals from the use of a method or methods. Despite WS' efforts to reduce risks to nontarget animals, the use of a method or methods could exclude, disperse, capture, or kill nontarget animals unintentionally. A discussion of the risks to nontarget animals and the potential effects on the populations of nontarget animals if WS implements Alternative 1 occurs below.

Risks to nontarget animals associated with available methods

The risks to nontarget animals associated with WS providing technical assistance during the implementation of Alternative 1 would be similar to those risks to nontarget animals discussed for Alternative 3. Therefore, to reduce redundancy, the effects associated with WS providing technical assistance that would occur if WS implements Alternative 1 occur in the discussion for Alternative 3. Similarly, the risks to nontarget animals from the use of nonlethal methods during the implementation of Alternative 1 would be similar to those risks to nontarget animals discussed for Alternative 2. To reduce redundancy, the risks to nontarget animals from the use of nonlethal methods if WS implements Alternative 1 occur in the discussion for Alternative 2.

Regarding risks to nontarget animals, the primary risk would be associated with lethal methods because the use of lethal methods could result in the death of a nontarget animal. Section II in Appendix B describes the lethal methods that WS could consider when formulating a management strategy using the

WS Decision Model. From federal fiscal year (FY) 2015 through FY 2022, the lethal removal of nonnative reptiles and amphibians in Florida by WS occurred primarily using firearms and humane killing after capturing a target animal in a cage trap, by hand, or using a glue board. No unintentional take of nontarget animals occurred by WS in Florida from FY 2015 through FY 2022 while targeting nonnative reptiles and amphibians. If WS implements Alternative 1, WS anticipates continuing to use primarily firearms and the humane killing of a target animal after live-capture to lethally remove nonnative reptiles and amphibians in Florida when WS determines those lethal methods are appropriate using the WS Decision Model. Risks associated with those lethal methods described in Section II of Appendix B occurs below.

- *Firearms*

The use of firearms is essentially selective for target species because WS' personnel would identify target species prior to application. There is a slight risk of misidentifying target species, especially when target and nontarget species have a similar appearance. There is also a slight risk of unintentional take of nontarget animals if a projectile strikes a nontarget animal after passing through a target animal, if misses occur, or if a nontarget animal is near a target animal when using a shotgun. WS' personnel can minimize risks by using appropriate firearms, by being aware of what is near or beyond the target animal, and by training to be proficient with the use of a firearm.

Although the use of firearms can reduce the number of target species using a location (similar to dispersing target species), the use of a firearm is most often used to supplement and reinforce the noise associated with nonlethal methods. The noise produced when discharging a firearm could disperse nontarget animals from an area. In those cases, nontarget species nearby could temporarily leave the immediate vicinity, but would most likely return after conclusion of the action. Additionally, when appropriate, WS would use suppressed firearms to minimize noise and the associated dispersal effect that could occur from the discharge of a firearm. WS' personnel would not employ firearms over large geographical areas or use firearms at such an intensity level that WS would cause harm to a nontarget animal by dispersing and preventing them from accessing essential resources (*e.g.*, food sources, habitat).

- *Gigging*

Gigging, primarily used on frogs, would be used opportunistically where target individuals are observed in an area where damage is occurring. WS' personnel can minimize risks by identifying the target animal on an individual basic and being trained in identification. Thus, the risks to nontarget species would be low and would not result in adverse impacts on nontarget populations.

- *Body-grip Traps*

Personnel would strategically place body-grip traps at locations likely to capture a target animal and minimize the threat to nontarget species by placement in those areas frequently used by target animals, using baits or lures that are as species specific as possible, and modification of individual methods to exclude nontarget animals from capture. WS would also use body-grip traps and cable devices in compliance with applicable federal, state, and local laws and regulations (see WS Directive 2.210), as well as WS' directives to minimize risks to nontarget species.

- *Cable Devices*

WS could use cable devices to capture larger iguanas and monitor lizards, such as the black spiny-tailed iguana. The risk of live-capturing or killing nontarget animals does occur when using cable devices. Risks would be greatest for animals that frequent the area where cable devices were placed and travel

along the same trails as the target species. Cable devices could be used in a variety of habitats; thus, many species of wildlife could be exposed to cable devices used by WS. As the amount of time between capture and checking the device increases, the risk of injuries occurring also likely increases. The selectivity of cable devices can be improved by design and using techniques designed to reduce the risk to nontarget animals (Association of Fish and Wildlife Agencies 2009, Short et al. 2012). Several designs and techniques would be employed by WS to reduce the risk of capturing or killing nontarget animals.

One commonly employed technique to minimize risk involves adjusting the loop size of the cable device. The loop size used when setting a snare or cable device can minimize the likelihood of capturing animals either larger or smaller than the intended species (Association of Fish and Wildlife Agencies 2009, Short et al. 2012). The height of the snare loop from the ground can also minimize risks of nontarget capture when using snares by positioning the loop at a level most apt to minimize risk of capture for other animals (Association of Fish and Wildlife Agencies 2009, Short et al. 2012, USDA 2019*b*). Adjusting the loop height can minimize capture of animals that are either taller or shorter than the target species. Raising the loop can allow smaller animals to pass under the under the snare. Conversely, lowering the height of the loop can allow larger animals to step over the loop. However, lowering the height of the loop too much could result in capturing a larger animal by the leg (Association of Fish and Wildlife Agencies 2009).

Various natural or other materials can be used as "*guide sticks*" to direct the target animal through a cable device or to guide a nontarget animal over, under, or around the snare (Association of Fish and Wildlife Agencies 2009). Knowledge of the animal species in an area and the behavior of those animals can be critical in deciding whether to use a guide stick when using cable devices. If guide sticks were used, appropriate placement and size must be considered because the placement and size or rigidity of the guide can influence animal behavior (Association of Fish and Wildlife Agencies 2009, USDA 2019*b*).

Baits or lures can be used to attract a target animal to the area where a device has been placed. When deciding on whether to use baits or lures and which ones, consideration is given to nontarget animals that may also be attracted to the bait or lure (Knopff et al. 2010). Selecting the appropriate bait or lure can increase or decrease risks of attracting nontarget animals to an area where a cable device is set (Association of Fish and Wildlife Agencies 2009, USDA 2019*b*, Association of Fish and Wildlife Agencies 2021).

- *Injection of Euthanasia Chemicals after Live Capture*

WS' personnel would use euthanasia chemicals in accordance with WS Directive 2.430, WS Directive 2.505, and the WS' Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs. Appendix B discusses those euthanasia chemicals that WS could consider after the live capture of a target species. Because live capture of target species using other methods would occur prior to using euthanasia chemicals, WS' personnel would identify target species prior to using euthanasia chemicals. Therefore, WS does not anticipate effects to occur to nontarget species from the use of euthanasia chemicals following live capture.

- *Carbon dioxide*

WS' personnel would administer carbon dioxide after placing a target animal inside a sealed chamber. Because WS' personnel would identify the animal species prior to administering carbon dioxide, the use of carbon dioxide would not adversely affect nontarget animals. In addition, WS would appropriately dispose of carcasses following euthanasia, which would eliminate risks to nontarget animals that may scavenge the carcass (see WS Directive 2.515).

- *Toxicants*

Exposure of nontarget animals to toxicants can be either through direct toxicant consumption (primary exposure) or through consumption of other organisms exposed to the toxicant (secondary exposure). There are currently no toxicants registered for use to manage nonnative reptiles and amphibians in Florida. WS would not use any toxicants in Florida to manage nonnative reptile and amphibians unless they were approved for use by the EPA pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act and approved for use in Florida by the Florida Department of Agriculture and Consumer Services. If approved for use, WS would use products pursuant to the label requirements to minimize risks to nontarget animals.

Although toxicants are not currently available to manage damage and threats of damage associated with nonnative reptiles and amphibians in Florida, toxicants for nonnative reptiles and amphibians have been approved for use in other states and territories. For example, acetaminophen has been approved for use as a toxicant to control brown tree snakes (*Boiga irregularis*) in Guam (Savarie et al. 2001, Vice and Pitzler 2002) and citric acid has been used in Hawaii to control coqui frogs (*Eleutherodactylus coqui*) (Pitt et al. 2005). In addition, Avery et al. (2011) found zinc phosphide showed potential as a toxicant for reducing local populations of black spiny-tailed iguanas. As part of the registration and approval of toxicants, the EPA considers the potential impacts of the toxicants use on nontarget animals and product labels often have requirements that applicators must follow to minimize risks to nontarget animals. For example, applicators using acetaminophen for brown tree snakes in Guam can place the bait inside bait stations that are designed to allow brown tree snakes to enter inside the station to feed on the bait but exclude most nontarget species.

Johnston et al. (2002) assessed the risks for both primary and secondary poisoning of nontarget wildlife associated with acetaminophen use in controlling brown tree snake populations on Guam. To manage brown tree snakes in Guam, an 80 mg dose tablet of acetaminophen is inserted inside a dead neonatal (newborn) mouse through the oral cavity. For many applications, the dead neonatal mouse containing the 80 mg tablet of acetaminophen is inserted inside a bait station designed to allow brown tree snakes to enter inside the bait station to feed on the dead neonatal mouse but exclude most nontarget animals from accessing the bait inside the station.

Zinc phosphide is a toxicant that is currently registered for use to kill small rodents, lagomorphs, muskrats, and nutria. According to the EPA (1998), zinc phosphide, when ingested, reacts with the acids in the gut releasing phosphine gas, which interferes with cell respiration leading to the death of the animal. Zinc phosphide is two to 15 times more toxic to rodents than to carnivores (Hill and Carpenter 1982). Secondary risks appear to be minimal to predators and scavengers that scavenge carcasses of animals killed with zinc phosphide (Tietjen 1976, Hegdal and Gatz 1977, Hegdal et al. 1980, Hill and Carpenter 1982, Johnson and Fagerstone 1994). Risks would be minimal because 90% of the zinc phosphide ingested by rodents is detoxified in the digestive tract (Hegdal et al. 1980) and 99% of the zinc phosphide residues occur in the digestive tracts, with none occurring in the muscle. In addition, the amount of zinc phosphide required to kill target rodents is not enough to kill most other predatory animals that consume tissue (Johnson and Fagerstone 1994).

In addition, zinc phosphide has a strong emetic action (*i.e.*, causes vomiting) and most nontarget animals in research tests regurgitated bait or tissues contaminated with zinc phosphide without succumbing to the toxicant (Hegdal and Gatz 1977, Hegdal et al. 1980, Johnson and Fagerstone 1994). Furthermore, predators tend to eviscerate zinc phosphide-poisoned rodents before eating them or otherwise avoid the digestive tract and generally do not eat the stomach and intestines (Hegdal et al. 1980, Johnson and Fagerstone 1994). Although zinc phosphide baits have a strong, pungent, phosphorous-like odor (garlic like), this characteristic seems to attract rodents, particularly rats, and apparently makes the bait

unattractive to some other animals. Many birds appear capable of distinguishing treated from untreated baits and they prefer untreated grain when given a choice (Siegfried 1968, Johnson and Fagerstone 1994). Birds appear particularly susceptible to the emetic effects of zinc phosphide, which would tend to offer an extra degree of protection against bird species dying from the consumption of grain treated with zinc phosphide or, for scavenging bird species, from eating poisoned rodents because they are likely to regurgitate the bait. Use of rolled oats instead of whole grain also appears to reduce bird acceptance of bait. Uresk et al. (1988) reported on the effects of zinc phosphide on six nontarget rodent populations. Uresk et al. (1988) determined that no differences were observed from pretreatment until after treatment in populations of eastern cottontail rabbits and white-tailed jackrabbits (*Lepus townsendii*). However, primary consumption of bait by nontarget wildlife could occur and potentially cause mortality (Sterner 1994). Uresk et al. (1988) reported a 79% reduction in deer mouse populations in areas treated with zinc phosphide; however, the effect was not statistically significant because of high variability in densities and the reduction was not long-term (Deisch et al. 1990).

Ramey et al. (2000) reported that five weeks after treatment, no ring-necked pheasants (*Phasianus colchicus*) had been killed because of zinc phosphide baiting. In addition, Hegdal and Gatz (1977) determined that zinc phosphide did not affect nontarget populations and more radio-tracked animals were killed by predators than died from zinc phosphide intoxication (Hegdal and Gatz 1977, Ramey et al. 2000). Tietjen (1976) observed horned larks (*Eremophila alpestris*) and mourning doves (*Zenaida macroura*) on zinc phosphide-treated prairie dog colonies, but observations after treatment did not locate any sick or dead birds, a finding similar to Apa et al. (1991). Uresk et al. (1988) reported that ground-feeding birds showed no difference in numbers between control and treated sites. Apa et al. (1991) further states that zinc phosphide was not consumed by horned larks because poisoned grain remaining for their consumption was low (*i.e.*, bait was accepted by prairie dogs before larks could consume it and birds may have a negative sensory response to zinc phosphide. Reduced impacts on birds associated with the use of zinc phosphide have also been reported by Tietjen and Matschke (1982).

Deisch et al. (1989) determined that zinc phosphide bait reduced ant densities but spider mites, crickets, wolf spiders, ground beetles, darkling beetles, and dung beetles were not affected. Wolf spiders and ground beetles showed increases after one year on zinc phosphide treated areas (Deisch 1986). Generally, direct long-term impacts from rodenticide treatments were minimal for the population of insects sampled (Deisch et al. 1989). Long-term effects were not directly related to rodenticides, but more to habitat changes (Deisch 1986) as vegetative cover and prey diversity increased without prairie dogs grazing and clipping the vegetation (Deisch et al. 1989).

- *Cervical dislocation*

Cervical dislocation is a method that WS could use to humanely kill a target animal after live-capture. The use of cervical dislocation would not pose any risks to nontarget animals because WS' personnel would identify the animal prior to using the method.

- *Egg Destruction*

WS' personnel could make eggs of certain target species, such as green iguanas, unviable by breaking an egg, shaking an egg, or soaking an egg in water for 24 hours. The destruction of eggs would essentially be selective for target species because WS' personnel would identify the eggs of target species prior to application. Therefore, WS does not anticipate direct or indirect effects to occur to nontarget species from destroying eggs of target species.

Effects on nontarget animal populations from unintentional take

As discussed previously, the potential effects on nontarget animal populations associated with the use of nonlethal methods would be similar to those potential effects discussed for Alternative 2. Similarly, the potential effects associated with WS providing technical assistance would be similar to those potential effects discussed for Alternative 3. Of primary concern would be WS' use of lethal methods because those methods could result in the unintentional death of a nontarget animal, which could potentially affect the populations of nontarget animals.

However, WS does not anticipate the unintentional lethal removal of nontarget animals to occur at such a frequency or intensity that would affect the population of a nontarget species. From FY 2015 through FY 2022, no lethal removal of nontarget animals occurred by WS in Florida during prior activities to manage damage caused by target species. If WS' implements Alternative 1, WS anticipates the unintentional lethal removal of nontarget animals during activities to reduce damage or threats to human safety associated with target species in Florida to be extremely low to non-existent. WS would continue to monitor the activities conducted to ensure program activities or methodologies used to reduce damage or threats caused by target species do not adversely affect the populations of nontarget animals. Methods available to resolve and prevent damage or threats caused by target species can be selective for target species when employed by trained, knowledgeable personnel.

Analysis of risks to species designated as threatened or endangered pursuant to the Endangered Species Act

WS would make special efforts to avoid jeopardizing threatened and endangered species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures through consultation with the United States Fish and Wildlife Service and/or the National Marine Fisheries Service. The Endangered Species Act 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 consultations with the United States Fish and Wildlife Service and/or the National Marine Fisheries Service pursuant to Section 7 of the Endangered Species Act to ensure compliance. WS also conducts consultations 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)].

Some of the target species addressed in this EA occur throughout Florida. If WS implements Alternative 1, WS could conduct activities to manage damage caused by those target species when an entity requests such assistance. Therefore, WS could conduct activities to manage damage in areas where threatened and endangered species occur. However, from FY 2015 through FY 2022, no take of threatened and endangered species by WS has occurred in Florida during the implementation of activities and the use of methods to manage the damage that target species cause. During the development of this EA, WS reviewed the current list of species designated as threatened or endangered in Florida as determined by the United States Fish and Wildlife Service and the National Marine Fisheries Service. WS conducted a review of potential impacts of implementing Alternative 1 on each of those species designated as threatened or endangered by the United States Fish and Wildlife Service and the National Marine Fisheries Service. The evaluation took into consideration the direct and indirect effects of implementing Alternative 1 to alleviate damage caused by target species. WS reviewed the status, critical habitats designations, and current known locations of those species. As part of the review process, WS prepared and submitted a biological evaluation to the United States Fish and Wildlife Service as part of the consultation process pursuant to Section 7 of the Endangered Species Act.

Based on the use patterns of methods currently available and the locations where WS could implement damage management activities, the implementation of Alternative 1 would have no effect on those threatened or endangered species in Florida under the jurisdiction of the National Marine Fisheries Service, including any designated critical habitat. In addition, base on the use patterns of available methods and based on current life history information for those species under the jurisdiction of the United States Fish and Wildlife Service, WS has made a no effect determination for several species currently listed in Florida (see Appendix C). For several species listed within the state, WS has determined that the proposed activities "*may affect*" those species but those effects would be solely beneficial, insignificant, or discountable, which would warrant a "*not likely to adversely affect*" determination. Based on those determinations, WS initiated informal consultation with the United States Fish and Wildlife Service for those species that a "*may affect, not likely to adversely affect*" determination was made (see Appendix C). The United States Fish and Wildlife Service concurred with WS' determination that activities conducted pursuant to the proposed action would not likely adversely affect those species.

The USFWS has also designated critical habitat in Florida for some of the species listed as threatened or endangered. Appendix C provides a list of those species with critical habitat designated in Flordia along with WS' effects determination. WS has determined implementation of Alternative 1 would have no effect on any critical habitat designated in Florida. WS based the effects determinations on a review of the activities that WS could conduct if WS implemented Alternative 1. The USFWS concurred with WS' effects determination for critical habitats designated in Florida.

Analysis of risks to state-designated threatened species and state species of special concern in Florida

Appendix D identifies those species designated by the State of Florida as state threatened or state species of special concern. WS has reviewed the list of species the State of Florida has designated as state threatened or species of special concern. Based on the review of those species, WS has determined that the proposed activities would have no effect on those species currently listed as state threatened or species of special concern. Appendix D also identifies species designated by the United States Fish and Wildlife Service pursuant to the Endangered Species Act as threatened, endangered, or threatened due to similarity of appearance. WS' effects determination for those species designated by the United States Fish and Wildlife Service as endangered, threatened, or threatened due to similarity of appearance occurs in Appendix C. WS would continue to review the species designated by the State of Florida as state threatened species and species of special concern. As appropriate, WS would consult with the FFWCC when WS determines activities may adversely affect a state threatened species or state species of special concern.

Alternative 2 – WS would continue the current integrated methods approach to managing damage caused by target species in Florida using only nonlethal methods

Implementation of Alternative 2 would require WS to only recommend and use nonlethal methods to manage and prevent damage associated with target species. WS would provide technical assistance and direct operational assistance by recommending and/or using only nonlethal methods. Using the WS Decision Model, WS' personnel would consider the potential effects to nontarget animals from the potential use of nonlethal methods when formulating a management strategy for each request for assistance. Nonlethal methods have the potential to cause adverse effects to nontarget animals primarily through live capture, exclusion, and dispersal.

If WS implemented Alternative 2, of concern are the possible negative physiological and/or behavioral effects that negative stimuli could cause, which could reduce the fitness of a nontarget animal, or the ability of a nontarget animal to survive, especially if the exposure to the stressor were chronic. The stress

caused during the use of nonlethal methods could negatively affect the health of an animal, interfere with the raising of young, and/or increase energy needs.

DIRECT, INDIRECT, AND CUMULATIVE EFFECTS ON NONTARGET ANIMAL POPULATIONS ASSOCIATED WITH IMPLEMENTING ALTERNATIVE 2

In general, the use of nonlethal methods to disperse, exclude, or capture target species from areas would have no effect on the populations of nontarget animals because those methods generally would not occur with such frequency and would not occur at an intensity level that would cause adverse effects. Therefore, WS does not anticipate direct or indirect effects to occur to any nontarget species. Based on the use pattern of methods and the activities that WS could conduct to manage damage or threats of damage caused by target species, WS does not anticipate cumulative effects to occur to any nontarget species. Activities conducted by WS would not occur with such frequency and would not occur at an intensity level that would cause cumulative adverse effects. WS has received no reports or documented any cumulative effects associated with the use of nonlethal methods from previous activities associated with managing damage caused by target species in the state that WS conducted.

Risks to nontarget animals associated with available methods

Appendix B describes the nonlethal methods that would be available for WS' personnel to use if WS implemented Alternative 2. The potential effects associated with specific methods or a category of methods occurs below.

- *Human Presence*

For the effects analysis, human presence will include physical actions that WS could use to haze target species and consideration of WS' employees conducting activities to manage damage in the state. Like the intent of many nonlethal methods, the presence of people and/or a vehicle and the physical actions of clapping, waving, or yelling can disperse target species from an area through auditory and visual cues. Like many visual and auditory methods intended to disperse animals from a location, the primary concern would be the possible negative physiological and/or behavioral effects that negative stimuli could cause, which could reduce the fitness of a nontarget animal or the ability of a nontarget animal to survive, especially if the exposure to the stressor was chronic. Activities conducted by WS can involve repeated visits to the same area until WS and/or another entity reduces damage or threats of damage. In some cases, such as airports, WS' employees may be present in areas multiple times a day and on a regular basis.

Like other visual and auditory stimuli, nontarget animals often habituate to the presence of people, especially in areas where nontarget animals frequently encounter people, such as urban areas. In addition, nontarget animals are likely to return to the area once WS' personnel are no longer present. However, in some situations, such as areas with colonial nesting waterbirds, the presence of people inside or near the colonies can cause nesting birds to abandon nests and/or flush adults, which may expose eggs/nestlings to the sun, inclement weather, or predation. However, WS would only conduct activities in those areas at the request of the property owner or manager and in most cases, WS would be conducting activities to reduce predation associated with a nonnative reptile species. Therefore, WS would work with the property owner or manager to limit exposure and disturbance, such as conducting activities prior to the beginning of nesting or conducting activities on the periphery of the colony.

As discussed in Section 2.4.1, when formulating a management strategy, WS' employees would consider factors essential to each request for assistance including risks to nontarget animals. The presence of WS'

personnel would not occur at a magnitude or intensity level that would cause harm to a nontarget animal by preventing them from accessing essential resources (*e.g.*, food sources, habitat).

- *Modifying Cultural Practices*

When providing technical assistance, WS could recommend that people requesting assistance modify behaviors that may be contributing to damage or threats of damage caused by target species. For example, WS could recommend that property owner or managers implement changes to animal husbandry practices, such as employing guard dogs to protect livestock. However, in those cases, the entity experiencing damage, or the threat of damage would be responsible for implementing the recommendations made by WS' personnel.

- *Limited Habitat Modification*

WS could also recommend limited modification of habitat in some situations, such as reducing cover occurring near runways. In those cases, the entity experiencing damage, or the threat of damage would be responsible for implementing the recommendations made by WS' personnel. WS' employees would recommend habitat modifications in limited circumstances where modifications could result in the dispersal of target species from an area or make an area less attractive to those species. WS' employees would not recommend habitat modifications over large areas and would not recommend modifications to the extent that would result in the removal or modification of large areas of habitat. The use of habitat modifications would generally be restricted to urban areas, airports, industrial parks, office complexes, and other areas where human activities are high. WS' personnel would not recommend habitat modification at a magnitude or intensity level that would cause harm to nontarget animals by reducing available habitat.

- *Exclusion Devices*

Exclusionary devices can be effective in preventing access to resources in certain circumstances. Exclusionary methods include the use of nets, window screens, and fences. The use of exclusionary methods is primarily associated with areas modified by people because target species are posing a threat the human health and safety or causing damage to a resource valued by people, such as buildings, infrastructure, turf, and agricultural commodities. Given the expense of excluding target species from large areas, exclusion methods are often restricted to small areas around high value resources (*e.g.*, fencing around a small grain research plot). The purchase and installation of exclusion devices would primarily occur by the entity experiencing damage or threats of damage. In addition, exclusion methods may also have limited application because their use could restrict people's access to the resource. Any exclusionary device erected to prevent access of target species also potentially excludes other nontarget species. However, WS' personnel and other entities would not employ exclusionary devices over large geographical areas or use those devices at such an intensity level that essential resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over such a wide geographical scope that long-term adverse effects would occur to a species' population.

- *Auditory Deterrents*

The intent with the use of auditory dispersal methods, such as electronic hazing devices, pyrotechnics, and propane cannons, is to illicit a flight response in target animals by producing a novel noise or producing an adverse noise. Of concern are the possible negative physiological and/or behavioral effects that negative stimuli could cause, which could reduce the fitness of a nontarget animal, or the ability of a nontarget animal to survive, especially if the exposure to the stressor was chronic. The stress from dispersal methods could negatively affect the health of an animal, interfere with the raising of young,

and/or increase energy needs. However, for effects to occur, a nontarget animal would have to be within hearing distance at the time WS' personnel used an auditory method and the resulting noise stimuli would have to elicit a negative response. Nontarget animals often habituate to the use of auditory deterrents, especially in areas where nontarget animals frequently encounter people, such as urban areas. In addition, nontarget animals are likely to return to the area once WS' personnel are no longer using those methods. The use of auditory deterrents would not occur at a magnitude or intensity level that would cause harm to a nontarget animal by preventing them from accessing essential resources (*e.g.*, food sources, habitat). In addition, WS anticipates using auditory deterrents infrequently because auditory deterrents are generally not effective at dispersing reptiles and amphibians.

- *Visual Deterrents*

Several visual scaring methods would be available for WS' personnel to recommend and/or use to manage damage. Visual methods include electronic guards, effigies, lasers, and lights. The intent associated with the use of visual dispersal methods would be to elicit a flight response by scaring target species from an area where damage was occurring or where damage could occur. Of concern are the possible negative physiological and/or behavioral effects that negative stimuli could cause, which could reduce the fitness of nontarget animals, or the ability of nontarget animals to survive, especially if the exposure to the stressor was chronic. The stress from dispersal methods could negatively affect the health of an animal, interfere with the raising of young, and/or increase energy needs. However, for effects to occur a nontarget animal would have to encounter a visual dispersal method and the resulting visual stimuli would have to elicit a negative response. Like other nonlethal methods, WS' personnel would not employ visual dispersal methods over large geographical areas or use those devices at such an intensity level that essential resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over such a wide geographical scope that long-term adverse effects would occur to a species' population.

- *Trained Dogs*

WS could use and/or recommend the use of trained dogs to locate target species, such as feral swine, boa constrictors, or reticulated pythons, in areas where they are causing damage or posing a threat of damage. Only authorized WS' personnel can use trained dogs and personnel can only use trained dogs to conduct specific functions. Pursuant to WS Directive 2.445, "*WS personnel shall control and monitor their trained dogs at all times. A trained dog is considered controlled when the dog responds to the command(s) of WS personnel by exhibiting the desired or intended behavior as directed*." Therefore, WS' personnel would use dogs that are proficient in the skills necessary to locate target animals in a manner that was responsive to its handler's commands.

To ensure proper monitoring and control, WS' personnel use various methods and equipment, such as muzzles, electronic training collars, harnesses, leashes, voice commands, global positioning system collars, and telemetry collars. A possibility exists that dogs could switch to a fresher trail of a nontarget species while pursuing the target species. This could occur with any animal that they have been trained to follow and could occur with an animal that is similar to the target species. With this said, this risk can be minimized greatly by WS' personnel correctly identifying the tracks of target species prior to releasing the dogs and calling them off a track if it is determined that they have switched tracks. Because WS' personnel would only use trained dogs that are responsive to commands, WS' personnel can call back dogs if WS' personnel determine the dogs begin approaching a nontarget species.

However, in some situations, such as areas with colonial nesting waterbirds, the presence of dogs inside or near the colonies can cause nesting birds to abandon nests and/or flush adults, which may expose eggs/nestlings to the sun, inclement weather, or predation. However, WS would only conduct activities in those areas at the request of the property owner or manager and in most cases, WS would be conducting

activities to reduce predation associated with a nonnative reptile species. Therefore, WS would work with the property owner or manager to limit exposure and disturbance, such as conducting activities prior to the beginning of nesting or conducting activities on the periphery of the colony.

As discussed in Section 2.4.1, when formulating a management strategy, WS' employees would consider factors essential to each request for assistance including risks to nontarget animals. In addition, before conducting activities, the property owner or manager must sign a work initiation document allowing WS to conduct activities on property they own or manage. The work initiation document also lists the methods the property owner agrees to allow WS to use on their property. Therefore, risks to nontarget species from the use of trained dogs would are very low and would not result in adverse impacts on nontarget species' populations.

- *Cage-type Traps, Funnel Traps, Hoop Traps, Basking Traps, Pitfall Traps, and Drift Fences*

Cage-traps, funnel traps, hoop traps, basking traps, and pitfall traps are available in a variety of designs, but they operate similarly. Hazards to animals captured in live-capture traps include stress, injury, and death. For example, White et al. (1991) demonstrated that red fox (*Vulpes vulpes*) held in cage traps of a box-style had elevated levels of the stress hormones, adrenocorticotropin and cortisol, as well as other physiological impacts when compared to fox not held in cages. Some animals may struggle to escape, and they may become injured. Blundell et al. (1999) reported swelling and abrasions to appendages of river otter live captured in Hancock traps and serious damage to teeth, presumably from otters chewing on the metal to escape. Powell and Proulx (2003) reported abrasions to the muzzles of animals live-captured in cage traps. Mowat et al. (1994) noted injuries to lynx (*Lynx lynx*) that were live captured in box traps that ranged from broken or split claws to superficial cuts on the nose, and rarely on the face. Mowat et al. (1994) considered those injuries to lynx that occurred from capture in box traps to be minor. Of the nontarget animals live-captured in box traps during a study conducted by Mowat et al. (1994), only one fox suffered injury from a cut on the foot, which was considered minor.

Death of captured animals could occur because of environmental conditions, such as extreme temperatures or exposure to rain. Euthanasia or the humane killing of animals could be necessary when release was improper due to a trap related injury. Live-capture traps generally allow the safe release of nontarget species and result in a lower potential for stress and injury compared to other trapping methods (Mowat et al. 1994, Powell and Proulx 2003, Kolbe et al. 2003, Schutz et al. 2006, Iossa et al. 2007, Munoz-Igualada et al. 2008).

Mortality rates associated with cage traps are low and impacts to a species population are not anticipated from cage trapping efforts (Gosling et al. 1988, Baker et al. 2001, Way et al 2002, Short et al. 2002, Shivik et al. 2005, Iossa et al. 2007). Risks of capturing nontarget animals and mortality rates would be dependent on the target animal and ability to implement cage trapping measures that are species specific reducing nontarget captures. WS implementing measures that increase selectivity and reduce capture time minimize the risk to nontarget animals. For example, the adoption and advancement of electronic signaling devices have been shown to reduce the holding time for trapped animals reducing the potential for stress and other impacts to nontarget animals (Larkin et al. 2003, Benevides et al. 2008, Darrow and Shivik 2008, Will et al. 2010). Signals sent from traps to remote devices such as cell phones not only serve to reduce the holding time for captured animals but also allow personnel to collect more accurate data regarding trapping, ensure compliance with regulations regarding trap monitoring and address animal welfare concerns. The use of the appropriate cage trap size and design; trap placement; and the selection of bait or lure applicable to the target animal reduce the risk of the capture of nontarget species (Baker and Clarke 1988, Andrzejewski and Owadowska 1994, Jojola et al. 2009, Phillips and Winchell 2011).

Live traps have the potential to capture nontarget species if those nontarget species enter inside the trap or trigger a trap. The placement of live traps in areas where target species are active, and the use of target-specific attractants would likely minimize the capture of nontarget animals. WS' personnel would attend live traps appropriately, which would allow them to release any nontarget animals captured unharmed in most situations.

Drift fences help guide target reptiles and amphibians into live-capture devices and risks to nontarget species would be similar to those described for exclusion devices because could impede animal movement. In addition, drift fences could unintentionally guide nontarget animals toward live-capture methods.

- *Foothold Traps and Glue Boards*

WS anticipates using foothold traps and glue boards infrequently and in specific situations where the target animal or animals use the same locations regularly. In addition, foothold traps and glue boards are only appropriate for a few of the target nonnative species identified in Section 1.2 and Appendix E. For example, foothold traps would not be appropriate to capture nonnative snake species. The home ranges, habitat preferences, travel corridors, population densities of both target and nontarget species are considered when selecting locations for the placement of foothold traps and glue boards. Many of the risks to nontarget animals associated with the use of foothold traps and glue boards would be similar to those discussed for cage-type traps.

When using foothold traps, WS can minimize the risk of capturing nontarget animals by the selection of trap size for the target animal, use of pan-tension devices, selection of the proper bait, lure or attractant, and appropriate trap placement. Selecting the proper trap size can reduce the risk of catching animals larger than the target species because they can pull free if the trap is activated. Pan-tension devices can reduce the risk of capturing animals that weigh less than target animals (Turkowski et al. 1984, Kamler et al. 2000, Kamler et al. 2002, Kamler et al. 2008). Therefore, the use of baits, lures, and attractants that are preferred by the target species can minimize the chances of capture of nontarget species. The attractant allows for more targeted management of animals and will reduce the potential for trapping nontarget animals.

WS would use glue boards in limited situations with a high likelihood of capturing the target animal or animals. For example, WS could place a glue board in front of an entrance where a target animal enters and exits a place of refuge. WS would check glue boards frequently to address any animals captured, which would allow WS to release any nontarget animals captured.

- *Nets*

Nets could include the use of net guns, cannon/rocket nets, drop nets, hand nets, and throw nets. Nets would restrain animals once captured and are live-capture methods. Nets have the potential to capture nontarget species. However, the use of nets would essentially be selective for target species because WS' personnel would identify the target animals prior to application. Net placement in areas where target species are active, and the use of target-specific attractants would likely minimize the capture of nontarget animals. WS' personnel would attend nets appropriately, which would allow them to release any nontarget animals captured unharmed or to only activate the net when nontarget animals are not present.

Even though live capture does occur from those methods, the potential for death of a target or nontarget animal while being restrained or released does exist, primarily from being struck by cannon or rocket assemblies during deployment. The likelihood of cannon or rocket assemblies striking a nontarget animal is extremely low. The risk is likely extremely low because a nontarget animal must be present when WS'

personnel activate the net, and the nontarget animal must be in a position where the assemblies strike the animal. WS' personnel would position nets so the net envelops target animals upon deployment, which would minimize the risk of assemblies striking a nontarget animal. When using nets, WS' personnel would often use a bait to attract target species and to concentrate target species in a specific area to ensure the net completely envelopes target animals. Therefore, WS' personnel could abandon sites if nontarget animal use of the area were high or could refrain from firing the net at a time when nontarget animals were present. The noise associated with firing cannon/rocket nets and net guns would be similar to those described for auditory deterrents.

- *Hand Capture and Noose Poles*

WS' personnel would use hand capture methods to selectively capture target animals. WS' personnel would identify a target animal before using their hands to capture the animal. Thus, hand capture methods would not adversely affect any nontarget species.

- *Fishing Hooks*

Fishing hooks, including large treble hooks and snagging hooks, could be used to capture spectacled caimans and other nonnative crocodilians. When using fishing hooks, WS' personnel generally use bait to attract and encourage nonnative crocodilians to ingest the hook. Although the use of hooks is a nonlethal capture method, the subsequent lethal removal of caimans and other nonnative crocodilians is the intended purpose from the use of baited hooks.

Baited fishing hooks have the potential to capture nontarget species especially species that may be attracted to and consume the bait. The placement of baited fishing hooks in areas where nonnative crocodilians are active, the use of target-specific bait, and the placement of fishing hooks only over water would likely minimize the capture of nontarget animals when using fishing hooks. WS' personnel would attend to fishing hooks appropriately, which likely would allow them to release any nontarget animals captured unharmed. There is the remote chance that the use of fishing hooks could result in the death of a nontarget animal. However, given that the fishing hooks would be applied with provisions to keep nonnative crocodilians alive, the risks to nontarget species are very low and would not result in adverse impacts on nontarget species' populations.

WS' personnel could also use fishing poles with snagging hooks and/or ropes with snagging hooks to snag the body of a nonnative crocodilian species. WS' personnel would first identify the target before casting a treble hook. There is a slight risk of unintentional capture of nontarget animals if a treble hook cast misses the intended target and hooks a nontarget animal. WS' personnel can minimize risks by using treble hooks by being aware of what is near or beyond the target animal, and by training to be proficient at casting treble hooks. Thus, the risks to nontarget species from the use of treble hooks are very low and would not result in adverse impacts on nontarget species' populations.

- *Cover Boards and Polyvinylchloride Pipe Refugia*

WS would use cover boards and polyvinylchloride pipe refugia in areas frequently used by the target species. Although nontarget species could take refuge under cover boards or use polyvinylchloride pipe refugia, those methods are live-capture methods and identification of the animal would occur prior to hand capture. Therefore, minimal risks would occur to nontarget species.

- *Immobilizing Drugs*

WS could administer chemicals (*e.g.*, Ketamine) to immobilize reptiles in certain instances (*e.g.*, affixing a radio and/or GPS transmitter on an animal). For WS' personnel to administer immobilization chemicals, the target animal would first need to be captured using live-capture methods (*e.g.*, live-capture traps). Using immobilization drugs is essentially selective for target animals because WS' personnel would identify target species prior to application. There is a slight risk of misidentifying target species, especially when target and nontarget species have a similar appearance. Therefore, risks to nontarget species from the use of immobilization chemicals are very low and would not result in adverse impacts on nontarget species' populations. Animals anesthetized using immobilizing drugs recover once the animal has fully metabolized the drug. Therefore, nontarget animals that may consume animals that recover are unlikely to receive a dosage that would cause any impairment. When using immobilizing drugs to handle or transport target animals, WS would monitor anesthetized animals until that animal recovers sufficiently to leave the site.

- *Radio Telemetry*

Radio and/or GPS transmitters are attached to some target animals for use as "scout" animals, which are then released and used to locate other individuals of the same species. For WS to use a target animal as a scout animal, the target animal would first need to be live captured using live traps or nets. While trying to capture target species to be used as scout animals, nontarget animals could be captured in live traps and nets. The use of live traps and nets for the purposes of capturing and using target species as scout animals would present the same threats to nontarget species as detailed in the live trap and nets sections listed above. WS would not use any nontarget species as scout animals. Therefore, using target species as scout animals would not adversely affect any nontarget species.

Alternative 3 - WS would recommend an integrated methods approach to managing target species damage in Florida through technical assistance only

Under a technical assistance alternative, WS would have no direct impact on nontarget species, including threatened and endangered species. Those persons requesting assistance could employ methods that WS' personnel recommend or provide through loaning of equipment. Using the WS Decision Model, WS' personnel would base recommendations from information provided by the person requesting assistance or through site visits. Recommendations would include methods or techniques to minimize impacts on nontarget animals associated with the methods that personnel recommend or loan. Methods recommended could include nonlethal and lethal methods as deemed appropriate by the WS Decision Model and as permitted by laws and regulations.

The potential impacts to nontarget animals under this alternative would be variable and based on several factors. If people employed methods as recommended by WS, the potential impacts to nontarget animals would likely be similar to Alternative 1. If people provided technical assistance did not use the recommended methods and techniques correctly or people used methods that WS did not recommend, the potential impacts on nontarget species, including threatened and endangered species, would likely be higher when compared to Alternative 1.

The potential impacts of hazing and exclusion methods on nontarget species would be similar to those described for Alternative 1. Hazing and exclusion methods would be easily obtainable and simple to employ. Because identification of targets would occur when employing shooting as a method, the potential impacts to nontarget species would likely be low under this alternative. However, the knowledge and experience of the person could influence their ability to distinguish between similar target species correctly.

Those people experiencing damage from target species may implement methods and techniques based on the recommendations of WS. The knowledge and skill of those persons implementing recommended methods would determine the potential for impacts to occur. If those persons experiencing damage do not implement methods or techniques correctly, the potential impacts from providing only technical assistance could be greater than Alternative 1. The incorrect implementation of methods or techniques recommended by WS could lead to an increase in nontarget animal removal when compared to the nontarget animal removal that could occur by WS under Alternative 1.

If WS provided technical assistance but none of the recommended actions were implemented and no further action was taken, the potential to remove nontarget animals would be lower when compared to Alternative 1. If those persons requesting assistance implemented recommended methods appropriately and as instructed or demonstrated, the potential impacts to nontarget animals would be similar to Alternative 1. If WS made recommendations on the use of methods to alleviate damage but the methods were not implemented as recommended by WS or if the methods recommended by WS were used inappropriately, the potential for lethal removal of nontarget animals would likely increase under a technical assistance only alternative. Therefore, the potential impacts to nontarget animals, including threatened and endangered species, would be variable under a technical assistance only alternative. It is possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal killing of target species, which could lead to unknown effects on local nontarget species' populations, including some threatened and endangered species.

When the damage caused by wildlife reaches a level where assistance does not adequately reduce damage or where no assistance is available, people sometimes resort to using chemical toxicants that are illegal for use on the intended target species and often results in loss of both target and nontarget wildlife (*e.g.*, see Allen et al. 1996, United States Department of Justice 2014, United States Department of Justice 2015). The use of illegal toxicants by individuals frustrated with the lack of assistance or assistance that inadequately reduces damage to an acceptable level can often result in the indiscriminate take of wildlife species.

The individuals requesting assistance are likely to use lethal methods because a damage threshold has been met that has triggered them to seek assistance to reduce damage. The potential impacts on nontarget animals by those persons experiencing damage would be highly variable. People whose damage problems caused by target species were not effectively resolved by nonlethal control methods would likely resort to other means of legal or illegal lethal control. This could result in less experienced persons implementing control methods and could lead to greater take of nontarget wildlife than the proposed action.

WS' recommendation that target species be harvested during the regulated season by private entities to alleviate damage would not increase risks to nontarget animals. Shooting would essentially be selective for target species and the unintentional lethal removal of nontarget animals would not likely increase based on WS' recommendation of the method.

The ability to reduce negative effects caused by target species to wildlife species and their habitats, including threatened and endangered species, would be variable under this alternative. The skills and abilities of the person implementing damage management actions would determine the risks to nontarget animals.

Alternative 4 –WS would not provide any assistance with managing damage caused by target species in Florida

Under this alternative, WS would not provide any assistance with managing damage associated with target species in the State. Therefore, no direct impacts to nontarget animals or threatened and endangered species would occur by WS under this alternative. Risks to nontarget animals and threatened and endangered species would continue to occur from those people who implement damage management activities on their own or through recommendations by other federal, State, and private entities. Although some risks could occur from those people that use methods in the absence of any involvement by WS, those risks would likely be low, and would be similar to those risks under the other alternatives.

The ability to reduce damage and threats of damage caused by target species would be variable based upon the skills and abilities of the person implementing damage management actions under this alternative. The risks to nontarget animals and threatened and endangered species would be similar across the alternatives because most of those methods described in Appendix B would be available to use by people if WS implements this alternative. If people apply those methods available as intended, risks to nontarget animals would be minimal to non-existent. If people apply those methods available incorrectly or apply those methods without knowledge of animal behavior, risks to nontarget animals could be higher if WS implements this alternative. If frustration from the lack of available assistance causes those persons experiencing damage caused by target species to use methods that are not legally available for use, risks to nontarget animals could be higher if WS implements this alternative. People have resorted to the use of illegal methods to resolve wildlife damage that have resulted in the lethal take of nontarget animals (*e.g*., see Allen et al. 1996, United States Department of Justice 2014, United States Department of Justice 2015).

3.1.3 Issue 3 - Effects of WS' Activities on Human Health and Safety

A common concern is the potential adverse effects methods available could have on human health and safety. An evaluation of the threats to human health and safety associated with methods available under the alternative approaches occurs below for each of the four alternative approaches carried forward for further analysis.

Alternative 1 - WS would continue the current integrated methods approach to managing damage caused by target species in Florida (Proposed Action/No Action)

Implementation of Alternative 1 would allow WS to integrate nonlethal and lethal methods into a damage management strategy when providing both direct operational assistance and technical assistance. The direct, indirect, and cumulative effects associated with those methods that would be available to manage damage occurs below for each method.

DIRECT, INDIRECT, AND CUMULATIVE EFFECTS ANALYSIS OF METHODS ON HUMAN HEALTH AND SAFETY

If WS implements Alternative 1, WS' personnel would assess the damage or threat occurring, would evaluate the management methods available, and would formulate a management strategy to alleviate damage or reduce the risk of damage. A WS' employee would formulate a management strategy by selecting from those methods described in Appendix B that the employee determines to be practical for use. WS' employees who conduct activities to alleviate damage caused by target species would be knowledgeable in the use of methods, the wildlife species responsible for causing damage or threats, and WS' directives. WS' personnel would incorporate that knowledge into the decision-making process

inherent with the WS' Decision Model, which they would apply when addressing threats and damage caused by target species. Therefore, when evaluating management methods and formulating a management strategy for each request for assistance, WS' employees would consider risks to human health and safety associated with methods.

For example, WS' personnel would consider the location where activities could occur. Risks to human safety from the use of methods would likely be greater in highly populated urban areas in comparison to rural areas that are less densely populated. If WS' personnel conducted activities on rural private property, where the property owner or manager could control and monitor access to the property, the risks to human safety from the use of methods would likely be lower. If damage management activities occurred at or near public use areas, then risks of the public encountering damage management methods and the corresponding risk to human safety would increase. In general, WS' personnel would conduct activities when human activity was minimal (*e.g.*, early mornings, at night) or in areas where human activity was minimal (*e.g.*, in areas closed to the public).

WS' personnel receive training in the safe use of methods and would follow the safety and health guidelines required by WS' directives (*e.g.*, see WS Directive 2.401, WS Directive 2.430, WS Directive 2.450, WS Directive 2.605, WS Directive 2.615, WS Directive 2.625, WS Directive 2.630, WS Directive 2.635). For example, WS' employees would adhere to safety requirements and use appropriate personal protective equipment pursuant to WS Directive 2.605. In addition, WS' personnel would also follow WS Directive 2.635 that establishes guidelines and standard training requirements for health, safety, and personal protection from zoonotic diseases. In addition, WS' use of methods would comply with applicable federal, state, and local laws and regulations (see WS Directive 2.210).

Before providing direct operational assistance, WS and the entity requesting assistance would sign a work initiation document or a similar document that would indicate the methods the cooperating entity agrees to allow WS to use on the property they own or property they manage. Thus, the cooperating entity would be aware of the methods that WS could use on property they own or manage, which would help identify any risks to human safety associated with the use of those methods. WS' personnel would also make the cooperator requesting assistance aware of threats to human safety associated with the use of methods.

Risks to human health and safety associated with available methods

Section I and Section II in Appendix B discuss several methods that would be available for use by WS. The risks to human health and safety associated with WS providing technical assistance during the implementation of Alternative 1 would be similar to those risks to human health and safety discussed for Alternative 3. Therefore, to reduce redundancy, the effects associated with WS providing technical assistance that would occur if WS implements Alternative 1 occur in the discussion for Alternative 3. Similarly, the risks to human health and safety from the use of nonlethal methods during the implementation of Alternative 1 would be similar to those risks to human health and safety discussed for Alternative 2. To reduce redundancy, the risks to human health and safety from the use of nonlethal methods if WS implements Alternative 1 occur in the discussion for Alternative 2.

The risks to human safety from the use of methods, when used appropriately and by trained personnel, would be low (see USDA 2019*b*, USDA 2019*c*, USDA 2019*d*, USDA 2019*e*, USDA 2020*a*, USDA 2020*b*, USDA 2021, USDA 2022*a*, USDA 2022*b*, USDA 2022*c*, USDA 2023*a*, USDA 2023*b*, USDA 2023*c*). No adverse effects to human safety have occurred from WS' use of methods to alleviate nonnative reptile and amphibian damage in the state from FY 2015 through FY 2022. Therefore, WS does not expect any direct, indirect, or cumulative effects to occur from WS' use of those methods described in Appendix B. Based on the use patterns of methods available to address damage caused by

nonnative reptiles and amphibians, the use of non-chemical would comply with Executive Order 12898, Executive Order 13045, and Executive Order 13985.

- *Firearms*

Certain safety issues do arise related to misusing firearms and the potential human hazards associated with the use of firearms to reduce damage. WS would work closely with cooperators requesting assistance to ensure that WS' personnel consider all safety issues before deeming the use of firearms to be appropriate. All WS' personnel who use firearms would follow the guidelines in WS Directive 2.615. To help ensure safe use and awareness, WS' employees who use firearms to conduct official duties receive training from an approved firearm safety-training course. 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 subject to the Lautenberg Domestic Confiscation Law and are required to inform their supervisor if they can no longer comply with the Lautenberg Domestic Confiscation Law (see WS Directive 2.615). Through programmatic risk assessments, WS has determined the use of firearms to manage wildlife damage poses a low risk to human health and safety (USDA 2019*e*).

- *Gigging*

Based on the use pattern, gigging would not pose a risk to human health and safety. WS' personnel would use gigging to capture target animals; therefore, WS' personnel would be present at the location to monitor for human activity.

- *Body-grip Traps*

WS typically uses body-grip traps in areas where human activity is minimal to ensure public safety. Body-grip traps rarely cause serious injury to people because they only trigger through direct activation of the device. Threats to human health and safety associated with body-grip traps vary with trap size and the type of trap. Injuries could range from cuts, bruises, or abrasions on fingers and hands to broken or fractured bones if a person accidently triggered the trap or was unfamiliar with the trap and attempted to handle the trap. In extreme scenarios, a person could drown if a body-grip trap closes on both hands and the person falls into deeper water.

Risks of injury would primarily be associated with WS' employees setting, checking, and handling body-grip traps. Risks to the public would primarily occur to people that tamper with or unknowingly encounter a body-grip trap. The property owner or manager would be aware of the types of methods that WS could use on the property or properties they own or manage by signing a work initiation document that includes those methods they agree to allow WS to use on their property. Pursuant to WS Directive 2.450, WS' employees must post appropriate warning signs on the main entrances or commonly used access points to areas where employees are using body-grip traps. Body-grip traps are passive, mechanical methods that, if left undisturbed, would pose a minimal risk to the public. However, if people intentionally tamper with or unknowingly step on or in a body-grip trap, depending the style, injuries could occur. WS would also use body-grip traps in compliance with applicable federal, state, and local laws and regulations (see WS Directive 2.210), as well as WS' directives to minimize risks to human health and safety.

- *Cable Devices*

Lethal-capture methods, such as body-grip traps and cable devices, are typically used in situations where human activity would be minimal to ensure public safety. Body-grip traps and cable devices rarely cause

serious injury to humans and are triggered through direct activation of the device. Therefore, human safety concerns associated with body-grip traps and cable devices used to capture target species require direct contact to cause bodily harm. Again, body-grip traps and cable devices are not typically used in high-use areas to ensure the safety of the public and pets. Signs warning of the use of those tools in the area are posted for public view at access points to increase awareness that those devices are being used and to avoid the area, especially pet owners. WS would also use body-grip traps and cable devices in compliance with applicable federal, state, and local laws and regulations (see WS Directive 2.210), as well as WS' directives to minimize risks to human health and safety. Through programmatic risk assessments, WS has determined the use of cable devices to manage wildlife damage pose minimal risks to the human health and safety (USDA 2019*b*).

- *Injection of Euthanasia Chemicals after Live Capture*

WS could administer chemicals to euthanize animals in certain instances. WS' personnel would only administer euthanasia chemicals to a target animal after capturing the animal using live capture methods and only after the animal was properly immobilized. All WS' personnel who handle and administer euthanasia chemicals would be properly trained in the use of those methods. WS' employees would follow approved procedures outlined in the WS' Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs (USDA 2019*f*). WS Directive 2.430 outlines WS' use of euthanasia chemicals and training requirements to use those chemicals. Training and adherence to WS' Directives would ensure the safety of employees and the public when applying euthanasia chemicals.

All chemicals used by WS would be securely stored and properly monitored to ensure the safety of the public. After using euthanasia chemicals, WS' employees would dispose of carcasses in accordance with WS Directive 2.515. Based on the use patterns the methods and those reasons listed above, the risks to human health and safety are extremely low. Through programmatic risk assessments, WS has determined the disposal of carcasses when conducting wildlife damage management activities pose a low risk to the environment and to human health and safety (USDA 2023*b*).

- *Carbon Dioxide*

Risks to human health and safety associated with the use of carbon dioxide would primarily occur to the applicator. The carbon dioxide released into the sealed chamber would diffuse into the atmosphere once WS' personnel opened the chamber to dispose of the animal. The use of carbon dioxide for euthanasia would occur in ventilated areas where exposure of the applicator or the public to large concentrations of released carbon dioxide would not occur. Therefore, risks to human safety from the use of carbon dioxide are extremely low.

- *Toxicants*

There are currently no toxicants registered for use to manage nonnative reptiles and amphibians in Florida. WS would not use any toxicants in Florida to manage nonnative reptile and amphibians unless they were approved for use by the EPA pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act and approved for use in Florida by the Florida Department of Agriculture and Consumer Services. If approved for use, WS' personnel would follow the label requirements to minimize risks to human health and safety, including using the required personal protective equipment. WS anticipates using zinc phosphide and acetaminophen infrequently to manage damage caused by nonnative reptile species in Florida. WS has completed a human health and ecological risk assessment for WS' use of zinc phosphide, including the use of zinc phosphide to manage damage. The use pattern, application rates, and the locations where WS could use zinc phosphide reduces the risk to the public (USDA 2020*a*).

- *Cervical Dislocation*

Risks associated with the use of cervical dislocation would primarily occur to the person handling the animal and primarily from the animal scratching or biting the handler. In general, WS' personnel would perform cervical dislocation outside of public view, which would minimize risks to the public. WS would dispose of carcasses euthanized in accordance with WS Directive 2.515.

- *Egg Destruction*

Egg destruction would involve breaking an egg, shaking an egg, or soaking an egg of a target species (*e.g.*, green iguanas) in water for 24 hours. Risks to human health and safety associated with egg destruction would be minimal (USDA 2022*c*).

Alternative 2 - WS would continue the current integrated methods approach to managing damage caused by target species in Florida using only nonlethal methods

Implementation of this alternative would require WS to only recommend and use nonlethal methods to manage and prevent damage caused by target species. WS would provide technical assistance and direct operational assistance under this alternative recommending and using only those nonlethal methods described in Section I of Appendix B.

DIRECT, INDIRECT, AND CUMULATIVE EFFECTS ANALYSIS OF METHODS ON HUMAN HEALTH AND SAFETY

Similar to Alternative 1, WS' personnel would assess the damage or threat occurring, would evaluate the management methods available, and would formulate a management strategy to alleviate damage or reduce the risk of damage using only nonlethal methods. A WS' employee would formulate a management strategy by selecting from those nonlethal methods described in Section I of Appendix B that the employee determines to be practical for use. WS' employees who conduct activities to alleviate nonnative reptile and amphibian damage would be knowledgeable in the use of methods, the wildlife species responsible for causing damage or threats, and WS' directives. WS' personnel would incorporate that knowledge into the decision-making process inherent with the WS' Decision Model, which they would apply when addressing threats and damage caused by target species. Therefore, when evaluating management methods and formulating a management strategy for each request for assistance, WS' employees would consider risks to human health and safety associated with methods.

Risks to human health and safety associated with available methods

Section I in Appendix B discusses several nonlethal methods that would be available for use by WS. The risks to human health and safety associated with WS providing technical assistance during the implementation of Alternative 2 would be similar to those risks to human health and safety discussed for Alternative 3. Therefore, to reduce redundancy, the effects associated with WS providing technical assistance that would occur if WS implements Alternative 2 occur in the discussion for Alternative 3.

No adverse effects to human safety have occurred from WS' use of nonlethal methods to alleviate nonnative reptile and amphibian damage in the state from FY 2015 through FY 2022. The risks to human safety from the use of nonlethal methods, when used appropriately and by trained personnel, would be low (USDA 2019*b*, USDA 2019*c*, USDA 2019*d*, USDA 2020*b*, USDA 2021, USDA 2023*a*, USDA 2023*c*). Therefore, WS does not expect any direct, indirect, or cumulative effects to occur from WS' use of those nonlethal methods described in Appendix B. Based on the use patterns of methods available to address damage caused by target animals and for those reasons discussed for Alternative 1, the use of

nonlethal methods would comply with Executive Order 12898, Executive Order 13045, and Executive Order 13985.

- *Human Presence*

As discussed previously, human presence may consist of physical actions of people or the presence of people and/or a vehicle. If WS implements Alternative 1, WS' activities would comply with relevant laws, regulations, policies, orders, and procedures. WS' personnel would follow the safety and health guidelines required by WS' directives (*e.g.*, see WS Directive 2.605, WS Directive 2.615, WS Directive 2.620, WS Directive 2.625, WS Directive 2.627, WS Directive 2.630, WS Directive 2.635). Therefore, the physical actions of WS' employees, including the presence of employees and vehicles, would not pose threat to human health and safety.

- *Modifying Cultural Practices*

The recommendation by WS that a property owner or manager modify cultural practices to reduce damage or threats of damage caused by target species would not increase risks to human safety above those risks already inherent with a property owner or manager conducting similar activities on their property.

- *Limited Habitat Modification*

The recommendation by WS that a property owner or manager use habitat manipulation methods to reduce damage or threats of damage caused by target species would not increase risks to human safety above those risks already inherent with a property owner or manager conducting similar work on their property. Recommendations to use habitat manipulation methods on property owned or managed by a cooperator to reduce localized target species populations that could then reduce target species damage or threats would not increase risks to human safety. Although accidents do occur when using certain equipment required to perform habitat manipulation (*e.g.*, the use of tractors, chainsaws, or other specialized equipment), the recommendation of using habitat manipulation methods to reduce localized target species populations would not increase those risks.

- *Exclusion Devices*

Exclusion methods would prevent animals from accessing a resource. Based on their use profile for alleviating damage associated with nonnative reptile and amphibian species, WS considers risks to human safety associated with exclusion methods to be low. Similarly, the use of drift fences would pose minimal risks to human health and safety.

- *Auditory deterrents*

Auditory deterrents that WS could use and/or recommend would include electronic hazing devices, pyrotechnics, and propane cannons. Risks to human health and safety would primarily occur from the noise produced by those methods, such as hearing loss from repeated and/or prolonged exposure to the noise produced by those methods. Other risks could include fire risks and bodily harm associated with the use of pyrotechnics and propane cannons. Although hazards to human safety from the use of auditory deterrents do occur, those methods are generally safe when used by trained individuals who have experience in their use. For example, although some risk of fire and bodily harm exists from the use of pyrotechnics, when used appropriately and in consideration of those risks, WS' personnel can use those methods with a high degree of safety. WS' employees would adhere to safety requirements and use appropriate personal protective equipment pursuant to WS Directive 2.605. WS' personnel who use

pyrotechnics would follow the guidelines for using pyrotechnics in accordance with WS Directive 2.627. Through programmatic risk assessments, WS has determined the use of pyrotechnics to manage wildlife damage pose a low risk to human health and safety (USDA 2023*c*).

- *Visual Deterrents*

Visual deterrents that WS' personnel could use and/or recommend would include electronic guards, effigies, lasers, and lights. Lasers and lights would pose minimal risks to the public because application occurs directly to target species by trained personnel, which limits the exposure of the public to misuse of the method. Similarly, the use of electronic guards and effigies would not pose risks to human safety.

- *Trained Dogs*

WS could use and/or recommend the use of trained dogs to locate target animals, such as feral swine, boa constrictors, and reticulated pythons, in areas where they are causing damage or posing a threat of damage. WS would only use trained dogs that are responsive to their handler, which would minimize risks to the public.

- *Hand Capture, Noose Poles, Nets, Traps, Drift Fences, and Glue Boards*

Live-capture methods that would be available for WS' personnel to use and/or recommend would include hand capture, noose poles, hand nets, throw nets, drop nets, net guns, cannon/rocket nets, cage-type traps, funnel traps, foothold traps, hoop traps, drift fences, basking traps, pitfall traps, and glue boards. Live-capture methods are typically used in situations where human activity would be minimal to ensure public safety. Traps rarely cause serious injury because live-capture traps available for target species are typically walk-in style traps where target species enter but are unable to exit or require a target species to trigger the trap. Therefore, human safety concerns associated with live traps used to capture target species require direct contact to cause bodily harm. If left undisturbed, risks to human safety would be minimal. Cannon/rocket nets pose minor safety hazards to the public because activation of the device occurs by trained personnel that are present on site and personnel would only activate the method after they observe target species in the capture area of the net. Personnel employing cannon/rocket nets are present at the site during application to ensure the safety of the public and operators. Similarly, WS personnel would be present when using fishing hooks to capture crocodilians.

Although some fire and explosive hazards exist with cannon/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. WS would not use cannon/rocket nets in areas where public activity was high, which further reduces the risks to the public. WS would use nets in areas with restricted public access whenever possible to reduce risks to human safety. WS' personnel employing hand nets, throw nets, drop nets, cannon/rocket nets, and net guns would also be present at the site during application to ensure the safety of the public. Through programmatic risk assessments, WS has determined the use of foothold traps (USDA 2019*d*), cage traps (USDA 2019*c*), cable devices (USDA 2019*b*), and nets (USDA 2020*b*) to manage wildlife damage pose minimal risks to the human health and safety.

- *Fishing Hooks*

Human safety concerns associated with the use of baited fishing hooks used to capture nonnative crocodilians require direct contact to cause bodily harm. Baited fishing hooks that are set for nonnative crocodilians to ingest would typically be used in situations where human activity would be minimal to

ensure public safety. These types of hooks would also be deployed directly over water, further minimizing the chance of direct human contact.

The use of snagging hooks would also occur in areas away from the public. Therefore, any risks from the use of snagging hooks would primarily occur to WS' personnel directly involved with nonnative crocodilians removal operations. WS' personnel would appropriate personal protective equipment when using snagging hooks to minimize risks. Therefore, risks to human health and safety associated with fishing hooks would be minimal.

- *Cover Boards and Polyvinylchloride Pipe Refugia*

WS' use of cover boards and polyvinylchloride pipe refugia would pose minimal risks to human health and safety based on their use patterns. Those methods provide refuge for target animals, which allows WS' personnel to hand capture the animals.

- *Immobilizing Drugs*

WS could administer chemicals (*e.g.*, Telazol, Ketamine, or a mixture of Ketamine and Xylazine) to immobilize reptiles in certain instances (*e.g.*, affixing a radio and/or GPS transmitter on an animal). For WS' personnel to administer immobilization drugs to a target animal, the animal would first need to be captured using live-capture methods (*e.g.*, cage trap). All WS' personnel who handle and administer immobilization drugs would be properly trained in the use of those methods. WS' employees would follow approved procedures outlined in WS' Immobilization and Euthanasia Manual (see WS Directive 2.430). Training and adherence to agency directives would ensure the safety of employees applying immobilization drugs. Immobilizing drugs used by WS would be securely stored and properly monitored to ensure the safety of the public. WS anticipates using immobilizing drugs infrequently and only in limited situations. WS Directive 2.430 outlines WS' acquisition, storage, and use of immobilizing drugs. Based on the use patterns of immobilizing drugs and WS adherence to WS Directive 2.430, risks to human health and safety would be low.

- *Radio Telemetry*

After using live capture methods to capture target species and using immobilization chemicals to sedate target species, WS could attach radio and/or GPS transmitters to those target animals before releasing the animal at the site of capture. The use of scout animals would not pose a risk to the public. WS' personnel would wear gloves and other personal protective equipment to minimize the risks associated with handling target animals while attaching transmitters. Therefore, the use of scout animals would not pose a risk to human health and safety.

Alternative 3 - WS would recommend an integrated methods approach to managing damage caused by target species in Florida through technical assistance only

If WS implements this alternative, WS' personnel would only provide recommendations on methods the requester could use to alleviate damage themselves with no direct involvement by WS. On occasion, WS' personnel could demonstrate the use of methods, but WS' personnel would not conduct any direct operational activities to manage damage caused by nonnative reptile and amphibian species. WS' personnel would only recommend for use those methods that were legally available to the requester for use. If WS implements this alternative approach, the only methods that would have limited availability for use by the public would be immobilizing drugs, euthanasia chemicals, toxicants (if registered), and the use of trained dogs. Immobilizing drugs, euthanasia chemicals, toxicants, and trained dogs would

generally not be available for use by the public but other professionals could use those methods or people could use other methods to achieve the same results.

If WS implements this alternative approach, those people that request assistance from WS could conduct activities and use methods recommended by WS' personnel, they could implement other methods, they could seek further assistance from other entities, or they could take no further action. Therefore, the requester and/or other entities would be responsible for using those methods available, including methods recommended by WS. The skill and knowledge of the person applying methods would determine the safety and efficacy of the methods the person was using. If people receiving technical assistance use methods according to recommendations and as demonstrated by WS, the potential risks to human safety would be similar to those risks if WS' personnel were using those methods. If people implement methods inappropriately, without regard for human safety, and/or use methods not recommended by WS, risks to human health and safety could be higher than those risks associated with the implementation of Alternative 1 and Alternative 2. The extent of the increased risk would be unknown and variable. However, methods inherently pose minimal risks to human safety given the design and the extent of the use of those methods.

Alternative 4 - WS would not provide any assistance with managing damage caused by target species in Florida

Under this alternative, WS would not be involved with any aspect of managing damage associated with nonnative reptiles and amphibians in the state, including technical assistance. Due to the lack of involvement in managing damage caused by target animal species, no impacts to human safety would occur directly from WS. This alternative would not prevent those entities experiencing threats or damage from conducting damage management activities in the absence of WS' assistance. The direct burden of implementing permitted methods would be placed on those people experiencing damage or would require those people to seek assistance from other entities.

Similar to the technical assistance only alternative (Alternative 3), immobilizing drugs, euthanasia chemicals, toxicants, and the use of trained dogs would have limited availability under this alternative to the public. Because most methods available to resolve or prevent damage or threats would be available to anyone, the threats to human safety from the use of those methods would be similar between the alternative approaches. However, methods employed by those persons not experienced in the use of methods or were not trained in their proper use, could increase threats to human safety. Overall, the methods available to the public, when applied correctly and appropriately, would pose minimal risks to human safety.

3.1.4 Issue 4 - Humaneness and Animal Welfare Concerns of Methods

As discussed previously, a common issue often raised is concerns about the humaneness and animal welfare concerns of methods available under the alternative approaches for resolving damage and threats. 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 people interpret 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.*" The American Veterinary Medical Association (AVMA) has previously described suffering as a "…*highly unpleasant emotional response usually associated with pain and distress*" (AVMA 1987). However, suffering "…*can occur without pain*…," and "…*pain can occur without suffering*…" (AVMA 1987). Because suffering carries with it the implication of occurring over time, 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 people do not take action 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. However, pain experienced by individual animals probably ranges from little or no pain to considerable pain (California Department of Fish and Game 1991). Research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness (Bateson 1991, Sharp and Saunders 2008, Sharp and Saunders 2011). Therefore, the challenge in coping with this issue is how to achieve the least amount of animal suffering.

The AVMA has previously stated "*...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 the use of AVMA accepted methods of euthanasia when killing all animals, including wild animals. However, the AVMA has previously stated, "*For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but terms such as killing, collecting, or harvesting, recognizing that a distress-free death may not be possible*" (Beaver et al. 2001). The AVMA (2020) has also stated, "*that the quickest and most humane means of terminating the life of free-ranging wildlife in a given situation may not always meet all criteria established for euthanasia…*".

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. 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 nonlethal 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. In addition, some people and groups of people have stereotyped methods as "*humane*" or "*inhumane*". However, many "*humane*" methods can be inhumane if not used appropriately. For example, many members of the public would generally consider a cage trap as "*humane*" because the animal would be alive and generally unharmed. Yet, not attending to an animal captured alive in a cage trap appropriately and in a timely manner could lead to conditions that many people could consider as "*inhumane*".

Given 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, the challenge for agencies is to conduct activities and employing methods that people perceive to be humane while assisting those persons requesting assistance to manage damage and threats associated with wildlife. Discussion of method humaneness and animal welfare concerns for those methods available under the alternative approaches occurs below.

Alternative 1 - WS would continue the current integrated methods approach to managing damage caused by target species in Florida (Proposed Action/No Action)

If WS implements Alternative 1, WS' personnel would formulate management strategies for each request for assistance by conducting a local problem analysis (see WS Directive 2.201). Methods that the employee determines to be practical for use would be the basis for each management strategy. When conducting a local problem analysis, WS' employees would consider many factors essential to formulating each management strategy, including method humaneness and concerns for the welfare of animals. The goal of WS would be to use methods as humanely as possible to resolve requests for

assistance. WS would continue to evaluate methods and activities to minimize the pain and suffering of methods addressed when attempting to resolve requests for assistance.

When formulating a management strategy using the WS Decision Model, WS' personnel would give preference to the use of nonlethal methods, when practical and effective, pursuant to WS Directive 2.101. Although some issues of humaneness could occur from the use of nonlethal methods, when used appropriately and attended to by trained personnel, those methods would not result in the inhumane treatment of target species. The nonlethal methods of primary concern would be the use of methods that capture and restrain a target animal or animals alive, such as cage traps. Concerns from the use of nonlethal methods would be from injuries and stress to the animals while restrained or during the application of the method. Although stress could occur to animals while restrained, timely attention to live-captured animals would alleviate suffering. In addition, stress experienced by animals would likely be temporary because WS' personnel would check methods in accordance with the laws and regulations in Florida to address those animals live-captured in a timely manner.

WS could employ lethal methods to alleviate or prevent damage and threats, when requested. Section II in Appendix B discusses the lethal methods that WS could use to manage damage in Florida. WS' Directive 2.505 provides guidance to WS' personnel when they use lethal methods. WS' personnel would exhibit a high level of respect and professionalism when conducting activities that result in the lethal removal of animals. WS' personnel would be familiar with the methods described in current AVMA guidelines for euthanasia (see WS Directive 2.505). WS' personnel would be professional in their use of management methods (see WS Directive 1.301).

Research and development by WS have improved the selectivity and humaneness of management techniques. Research is continuing to bring new findings and products into practical use (*e.g.*, see Lovallo et al. 2021). Until new findings and products were found practical, a certain amount of animal suffering could occur when some methods were used in situations where nonlethal damage management methods were not practical or effective. As stated previously, research suggests that some methods, such as restraint in foothold traps or changes in the blood chemistry of trapped animals, indicate "*stress*" (Kreeger et al. 1990). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness (Bateson 1991, Sharp and Saunders 2008, Sharp and Saunders 2011). Therefore, the goal would be to address requests for assistance effectively using methods in the most humane way possible that minimizes the stress and pain to the animal.

Alternative 2 - WS would continue the current integrated methods approach to managing damage caused by target species in Florida using only nonlethal methods

If WS implemented this alternative, WS would only use nonlethal methods, which most people would generally regard as humane. WS would use nonlethal methods to live capture, exclude, or disperse target species. The humaneness and animal welfare concerns of nonlethal methods would be identical to those described for Alternative 1 because those same nonlethal methods would be available for use if WS implemented this alternative. Although some issues of humaneness and animal welfare concerns could occur from the use of nonlethal methods, those methods, when used appropriately and by trained personnel, would not result in the inhumane treatment of target species.

Alternative 3 - WS would recommend an integrated methods approach to managing damage caused by target species in Florida through technical assistance only

If WS implemented this alternative, the issue of method humaneness and animal welfare concerns would be similar to the humaneness and animal welfare concerns discussed for Alternative 1 because many of

the same methods would be available for people to use. WS would not directly be involved with damage management activities if WS implemented Alternative 3. However, the entity receiving technical assistance from WS could employ those methods that WS recommends. Therefore, by recommending methods and, thus, a requester employing those methods, the issue of humaneness and animal welfare concerns would be similar to Alternative 1.

WS would instruct and demonstrate the proper use of methodologies to increase their effectiveness and to ensure people have the opportunity to use methods to minimize pain and suffering. However, the skill and knowledge of the person applying methods would determine the humane use of the methods the person was using despite WS' demonstration. Therefore, a lack of understanding of the behavior of animals or improperly identifying the damage caused by animals along with inadequate knowledge and skill in using methodologies to resolve the damage or threat could lead to incidents with a greater probability of people perceiving those activities as inhumane. In those situations, people are likely to regard the pain and suffering to be greater than discussed for Alternative 1.

Those persons requesting assistance would be directly responsible for the use and placement of methods and if monitoring or checking of those methods does not occur in a timely manner, captured wildlife could experience suffering and if not addressed timely, could experience distress. The amount of time an animal is restrained under the proposed action would be shorter compared to a technical assistance alternative if those requesters implementing methods are not as diligent or timely in checking methods. It is difficult to evaluate the behavior of individual people. In addition, it is difficult to evaluate how those people will react under given circumstances. Therefore, this alternative can only evaluate the availability of WS' assistance because determining human behavior can be difficult. If those persons seeking assistance from WS apply methods recommended by WS through technical assistance as intended and as described by WS, then those people could apply those methods humanely to minimize pain and distress. If those persons provided technical assistance by WS apply methods not recommended by WS or do not employ methods as intended or without regard for humaneness or animal welfare concerns, then the issue of method humaneness and animal welfare concerns would be of greater concern because the pain and distress of target species would likely be higher.

Alternative 4 – WS would not provide any assistance with managing damage caused by target species in Florida

WS would not provide any assistance with managing damage caused by nonnative reptiles and amphibians in Florida if WS implemented Alternative 4. Those people experiencing damage or threats associated with target species could continue to use those methods legally available. Those persons who consider methods inhumane would likely consider those methods inhumane under any alternative because people often label methods inhumane no matter the entity employing those methods. A lack of understanding regarding the behavior of target species or methods used could lead to an increase in situations perceived as being inhumane to wildlife despite the method used. Despite the lack of involvement by WS under this alternative, those methods perceived as inhumane by certain individuals and groups would still be available to the public to use to resolve damage and threats caused by target species.

3.2 ISSUES NOT CONSIDERED FOR COMPARATIVE ANALYSIS

WS identified additional issues during the scoping process of this EA. WS considered those additional issues but a detailed analysis does not occur in Chapter 3. Discussion of those additional issues and the reasons for not analyzing those issues in detail occur below.

3.2.1 Effects of Activities on Soils, Water, and Air Quality

The implementation of those alternative approaches discussed in Section 2.4.1 by WS would meet the requirements of applicable federal laws, regulations, and Executive Orders for the protection of the environment, including the Clean Air Act. The actions described in Section 2.4.1 do not involve major ground disturbance, construction, or habitat alteration. Activities that WS could conduct during implementation of those alternative approaches discussed in Section 2.4.1 would not cause changes in the flow, quantity, or storage of water resources. The use and storage of methods by WS' personnel would also follow WS' directives, including WS Directive 2.210, WS Directive 2.430, WS Directive 2.465, WS Directive 2.605, WS Directive 2.615, WS Directive 2.625, and WS Directive 2.627. Through programmatic risk assessments, WS has determined the use of cage traps (USDA 2019*c*), cable devices (USDA 2019*b*), foothold traps (USDA 2019*d*), nets (USDA 2020*b*), zinc phosphide (USDA 2020*a*), firearms (USDA 2019*e*), lead (USDA 2022*a*), dog use (USDA 2021), egg addling (USDA 2022*c*), quick-kill traps (USDA 2022*b*), explosives (USDA 2023*c*), hand capture (USDA 2023*a*), and carcass disposal (USDA 2023*b*) to manage wildlife damage pose minimal risks to the environment.

Most methods available for use to manage damage caused by target species are mechanical methods. Mechanical methods would not cause contaminants to enter water bodies or result in bioaccumulation. For example, firearms are mechanical methods that WS could use to remove target species lethally and to reinforce the noise associated with nonlethal methods, such as pyrotechnics. Firearms would not enter bodies of water and would be securely stored off-site after each use; therefore, the firearm itself would not contaminate water or result in the bioaccumulation of chemicals or other hazardous materials.

There is often concern about the deposition of lead into the environment from ammunition used in firearms used to lethally remove target species. The lethal removal of those target species addressed in this EA by WS using firearms occurs primarily from the use of rifles and handguns. However, the use of shotguns could be employed to lethally remove some species. To reduce risks to human safety and property damage from bullets passing through an individual of a target species, the use of rifles would be applied in such a way (*e.g.*, caliber, bullet weight, distance) to reduce the likelihood of the bullet passing through the target species. Target species that were removed using a firearm would often occur within areas where retrieval of all carcasses for proper disposal would be highly likely (*e.g.*, at an airport). WS' personnel would retrieve the carcasses of target species to the extent possible and would dispose of the carcasses in accordance with WS Directive 2.515. With risks of lead exposure occurring primarily from ingestion of bullet fragments and lead shot, the retrieval and proper disposal of carcasses would greatly reduce the risk of scavengers ingesting lead contained within the carcass.

However, deposition of lead into soil could occur if, during the use of a firearm, the projectile passed through an individual of a target species, if misses occurred, or if WS' personnel were not able to retrieve the carcass. 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 generally stays within the top 20 centimeters (about 8 inches). In addition, concerns occur that lead from bullets deposited in soil from shooting activities could lead to contamination of ground water or surface water. Stansley et al. (1992) studied lead levels in water that had 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. Stansley et al. (1992) believed the lead contamination near the parking lot was due to runoff from the lot, and not from the shooting range areas. The study also indicated that even when lead shot was highly accumulated in areas with permanent water bodies present, the lead did not necessarily cause elevated lead levels in 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, which reduces the transport of lead across the landscape and naturally serves to reduce the potential for ground or surface water contamination (Craig et al. 1999). Those studies suggest that, given the very low amount of lead deposited and the concentrations that would occur from WS' activities to reduce target species damage using firearms, as well as most other forms of hunting in general, lead contamination from such sources would be minimal to nonexistent (USDA 2022*a*).

Because the take of target species could occur by other entities, WS' assistance with removing target species would not be additive to the environmental status quo. WS' assistance would not be additive to the environmental status quo because those target species removed by WS using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of WS' involvement. WS' involvement in activities may result in lower amounts of lead being deposited into the environment due to efforts by WS to ensure projectiles do not pass through, but are contained within the carcass, which would limit 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 WS' personnel lethally remove a target species humanely in situations that ensure accuracy and that misses occur infrequently, which would further reduce the potential for WS' activities to deposit lead in the soil.

In addition, WS' involvement in activities would ensure WS' personnel made efforts to retrieve carcasses lethally removed using firearms to prevent the ingestion of lead in carcasses by scavengers. WS' involvement would also ensure carcasses were disposed of properly to limit the availability of lead. Based on current information, the risks associated with lead ammunition that WS' activities could deposit into the environment due to misses, the bullet passing through the carcass, or from carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination. WS would not use lead ammunition at a magnitude that activities would deposit a large amount of spent bullets or shot in such a limited area that would result in large accumulations of lead in the soil. WS may utilize non-toxic ammunition in rifles and handguns as the technology improves and ammunition becomes more effective and available.

Consequently, WS does not expect that implementing any of the alternative approaches discussed in Section 2.4.1 would significantly change the environmental status quo with respect to soils, geology, minerals, water quality, water quantity, floodplains, wetlands, other aquatic resources, air quality, prime and unique farmlands, timber, and range. WS has received no reports or documented any effects associated with soil, water, or air quality from previous activities associated with managing damage caused by target species in the state that WS conducted. Therefore, the EA will not analyze those elements further.

3.2.2 Greenhouse Gas Emissions by WS

The ten warmest years on record have occurred since 2010 and 2022 was the sixth warmest year on record based on National Oceanic and Atmospheric Administration data (Lindsey and Dahlman 2023). Increases in global climate temperature pose substantial challenges for ecosystems, human and

animal health and safety, food and water supplies, emergency response, invasive species management, facilities and infrastructure and other facets of the human environment (Hauser et al. 2009, Blunden and Arndt 2020, Blunden and Boyer 2022). Observed increases in global average surface temperature are often attributable to human-caused increases in greenhouse gas concentrations and other human-caused factors (Intergovernmental Panel on Climate Change 2022). Greenhouse gases are components of the atmosphere that trap heat relatively near the surface of the earth, and therefore contribute to the greenhouse effect and global warming. Most greenhouse gases occur naturally in the atmosphere but increases in their concentration can result from human activities such as the burning of fossil fuels. Global temperatures are likely to continue rising as human activities continue to add carbon dioxide, methane, nitrous oxide, and other greenhouse (heat-trapping) gases to the atmosphere.

The Intergovernmental Panel on Climate Change (2022) report states that climate change impacts are strongest and most comprehensive for natural systems, causing changes in precipitation levels, timing, and extremity; water quality, quantity, and timing; seasonal timing of life cycle activities, migration patterns, geographic ranges abundance, and interactions of terrestrial, aquatic, and marine species; ocean acidification; temperature extremes; and increases in high sea levels. Continued emissions of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive, and irreversible impacts for people and ecosystems.

During evaluations of the national program to manage feral swine (*Sus scrofa*), the WS program reviewed greenhouse gas emissions for the entire national WS program (see pages 266 and 267 in USDA 2015). The analysis estimated effects of vehicle, aircraft, office, and all-terrain vehicle use by WS nationwide for FY 2013 and included the potential new vehicle purchases that could be associated with a national program to manage damaged caused by feral swine. The review concluded that the range of Carbon Dioxide Equivalents (includes CO_2, NO_x CO, and SO_x) for the entire national WS program would be between 10,350 and 12,254 metric tons or less per year (see pages 266 and 267 in USDA 2015), which was below the reference point of 25,000 metric tons per year recommended by Council on Environmental Quality at that time for actions requiring detailed review of impacts on greenhouse gas emissions. In Florida, activities to manage nonnative reptile and amphibian damage could include working in an office, travel from office to field locations, travel at field locations (vehicles or all-terrain vehicles), and from other work-related travel (*e.g.*, attending meetings). Activities to manage damage caused by nonnative reptiles and amphibians in Florida by WS would be responsible for only a small percentage of the greenhouse gas emissions of the national WS program.

Agencies have a responsibility to work to reduce greenhouse gas contributions even if their overall emissions are low relative to other sources. WS' facilities and vehicles in Florida are managed and acquired through the General Services Administration and are part of the General Services Administration Climate Action and Sustainability Initiatives (General Services Administration 2023). Through participation in these initiatives, WS anticipates that the overall contribution of WS' activities to greenhouse gas emissions will decrease with time.

There is insufficient data to make quantitative comparisons amongst the alternative approaches in Carbon Dioxide Equivalents generated because decreases in trips to implement one type of method (*e.g.*, lethal methods) are likely to be replaced with trips to implement other types of methods or replaced with trips by entities that can manage damage without any involvement by WS. Additionally, the choice of methods used and the associated impact on Carbon Dioxide Equivalents, as reflected in vehicle trips to implement and monitor the methods, is highly dependent upon site-specific circumstances that are also difficult to predict. Given the variability and the likelihood that shifts in vehicle use by WS would likely result in compensatory shifts in activities by other entities, the differences amongst the alternative approaches are likely to be low or difficult to detect. Therefore, WS has concluded that detailed comparative analysis of this issue amongst the alternative approaches would not provide substantive

information to guide a selection amongst the alternative approaches. Consequently, WS did not advance this issue for detailed analysis amongst the alternative approaches in Section 3.1.

3.2.3 WS' Actions Would Result in Irreversible and Irretrievable Commitments of Resources

Other than relatively minor uses of fuels for vehicles, electricity for office operations, euthanasia chemicals, immobilizing drugs, carbon dioxide for euthanasia, and some components associated with ammunition (*e.g*., black powder, shot) and pyrotechnics (*e.g*., black powder, cardboard), no irreversible or irretrievable commitments of resources result from WS' activities.

3.2.4 Impacts on Cultural, Archaeological, Historic, and Tribal Resources and Unique Characteristics of Geographic Areas

Several different types of federal and state lands occur within the analysis area, such as national wildlife refuges, national forests, and wildlife management areas. WS recognizes that some persons interested in those areas may feel that any activities that could occur in those areas would adversely affect the esthetic value and natural qualities of the area. Similarly, WS' activities could occur within areas with cultural, archaeological, historic, and/or tribal resources. WS would only provide direct operational assistance if WS implements Alternative 1 or Alternative 2 (see Section 2.4.1). WS would provide no assistance with managing damage caused by target species if WS implements Alternative 4 and WS would only provide technical assistance if WS implements Alternative 3.

If WS implements Alternative 1 or Alternative 2, the methods that WS could employ would not cause major ground disturbance and would not cause any physical destruction or damage to property. In addition, the methods available would not cause any alterations of property, wildlife habitat, or landscapes, and would not involve the sale, lease, or transfer of ownership of any property. In general, implementation of Alternative 1 or Alternative 2 would not have the potential to introduce visual, atmospheric, or audible elements to areas that could result in effects on the character or use of properties. Therefore, if WS implemented Alternative 1 or Alternative 2, the methods would not have the potential to affect the unique characteristics of geographic areas or any cultural, archeological, historic, and tribal resources. If WS implements Alternative 1 or Alternative 2 and WS planned an individual activity with the potential to affect historic resources, WS and/or the entity requesting assistance would conduct the site-specific consultation, as required by Section 106 of the National Historic Preservation Act, as necessary.

Conducting activities at or near historic or cultural sites for the purposes of alleviating damage caused by target species would have the potential for audible effects on the use and enjoyment of the historic property. For example, WS could use firearms to remove nonnative reptiles and amphibians. However, WS would only use such methods at a historic site after the property owner or manager signed a work initiation document or a similar document allowing WS to conduct activities on their property. A built-in minimization factor for this issue is that nearly all the methods involved would only have temporary effects on the audible nature of a site and could be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects.

In addition, WS would only conduct activities on tribal lands at the request of the Tribe and only after signing appropriate authorizing documents. Therefore, the Tribe would determine what activities they would allow and when WS' assistance was required. Because Tribal officials would be responsible for requesting assistance and determining what methods would be available to alleviate damage, no conflict with traditional cultural properties or beliefs would likely occur. WS would also adhere to the Native American Graves Protection and Repatriation Act. If WS' personnel located Native American cultural

items while conducting activities on federal or tribal lands, WS would notify the property manager and would discontinue work at the site until authorized by the managing entity.

WS would abide by federal and state laws, regulations, work plans, Memorandums of Understanding, and policies to minimize any effects and would abide by any restrictions imposed by the land management agency on activities conducted by WS. The implementation of those alternative approaches discussed in Section 2.4.1 by WS would meet the requirements of applicable federal laws, regulations, and Executive Orders for the protection of the unique characteristics of geographic areas or any cultural, archeological, historic, and tribal resources.

3.3 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Based on the best available information, the analyses in Section 3.1.1 and the information discussed in Appendix E indicate the direct, indirect, and cumulative effects on populations of target species associated with implementing Alternative 1 would be of low magnitude. The cumulative lethal removal of target species from all known sources of mortality would not reach a threshold that would cause a decline in their respective populations. The implementation of Alternative 2, Alternative 3, or Alternative 4 would likely have similar effects on target species populations to implementing Alternative 1 because the same or similar activities would occur by other entities. As discussed in Section 1.7.2, unless specifically provided in the Florida Administrative Code, people can take all species of freshwater aquatic life and animal life not native to Florida throughout the year without restrictions.

If WS implemented Alternative 1, those methods that WS could use to alleviate damage would essentially be selective for target species because WS' personnel would consider the methods available and their potential to disperse, capture, or kill nontarget animals based on the use pattern of the method. WS' personnel would have experience with managing animal damage and would receive training in the use of methods, which would allow WS' employees to use the WS Decision Model to select the most appropriate methods to address damage caused by target species and to reduce the risks to nontarget animals. From FY 2015 through FY 2022, no lethal removal of nontarget animals occurred by WS in Florida during prior activities to manage damage caused by target species.

If WS implemented Alternative 3, the knowledge and skill of those persons implementing recommended methods would determine the potential for impacts to occur. If those persons experiencing damage do not implement methods or techniques correctly, the potential impacts from providing only technical assistance could be greater than Alternative 1. The incorrect implementation of methods or techniques recommended by WS could lead to an increase in nontarget animal removal when compared to the nontarget animal removal that could occur by WS under Alternative 1. Similarly, if WS implemented Alternative 4, the knowledge and skill of those persons implementing methods would determine the potential for impacts to occur. If those persons experiencing damage do not implement methods or techniques correctly, the potential impacts from implementing Alternative 4 could be greater than Alternative 1.

The risks to human health and safety from the use of available methods, when used appropriately and by trained personnel, would be low. No adverse effects to human safety have occurred from WS' use of methods to alleviate damage caused by target species in Florida from FY 2015 through FY 2022. Based on the use patterns of methods available to address damage caused by target species, implementation of Alternative 1 would comply with Executive Order 12898, Executive Order 13045, and Executive Order 13985. Other entities could conduct activities to manage damage caused by target species. If people implemented methods appropriately and in consideration of human safety, threats to human health and safety would be minimal. If people implemented methods inappropriately, without regard for human safety, and/or used illegal methods, risks to human health and safety would increase.

People experiencing damage or threats of damage associated with target species could use many of those methods discussed in Appendix B regardless of the alternative implemented by WS. Therefore, the issue of humaneness associated with methods would be similar across any of the alternative approaches because people could use those methods in the absence of WS' involvement. 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 alternative approaches. In addition, many "*humane*" methods can be inhumane if not used appropriately. For example, people may view a live trap a humane method because the trap captures an animal alive. Yet, without proper care, people can treat an animal captured in a live trap inhumanely if they do not attend to the animal appropriately.

CHAPTER 4: LIST OF PREPARERS, REVIEWERS, AND PERSONS CONSULTED

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APPENDIX A
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APPENDIX B
METHODS AVAILABLE TO MANAGE DAMAGE

WS is evaluating the use of an adaptive approach to managing damage associated with reptiles and amphibians, when requested, through the implementation and integration of safe and practical methods based on local problem analyses and the informed decisions of trained WS' personnel. WS' personnel would formulate integrated method approaches using the WS Decision Model (Slate et al. 1992; see WS Directive 2.201). An integrated approach to resolving requests for assistance using the Decision Model would allow WS' personnel greater flexibility and more opportunity to develop an effective damage management strategy for each request for assistance, such as considerations for threatened, endangered, or candidate species, that could be present in an area.

When selecting damage management techniques for specific damage situations, WS' personnel would consider the target species involved along with the magnitude, geographic extent, duration, frequency, and likelihood of further damage. WS' personnel would also consider the status of target and potential nontarget species, local environmental conditions and impacts, social and legal aspects, humaneness of methods, animal welfare concerns, 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. WS' personnel would evaluate those factors when formulating damage management strategies that incorporate the application of one or more techniques.

A variety of methods would potentially be available to WS relative to the management or reduction of damage from reptiles and amphibians. Various federal, state, and local statutes and regulations, and WS' directives would govern WS' use of damage management methods. WS would develop and recommend or implement strategies based on resource management, physical exclusion, and wildlife management approaches. Within each approach there may be available several specific methods or techniques. WS could recommend or use the following methods in Florida. Many of the methods described would also be available to other entities in the absence of any involvement by WS.

I. NONLETHAL METHODS

Nonlethal methods consist primarily of tools or devices used to disperse, exclude, or capture a particular animal or a local population to alleviate damage and conflicts. When evaluating management methods and formulating a management strategy, WS' personnel would give preference to nonlethal methods when they determine those methods to be practical and effective (see WS Directive 2.101). Researchers have suggested various methods of reducing property damage caused by invasive reptiles. Some of the suggested methods include the use of barriers, electric fencing, dogs, harassment, and live trapping of problem animals and juveniles (Engeman and Vice 2001, Engeman et al. 2005*b*, Kern 2009, Krysko et al. 2007). It has also been suggested that only a small proportion of a population can be live trapped; thus, making complete removal of invasive reptiles using this method impossible (Campbell 2005, Reed et al. 2011). Most of the nonlethal methods available to WS would also be available to other entities within the state and other entities could employ those methods to alleviate nonnative reptile and amphibian damage.

Human presence: Human presence may consist of physical actions of people, such as clapping, waving, or shouting, or the presence of people and/or a vehicle at a location where damage or threats of damage are occurring. For example, animals may associate a vehicle with previous hazing activities and approaching an area in that vehicle or a similar vehicle may disperse target species from an area. Similarly, making a person's presence known to target species by clapping, waving, or shouting can often disperse animals from an area. When animals begin to associate people with hazing and/or shooting activities, the presence of people can disperse those target species when they see people approach.

Human activities can also enhance the effectiveness of effigies, such as human effigies, because they associate people with hazing or shooting activities.

Modifying cultural practices: WS' personnel could make recommendations to people related to changing cultural methods. Recommendations could include modifying the behavior of people that may be attracting or contributing to the damage caused by reptile and amphibian species. For example, artificial feeding of animals by people can attract and sustain more animals in an area than could normally be supported by natural food supplies. Similarly, WS could recommend people feed pets indoors or remove pet food from outside that may be attracting animals. WS could recommend securing garbage cans to prevent animals from accessing them.

Limited habitat modification: In most cases, the resource or property owner would be responsible for implementing habitat modifications, and WS would only provide recommendations on the type of modifications that would provide the best chance of achieving the desired effect. People can manage habitat to make it less attractive to certain wildlife species. For example, WS' personnel could recommend limited habitat management in urban and suburban areas, such as at golf courses, residential homes, and business, where requesters can plant vegetation that is less palatable to a species. Limitations of habitat management as a method of reducing animal damage are determined by the characteristics of the species involved, the nature of the damage, economic feasibility, and other factors.

Exclusion: Exclusion pertains to preventing access to resources through fencing, netting, or other barriers. Fencing of small critical areas can sometimes prevent animals that cannot climb from entering areas of protected resources. Fencing installed with an underground skirt can prevent access to areas for many species that can dig. Areas such as airports, yards, or gardens may be fenced. Hardware cloth or other metal barriers can sometimes be used to prevent the entry of smaller target species into buildings through existing holes or gaps. In many cases, WS could recommend the use of exclusion, but the implementation of specific methods could be the responsibility of the property owner or manager.

Auditory Deterrents: The intent with the use of auditory dispersal methods, such as pyrotechnics, and propane cannons, is to illicit a flight response in target animals by producing a novel noise or producing an adverse noise. WS could use and/or recommend electronic guards to disperse and prevent damage caused by nonnative reptile and amphibian species. Electronic guards generally use a combination of stimuli (novel noise and light) to disperse animals. When operational, the device can automatically turn on to flash and omit sound for a few seconds at several minute intervals (*e.g.*, see USDA 2002).

WS could use and recommend pyrotechnics. The term "*pyrotechnic*" encompasses a number of commercially available devices that produce a loud noise after firing the device. People may refer to some of the common individual devices as "*bird bombs*", "*screamers*", "*bangers*", "*shell crackers*", or "*CAPA*". The most common pyrotechnics are pyrotechnics that people fire from a pyrotechnic launcher or from a shotgun. Those pyrotechnics fired from a launcher or from a shotgun travel approximately 200 to 300 feet downrange. Some types of pyrotechnics emit a loud whistle as they travel while some travel downrange and then explode with a bang. Pyrotechnics that whistle as they travel and those that explode with a bang after travelling downrange generally emit a 100-decibel report that can startle target animals. A long-range pyrotechnic that is commercially available can travel approximately 1,000 feet downrange and produce a 150-decibel report. Pyrotechnics are one of the primary methods that WS' personnel use to disperse animals.

Propane cannons are another auditory deterrent that WS could use. Propane cannons operate using propane gas and when fired, produce a noise similar to a firearm. The user attaches the cannon to a propane tank using a hose. Opening the valve on the propane tank releases propane gas into a bladder

system on the propane cannon, which begins to fill with propane gas. Once the bladder system fills, it releases the propane gas into the chamber of the cannon and simultaneously, a striking mechanism produces a spark that ignites the gas causing a loud explosion similar to the sound of a firearm firing. Propane cannons use a timing mechanism that people can adjust to vary how often the cannon fires. For example, propane cannons may be set to fire every five minutes. Some models are capable of being set to produce multiple blasts. For example, the user can set the propane cannon to produce a random series of single, double, or triple blasts. In addition, attachments to propane cannons can allow the user to control when the cannon operates during a 24-hour period. For example, the user may set the cannon to begin firing in the morning and then shut off in the evening. The user can also fit cannons with mechanisms that allow the cannon to rotate so that each firing occurs from a different direction.

Visual deterrents: Visual scaring techniques use visual stimuli that deter or scare target animals from an area, such as electronic guards (siren strobe-light devices), propane cannons, pyrotechnics, lasers, lights, scarecrows, human effigies, effigies of predators, and the noise associated with the discharge of a firearm. Unfortunately, many of these techniques are only effective for a short time before animals habituate to them (*e.g.*, see Belant et al. 1996). The success of frightening methods depends on an animal's fear of, and subsequent aversion to, offensive stimuli (Shivik and Martin 2001, Shivik et al. 2003, Mettler and Shivik 2007). A persistent effort is usually required to effectively apply frightening techniques and the techniques must be sufficiently varied to prolong their effectiveness. Over time, animals often habituate to commonly used scare tactics and ignore them (*e.g.*, see Conover 1982, Pfeifer and Goos 1982, Dolbeer et al. 1986, Bomford 1990, Shivik et al. 2003, Mitchell et al. 2004, Shivik 2006).

Trained dogs: WS' personnel could use specially trained dogs to locate target species (Coolahan 1990, Engeman and Vice 2001, Rowley and Rowley 1987), such as Burmese pythons or reticulated pythons. Researchers found that dog search teams had a higher success rate than human search teams and performed searches 2.5 times faster than human teams (Romagosa et al. 2011). Trained dogs would be used in limited situations to locate invasive reptiles identified as responsible for causing damage or posing threats. By locating invasive reptiles or areas where those reptiles frequent, appropriate damage management methods can be employed in those areas. Therefore, dogs will only be used to locate and track invasive reptiles in remote areas.

The dogs would receive training to follow the scent of a target species and to avoid following the scent of nontarget species. WS' personnel typically find the track of the target species in areas with recent damage or at a location where recent sightings of target animals have occurred. Personnel would then put their dogs on the tracks of the target animal or guide the dogs in an area until the dogs locate the scent of a target animal. Typically, if the scent is not too old, the dogs can follow the trail. Once a target animal is located, WS' personnel can capture the target animal or lethally remove the animal. Consideration will be given to the potential for dogs to disperse invasive reptiles from areas before employing tracking dogs.

Foothold traps: Foothold traps are mechanical devices designed to capture animals by gripping an animal's foot. A foothold trap consists of a pair of metal jaws, springs, a base to attach the springs and jaws, and a pan triggering mechanism. The springs hold the metal jaws of the trap closed while the pan triggering mechanism, when set, holds the jaws open until an animal steps on the pan, which allows the springs to close the jaws. WS can use foothold traps with rubber pads on the jaws or foothold traps with laminated jaws to reduce injury. WS places foothold traps beside, or in some situations, in travel ways that target species actively use. Placement of traps is contingent upon the habits of the respective target species, habitat conditions, and presence of nontarget animals. Effective trap placement and adjustment and the use and placement of appropriate baits and lures by trained WS' personnel also contribute to the selectivity of foothold traps. An additional advantage is that foothold traps can allow for the on-site

release of nontarget animals because foothold traps capture animals alive. The use of foothold traps requires more skill than some methods, but they are indispensable in resolving many damage problems.

Cage-type traps: Cage traps come in a variety of styles to live-capture animals. The most commonly known cage-type traps are box traps and corral traps. Box traps (*e.g.*, Sherman box traps) are usually rectangular and are made from various materials, including metal, wire mesh, plastic, and wood. These traps are well suited for use in residential areas and work best when baited with foods or lures attractive to the target animal. Traps are placed in areas where activity by the target species is high. When the target animal enters the cage trap to investigate, a pan or wire is triggered releasing the door and enclosing the animal inside the trap. Traps can also be designed with a one-way door, so target animals enter the trap to investigate an attractant, but once inside are unable to exit the trap. Traps can range in size from small to large, and longer multi-trigger cage traps. Cage traps for pythons and monitor lizards must be long enough to accommodate the larger bodies and long tails of these species. Traps can be used in combination with fencing. As many reptiles are considered ambush predators, baited traps may not be the best method for capturing these reptiles (Reed et al. 2011). Trap-drift fence combinations and multi-capture traps have been designed and tested for capturing pythons; however, they have limitations for capturing snakes and may not be effective capture methods (Avery et al. 2010, Reed et al. 2011).

Drop nets: Although not a commonly used method for reptiles or amphibians, WS could occasionally use drop nets to capture target species. Drop nets are nylon or cloth nets that would be suspended above an area actively used by an animal or group of animals where target individuals have been conditioned to feed (Ramsey 1968) or attracted to an area by a decoy animal. The area would be baited and once feeding occurs under the net, the net would be released. Drop nets require constant supervision by personnel to drop the net when target individuals are present and when animals are underneath the net. This method has limited use due to the time and effort required to condition animals to feed in a location and the required monitoring of the site to drop the net when target wildlife are present. Nets are used to live-capture target individuals and if any nontargets are present, they can be released on site unharmed. Drop nets allow for the capture of several animals during a single application. Injuries to animals can occur from the use of nets.

Cannon/rocket nets: Similar to drop nets, cannon/rocket nets use nylon or cloth nets to capture wildlife that have been conditioned to feed in a given area through baiting or attracted to an area by a decoy animal (Hawkins et al. 1968). When using cannon/rocket nets, the net is fully deployed to determine the capture area when fired. Once the capture zone has been established, the net is rolled up upon itself and bait is placed inside the zone to ensure feeding wildlife are captured. When target animals are feeding at the site and within the capture zone of the net, the launcher is activated by personnel near the site, which launches the net over the target wildlife. The net is launched using small explosive charges and weights. Only personnel trained in the safe handling of explosive charges will be allowed to employ rocket nets when explosive charges were used. Pneumatic cannon nets could also be used, which propels the net using compressed air instead of small explosive charges. Cannon/rocket nets require personnel to be present at the site continually to monitor for feeding. Cannon/rocket nets can be used to capture multiple animals during a single application. Similar to drop nets, injuries to animals can occur. Nontargets incidentally captured can be released on site unharmed.

Net guns: Net guns are similar to cannon/rocket nets except the nets are smaller and the nets are propelled from a hand-held launcher similar to a gun. The hand-held gun launches a weighted net over a target animal(s) using a firearm blank or compressed air. Similar to the use of cannon/rocket nets and drop nets, the use of net guns is often associated with the use of an attractant. WS may use net guns to

capture individual animals or a small number of animals that WS is unable to capture using other methods.

Handheld nets: Nylon or cloth nets on poles can be used to catch invasive reptiles trying to evade capture by falling out of trees or swimming through water. Nets are used to live-capture target individuals and if any nontargets are present, they can be released on-site unharmed. Handheld nets would be available under all alternatives for use.

Hand Capture: During mornings and nights with cooler temperatures, reptiles become stunned and can be simply picked from branches or off the ground. Temperatures below 10° Celsius (50° Fahrenheit) are best for this method (Krysko et al. 2007).

Noose Poles: Noose poles, or catch poles, consist of noose made of good quality line or cable attached to the end of a pole. This method can be advantageous in collecting invasive reptiles out of arms reach in a tree or for use on a boat. Noose poles can be made from wood, bamboo, fiberglass, plastic, and other materials depending on preference and availability (Cherkiss et al 2016). Poles should be stiff and lightweight. Noose poles are used by placing the noose around the animal's neck, pull the line quickly, closing the noose. When capturing crocodilians, the noose is rigged so that it breaks free from the pole. This prevents an unwieldy device as the crocodilian thrashes and allows the animal to tire itself out (Cherkiss et al 2016).

Fishing hooks: WS would use fishing hooks to capture primarily spectacled caiman, but WS could use fishing hooks to capture other nonnative crocodilians and nonnative turtles in Florida. In some situations, WS could attach a fishing hook to one end of fishing line or rope and attach the other end to a pole or tree. WS' personnel would then bait the hook to attract nonnative crocodilians and nonnative turtles (Fowler and Avery 1994). After ingesting the bait with the hook, the hook would capture the nonnative crocodilian or nonnative turtle, similar to fishing. WS could then use a firearm to remove the nonnative crocodilian or nonnative turtle. In addition, WS' personnel could use fishing poles with snagging hooks and/or ropes with snagging hooks from shore or from a boat to snag and pull nonnative crocodilians to the shore or to a boat (McDaniel and Hord 1990). Using a fishing pole or rope and a snagging hook, people can snag nonnative crocodilians by casting the hook over a nonnative crocodilian that is at the surface and dragging the hook across the surface of the water. If nonnative crocodilians submerge under the water, people often cast the hook out near where the nonnative crocodilian submerged and drag the hook along the bottom of the water back to the person who cast the hook. Once pulled to the shore or to a boat, WS' personnel can remove the nonnative crocodilian using a firearm.

Cover Objects: Amphibians and reptiles often shelter under natural objects such as rocks or logs to take advantage of different microclimates. Artificial objects (plywood, metal, plastic, etc.) can be used to the same effect (Norton et al. 2016). After enough time has passed, cover objects can be carefully lifted to check for the presence of target species. A secondary capture technique such as hand capture or the use of nets would then be used to secure the target species.

Polyvinylchloride Pipe Refugia: Tree frogs will often occupy polyvinylchloride pipe or large diameter sections of bamboo attached to trees or placed directly in the ground. Pipes are checked on a regular basis and target frog species removed by hand or with the use of specialized tools. Pipe diameter, length and location, as well as the presence of water in pipes, can affect trapping success (Boughton et al. 2000). Pipes should be designed with nylon rope tied through a hole at the top of the pipe to allow nontargets such as flying squirrels a route of escape.

Hoop Traps: Baited hoop traps can be used to catch freshwater turtles. The hoop trap is made from two or three metal or plastic hoops enclosed in netting. The open end of the net is placed beneath the surface of the water and the top end is left above the surface to allow trapped turtles to breathe. Different baits are used for different target species.

Basking Traps: Basking traps are mesh baskets with a floating platform. The trap is anchored near aquatic vegetation and away from other favorable basking sites. Turtles climb the sloped side of the trap to reach the central bait platform. Turtles will fall into the central basket portion from which they are unable to escape. Traps are checked frequently to prevent overheating.

Drift Fences: A drift fence is a section of material that is impassable by the target animal and thus will direct their movement along the edge of the fence, typically toward a trap designed for the target species. Drift fences are often placed in locations to intercept animals engaging in normal movement patterns. Drift fences must be placed with consideration to nontarget species. Drift fences are used in conjunction with funnel and pitfall traps (Fisher et al. 2008).

Funnel Traps: Funnel traps are elongated traps that have funnels at one or both ends that allow animals to pass easily into them through the large end of the funnels. Inside the traps, the animals have difficulty finding their way out through the small end of the funnels (Fisher et al. 2008). A variety of funnel trap designs could be used, depending on the target species and habitat. Frequent monitoring is required to prevent capture of nontarget species.

Pitfall Traps: Pitfall traps are open containers that are buried in the ground such that the tops of the containers are level with the ground. Terrestrial animals fall into the containers as they move across the ground. Various containers have been used as pitfall traps such as 5-gallon plastic buckets, coffee cans, metal buckets, "lard" cans, local pottery water containers, and 55-gallon drums (Fisher et al. 2008). The containers should have small drain holes in the bottom to minimize flooding during rain events while traps are open. Pitfall traps are often used in conjunction with drift fences that guide animals into the pitfall trap. This technique has proven to be effective at sampling a high diversity of reptiles and amphibians, invertebrates and small mammals (Enge 2001). Traditional fences with large pitfall traps are effective for sampling squamate reptiles (Enge 2001).

Glue Boards: A glue board consists of multiple rodent glue traps secured to a plywood board and is used to trap animals inhabiting buildings or structures, replaced around trees, or entrances to borrows. The board is placed in the path where target animal is likely to travel. A hole drilled in the board can be used with a hook to safely extract the board in the case of venomous snakes. Zani and Vitt (1995) found that sticky traps had no adverse effects on the lizards they caught and used vegetable oil to remove them from the boards. Traps set on trees resulted in higher capture success than traps set on the ground for aboral lizards (Ribeiro-Junior et al. 2006).

WS anticipates using glue boards infrequently and in limited situations with a high likelihood of capturing the target animal or animals, such as placing a glue board in front of an entrance where a target animal enters and exits a place of refuge. WS would check glue boards frequently to address any animals captured. Before using glue boards, WS would consider risks of capturing nontarget animals. WS could use vegetable oil or mineral oil to remove animals from glue boards.

Immobilizing Drugs: WS could administer chemicals (*e.g.*, Telazol, Ketamine, or a mixture of Ketamine and Xylazine) to immobilize reptiles in certain instances (*e.g.*, affixing a radio and/or GPS transmitter on an animal to be used as a Scout animal). For WS' personnel to administer immobilization chemicals to a target reptile, the target animal would first need to be captured using live-capture methods

(*e.g.*, live-capture traps). WS' personnel would administer immobilizing drugs through hand injection or jab stick.

Ketamine (Ketamine Hydrochloride) is a dissociative anesthetic that is available to capture wildlife. It is used to eliminate pain, calm fear, and allay anxiety. Ketamine is possibly the most versatile drug for chemical capture, and it has a wide safety margin (USDA 2019*f*). When used alone, this drug may produce muscle tension, resulting in shaking, staring, increased body heat, and, on occasion, seizures. Usually, ketamine is combined with other drugs, such as xylazine. The combination of such drugs is used to control an animal, maximize the reduction of stress and pain, and increase human and animal safety. WS anticipates using ketamine infrequently.

Telazol is a combination of equal parts of tiletamine hydrochloride and zolazepam hydrochloride (a tranquilizer). Telazol produces a state of unconsciousness in which protective reflexes, such as coughing and swallowing, are maintained during anesthesia. Schobert (1987) listed the dosage rates for many wild and nonnative animals. Before using telazol, the size, age, temperament, and health of the animal are considered. Following a deep intramuscular injection of telazol, onset of anesthetic effect usually occurs within 5 to 12 minutes. Muscle relaxation is optimum for about the first 20 to 25 minutes after the administration, and then diminishes. Recovery varies with the age and physical condition of the animal and the dose of Telazol administered, but usually requires several hours.

Xylazine is a sedative (analgesic) that calms nervousness, irritability, and excitement, usually by depressing the central nervous system. WS often uses a combination of xylazine and ketamine to produce a relaxed anesthesia. When using ketamine/xylazine combinations, xylazine will usually overcome the tension produced by ketamine, resulting in a relaxed, anesthetized animal (USDA 2019*f*). This reduces heat production from muscle tension but can lead to lower body temperatures when working in cold conditions.

Radio Telemetry: Tracking devices are often used as part of ecology studies to locate and track movements of individuals or groups. Once an individual is live captured, the reptile is implanted with a tracking device that does not interfere with the daily activities of the reptiles or the status of the individual in the group. The radio transmitter emits a signal that can be located and monitored using telemetry or satellite equipment. Movement patterns can be established for target species. Knowing movement and activity patterns, allow damage management methods and techniques to be applied in localized areas to achieve maximum effectiveness and to minimize capturing nontargets. Tracking devices can also provide indication if invasive reptiles are dispersing from the area once damage management activities are initiated.

Harvey et al. (2008) captured and surgically implanted 17 adult Burmese pythons with very high frequency transmitters in Everglades National Park and other state-owned land. These snakes were tracked during the breeding season to locate breeding aggregations. "Scout snakes," as they have been termed, led researchers to other pythons. Of 25 pythons discovered by this method, 19 were captured and removed. The release of scout snakes by WS would only occur when authorized by the FFWCC and WS would only release scout snakes on properties where the property owner has agreed to allow WS to release scout snakes.

II. LETHAL METHODS

In addition to the use of nonlethal methods, WS' personnel could also use lethal methods.

Firearms: Shooting is selective for target species since targets are identified before application. Shooting is an effective method to remove a small number of invasive reptiles where damage is occurring and often used opportunistically where target individuals are observed in an area where damage is occurring. The discharge of firearms is limited to locations where it is legal and safe. Shooting can be expensive because it often requires many staff hours to obtain adequate removal of target species to alleviate damage or reduce threats. Since the discharge of firearms often acts as a harassment or dispersal technique to target species in the immediate area of application, a concern arises from the potential for invasive reptiles to disperse to other areas when this method is applied. To alleviate concerns of dispersing invasive reptiles, the use of firearms would be limited to those situations where other methods have been ineffective, where the availability of other methods are limited, or in situations where resolution of the damage or threat is required immediately.

At night, shooting could also occur in conjunction with night vision equipment, infrared/thermal imaging devices, and spotlights were deemed appropriate. Shooting would be available under the proposed action and could be available to affected property owners or managers under Alternative 2 and Alternative 3.

Gigging: A gig is simply a multi-pronged spear used to impale the target animal, usually frogs. Gigging would be used opportunistically where target individuals are observed in an area where damage is occurring. There is little to no risk to nontarget animals as each animal must be actively targeted.

Body-grip traps: Body grip traps generally consist of a pair of rectangular metal frames loaded and set by heavy duty springs which quickly close when triggered. When not in use or when triggered, the spring or springs hold the rectangular rotating metal jaws closed. Opening the frames applies tension to the spring(s). A latch, or "dog", holds the metal frames open with the spring or springs held under tension. The dog is attached to a trigger that is set to release when a target animal trips the trigger releasing the tension on the springs closing the rotating metal frames quickly with tremendous force. Rotating-jaw traps should be placed to ensure the metal frames close on either side of the neck of the target animal to ensure the force of the closing frames causes a quick death. WS recognizes that the use of quick-kill traps results in nontarget species take but strives to minimize this. The different sizes, shapes, and behaviors of the animals that WS personnel could target with quick-kill traps influence how those animals approach traps. WS personnel enhance the selectivity of quick-kill traps by placement, trap size, trigger configurations, and baits. For example, when using rotating-jaw traps, personnel can reduce the risk of capturing nontarget animals by using recessed sets (*i.e.*, placing trap inside a cubby, cage, or burrow), restricting openings, or by elevating traps.

Cable devices: Cable devices consist of a fishing line, cable, or wire that a manufacturer or WS' personnel have fabricated with a loop at one end of the device. WS' personnel or the manufacturer often fabricates the end opposite of the loop to work as an anchor to hold the cable device. WS' personnel would position the loop to close around the neck, torso, leg, or foot of a target animal as the animal moves through the loop. WS can use cable devices wherever a target animal moves through a restricted travel lane (*e.g.*, trails through vegetation). When an animal moves forward into the loop formed by the cable, the noose tightens and the animal is held. USDA (2019*b*) provides more information on cable devices and WS' use of cable devices to capture target animals.

Injection of Euthanasia Chemicals: WS' personnel would use euthanasia chemicals in accordance with WS Directive 2.430, WS Directive 2.505, and the WS' Field Manual for the Operational Use of Immobilizing and Euthanizing Drugs (USDA 2019*f*). Sodium pentobarbital is a barbiturate that WS could use to euthanize animals. Sodium pentobarbital rapidly depresses the central nervous system to the point of respiratory arrest. WS would only administer sodium pentobarbital after live capturing a target animal and only after WS properly immobilized the animal to allow for direct injection. There are United

States Drug Enforcement Administration restrictions on who can possess and administer this drug. In accordance with United States Drug Enforcement Administration and state regulations, only WS' personnel certified in the use of euthanasia chemicals would use sodium pentobarbital and its dilutions (*e.g.*, Beuthanasia-D, Fatal-Plus) for euthanasia.

WS anticipates using sodium pentobarbital and its dilutions infrequently. Trained WS' personnel would administer sodium pentobarbital and its dilutions directly to the target animal through injection from a syringe after live-capture. There are secondary hazards associated with scavengers feeding on carcasses euthanized with sodium pentobarbital. Therefore, WS would dispose of all animals euthanized using sodium pentobarbital and all of its dilutions through deep burial to prevent secondary poisoning of scavenging animals and introduction of those chemicals to nontarget animals (see WS Directive 2.515). Through programmatic risk assessments, WS has determined the disposal of carcasses when conducting wildlife damage management activities pose a low risk to the environment and to human health and safety (USDA 2023*b*).

Carbon dioxide: Carbon dioxide is another method that WS could consider for use when euthanizing target species. After live capture, WS would place a target animal or animals inside a sealed chamber. WS would slowly release carbon dioxide gas into the chamber. As the carbon dioxide levels increase in the chamber, the animal dies from hypoxia. Like other euthanasia chemicals, WS anticipates using carbon dioxide infrequently because reptiles and amphibians may breathe too slowly for the use of carbon dioxide. Many reptiles and amphibians can hold their breath and the design of their hearts allows reptiles and amphibians to survive for prolong periods of not breathing oxygen. Therefore, the time needed for reptiles and amphibians to lose consciousness during the use of carbon dioxide may be longer (AVMA 2020). WS use of methods to humanely kill a target animal after live capture would follow those guidelines in WS Directive 2.505. Training and adherence to WS' Directives would ensure the safety of employees and the public when using methods to humanely kill target animals.

Toxicants: At the time WS developed this EA, no toxicants were available to manage damage or threats of damage associated with nonnative reptiles or amphibians in Florida. WS would not use toxicants in Florida unless the EPA approves a toxicant for use to manage nonnative reptile and/or amphibian damage and the Florida Department of Agriculture and Consumer Services approves a toxicant for use in Florida. In addition, WS would only use toxicants if allowed by Florida law. Therefore, if no toxicants are approved for use, WS would not use toxicants to manage damage caused by nonnative reptiles and amphibians in Florida.

However, toxicants are available for use in some areas for the control of certain reptile species and amphibians. For example, acetaminophen has been used as a toxicant to control invasive brown tree snakes in Guam (Savarie et al. 2001) due to its high lethality to reptiles, but low risk to nontargets (Johnston et al. 2002). The toxicant was delivered using dead mice as a bait delivery system. Although Florida has many nontarget reptile species that could be harmed by acetaminophen, this tool could be used in very specific situations or locations where nontarget species are not present. Acetaminophen is an effective toxicant in juvenile Nile monitors and Burmese pythons when administered in a dead mouse. An 80-milligram dose resulted in 100% mortality in monitors ranging in mass from 16.2 to 105 grams, whereas 40-milligram and 80-milligram doses yielded 85.7% and 100% mortality, respectively, in pythons ranging in mass from 89 to 191 grams (Mauldin and Savarie 2010). Further research is required to determine acetaminophen dosages that would be consistently lethal to adult pythons and monitors.

Zinc phosphide showed potential as a toxicant for reducing populations for black spiny-tailed iguana. Zinc phosphide produced 100% mortality at dose levels as little as 25 mg per lizard, equivalent to about 0.5% in bait which is lower than currently used in commercial baits for commensal rodent control (Avery et al. 2011). Various studies demonstrated that zinc phosphide has low secondary toxicity, so there

appears to be little risk to scavengers and predators that might feed on iguanas killed with zinc phosphide (Avery et al. 2011). Zinc phosphide could pose a danger to nontargets species but presenting the bait in bait stations would exclude nontargets.

Cervical dislocation: Cervical dislocation could be another method that WS considers when euthanizing target species that WS captures alive. The animal is stretched, and the neck is hyper-extended and dorsally twisted to separate the first cervical vertebrae from the skull. Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and is rapidly accomplished. Because death of reptiles and amphibians can be difficult to confirm, the AVMA (2020) often recommends the application of two or more procedures when euthanizing reptiles and amphibians, such as spinal cord severing followed by decapitation or pithing (*i.e.*, physical destruction of the brain). WS use of methods to humanely kill a target animal after live capture would follow those guidelines in WS Directive 2.505. Training and adherence to WS' Directives would ensure the safety of employees and the public when using methods to humanely kill target animals.

Egg destruction: WS' personnel could make eggs of target species, such as green iguanas, unviable in several different ways. Egg destruction would involve breaking an egg, shaking an egg, or soaking an egg in water. WS' personnel would first gather the eggs. After gathering the eggs, WS' personnel could break the eggs open or vigorously shaken numerous times, which causes the embryo to detach from the egg sac. WS' personnel could also soak the eggs in water for 24 hours.

APPENDIX C
THREATENED AND ENDANGERED SPECIES THAT ARE FEDERALLY LISTED IN THE STATE OF FLORIDA

Table C.1 – Federal list of threatened or endangered species in Florida

Common Name	Scientific Name	Status[†]	Determination[‡]
Animals			
Reptiles			
American Alligator	*Alligator mississippiensis*	T/SA	NE
American Crocodile	*Crocodylus acutus*	T	MANLAA
Atlantic Salt Marsh Snake	*Nerodia clarkii taeniata*	T	MANLAA
Bluetail Mole Skink	*Eumeces egregius lividus*	T	MANLAA
Eastern Indigo Snake	*Drymarchon corais couperi*	T	MANLAA
Gopher Tortoise	*Gopherus polyphemus*	C	MANLAA
Green Sea Turtle	*Chelonia mydas*	T	MANLAA
Hawksbill Sea Turtle	*Eretmochelys imbricata*	E	MANLAA
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E	MANLAA
Key Ring-necked Snake	*Diadophis punctatus acricus*	PE	NE
Leatherback Sea Turtle	*Dermochelys coriacea*	E	MANLAA
Loggerhead Sea Turtle	*Caretta caretta*	T	MANLAA
Rim Rock Crowned Snake	*Tantilla oolitica*	PE	NE
Sand Skink	*Neoseps reynoldsi*	T	MANLAA
Suwannee Alligator Snapping Turtle	*Macrochelys suwanniensis*	PT	MANLAA
Alligator Snapping Turtle	*Macrochelys temminckii*	PT	NE
Birds			
Audubon's Crested Caracara	*Polyborus plancus audubonii*	T	MANLAA
Bachman’s Warbler	*Vermivora bachmanii*	E	MANLAA
Cape Sable Seaside Sparrow	*Ammodramus maritimus mirabilis*	E	MANLAA
Eastern Black Rail	*Laterallus jamaicensis jamaicensis*	T	MANLAA
Everglade Snail Kite	*Rostrhamus sociabilis plumbeus*	E	MANLAA
Florida Grasshopper Sparrow	*Ammodramus savannarum floridanus*	E	MANLAA
Florida Scrub-jay	*Aphelocoma coerulescens*	T	MANLAA
Piping Plover	*Charadrius melodus*	T	MANLAA
Red Knot	*Calidris canutus rufa*	T	MANLAA
Red-cockaded Woodpecker	*Picoides borealis*	E	MANLAA
Roseate Tern	*Sterna dougallii dougallii*	T	MANLAA
Whooping Crane	*Grus americana*	EXP	MANLAA
Wood Stork	*Mycteria americana*	T	MANLAA
Mammals			
Anastasia Island Beach Mouse	*Peromyscus polionotus phasma*	E	MANLAA
Choctawhatchee Beach Mouse	*Peromyscus polionotus allophrys*	E	MANLAA
Florida Bonneted Bat	*Eumops floridanus*	E	MANLAA
Florida Panther	*Puma* (=*Felis*) *concolor coryi*	E	MANLAA
Florida Salt Marsh Vole	*Microtus pennsylvanicus dukecampbelli*	E	MANLAA
Gray Bat	*Myotis grisescens*	E	MANLAA
Key Deer	*Odocoileus virginianus clavium*	E	MANLAA
Key Largo Cotton Mouse	*Peromyscus gossypinus allapaticola*	E	MANLAA

Key Largo Woodrat	*Neotoma floridana smalli*	E	MANLAA
Lower Keys Marsh Rabbit	*Sylvilagus palustris hefneri*	E	MANLAA
Perdido Key Beach Mouse	*Peromyscus polionotus trissyllepsis*	E	MANLAA
Puma	*Puma* (=*Felis*) *concolor*	T/SA	NE
Silver Rice Rat	*Oryzomys palustris natator*	E	MANLAA
Southeastern Beach Mouse	*Peromyscus polionotus niveiventris*	T	MANLAA
St. Andrew Beach Mouse	*Peromyscus polionotus peninsularis*	E	MANLAA
West Indian Manatee	*Trichechus manatus*	T	MANLAA
Amphibians			
Florida Keys Mole Skink	*Plestiodon egregius egregious*	PT	NE
Frosted Flatwoods Salamander	*Ambystoma cingulatum*	T	MANLAA
Reticulated Flatwoods Salamander	*Ambystoma bishopi*	E	MANLAA
Fish			
Gulf Sturgeon	*Acipenser oxyrinchus* (=*oxyrhynchus*) *desotoi*	T	MANLAA
Okaloosa Darter	*Etheostoma okaloosae*	T	MANLAA
Mussels			
Chipola Slabshell	*Elliptio chipolaensis*	T	MANLAA
Choctaw Bean	*Villosa choctawensis*	E	MANLAA
Fat Threeridge (mussel)	*Amblema neislerii*	E	MANLAA
Fuzzy Pigtoe	*Pleurobema strodeanum*	T	MANLAA
Gulf Moccasinshell	*Medionidus penicillatus*	E	MANLAA
Narrow Pigtoe	*Fusconaia escambia*	T	MANLAA
Ochlockonee Moccasinshell	*Medionidus simpsonianus*	E	MANLAA
Oval Pigtoe	*Pleurobema pyriforme*	E	MANLAA
Purple Bankclimber	*Elliptoideus sloatianus*	T	MANLAA
Round Ebonyshell	*Fusconaia rotulata*	E	MANLAA
Shinyrayed Pocketbook	*Lampsilis subangulata*	E	MANLAA
Southern Kidneyshell	*Ptychobranchus jonesi*	E	MANLAA
Southern Sandshell	*Hamiota australis*	T	MANLAA
Suwannee Moccasinshell	*Medionidus walker*	T	MANLAA
Tapered Pigtoe	*Fusconaia burkei*	T	MANLAA
Snails			
Stock Island Tree Snail	*Orthalicus reses* (not incl. *nesodryas*)	T	MANLAA
Insects			
Bartram's Hairstreak Butterfly	*Strymon acis bartrami*	E	MANLAA
Florida Leafwing Butterfly	*Anaea troglodyta floridalis*	E	MANLAA
Miami Blue Butterfly	*Cyclargus* (=*Hemiargus*) *thomasi bethunebakeri*	E	MANLAA
Miami Tiger Beetle	*Cicindelidia floridana*	E	MANLAA
Monarch Butterfly	*Danaus plexippus*	C	MANLAA
Schaus Swallowtail Butterfly	*Heraclides aristodemus ponceanus*	E	MANLAA
Crustaceans			
Panama City Crayfish	*Procambarus econfinae*	T	MANLAA
Squirrel Chimney Cave Shrimp	*Palaemonetes cummingi*	T	NE

Plants			
Flowering Plants			
Aboriginal Prickly-apple	*Harrisia* (=*Cereus*) *aboriginum* (=*gracilis*)	E	NE
American Chaffseed	*Schwalbea americana*	E	NE
Apalachicola Rosemary	*Conradina glabra*	E	NE
Avon Park Harebells	*Crotalaria avonensis*	E	NE
Beach Jacquemontia	*Jacquemontia reclinata*	E	NE
Beautiful Pawpaw	*Deeringothamnus pulchellus*	E	NE
Big Pine Partridge Pea	*Chamaecrista lineata keyensis*	E	NE
Blodgett's Silverbush	*Argythamnia blodgettii*	T	NE
Britton's Beargrass	*Nolina brittoniana*	E	NE
Brooksville Bellflower	*Campanula robinsiae*	E	NE
Cape Sable Thoroughwort	*Chromolaena frustrata*	E	NE
Carter's Mustard	*Warea carteri*	E	NE
Carter's Small-flowered Flax	*Linum carteri carteri*	E	NE
Chapman Rhododendron	*Rhododendron chapmanii*	E	NE
Cooley's Water-willow	*Justicia cooleyi*	E	NE
Cooley's Meadowrue	*Thalictrum cooleyi*	E	NE
Crenulate Lead-plant	*Amorpha crenulata*	E	NE
Deltoid Spurge	*Chamaesyce deltoidea* ssp. *deltoidea*	E	NE
Etonia Rosemary	*Conradina etonia*	E	NE
Everglades Bully	*Sideroxylon reclinatum* ssp. *austrofloridense*	T	NE
Florida Bonamia	*Bonamia grandiflora*	T	NE
Florida Brickell-bush	*Brickellia mosieri*	E	NE
Florida Golden Aster	*Chrysopsis floridana*	T	NE
Florida Pineland Crabgrass	*Digitaria pauciflora*	T	NE
Florida Prairie-clover	*Dalea carthagenensis floridana*	E	NE
Florida Skullcap	*Scutellaria floridana*	T	NE
Florida Semaphore Cactus	*Consolea corallicola*	E	NE
Florida Torreya	*Torreya taxifolia*	E	NE
Florida Ziziphus	*Ziziphus celata*	E	NE
Four-petal Pawpaw	*Asimina tetramera*	E	NE
Fragrant Prickly-apple	*Cereus eriophorus var. fragrans*	E	NE
Fringed Campion	*Silene polypetala*	E	NE
Garber's Spurge	*Chamaesyce garberi*	T	NE
Garrett's Mint	*Dicerandra christmanii*	E	NE
Gentian Pinkroot	*Spigelia gentianoides*	E	NE
Godfrey's Butterwort	*Pinguicula ionantha*	T	NE
Golden Sedge	*Carex lutea*	E	NE
Harper's Beauty	*Harperocallis flava*	E	NE
Highlands Scrub Hypericum	*Hypericum cumulicola*	E	NE
Key Tree Cactus	*Pilosocereus robinii*	E	NE
Lakela's Mint	*Dicerandra immaculata*	E	NE
Lewton's Polygala	*Polygala lewtonii*	E	NE
Longspurred Mint	*Dicerandra cornutissima*	E	NE
Miccosukee Gooseberry	*Ribes echinellum*	T	NE
Okeechobee Gourd	*Cucurbita okeechobeensis okeechobeensis*	E	NE
Papery Whitlow-wort	*Paronychia chartacea*	T	NE

Pigeon Wings	*Clitoria fragrans*	T	NE
Pineland Sandmat	*Chamaesyce deltoidea pinetorum*	T	NE
Pygmy Fringe-tree	*Chionanthus pygmaeus*	E	NE
Rugel's Pawpaw	*Deeringothamnus rugelii*	E	NE
Sand Flax	*Linum arenicola*	E	NE
Sandlace	*Polygonella myriophylla*	E	NE
Scrub Blazingstar	*Liatris ohlingerae*	E	NE
Scrub Buckwheat	*Eriogonum longifolium var. gnaphalifolium*	T	NE
Scrub Lupine	*Lupinus aridorum*	E	NE
Scrub Mint	*Dicerandra frutescens*	E	NE
Scrub Plum	*Prunus geniculate*	E	NE
Short-leaved Rosemary	*Conradina brevifolia*	E	NE
Small's Milkpea	*Galactia smallii*	E	NE
Snakeroot	*Eryngium cuneifolium*	E	NE
Telephus Spurge	*Euphorbia telephioides*	T	NE
Tiny Polygala	*Polygala smallii*	E	NE
Wedge Spurge	*Chamaesyce deltoidea serpyllum*	E	NE
White Birds-in-a-nest	*Macbridea alba*	T	NE
Wide-leaf Warea	*Warea amplexifolia*	E	NE
Wireweed	*Polygonella basiramia*	E	NE
Ferns			
Florida Bristle Fern	*Trichomanes punctatum* ssp. *floridanum*	E	NE
Lichens			
Florida Perforate Cladonia	*Cladonia perforate*	E	NE

†T=Threatened; E=Endangered; PT=Proposed threatened; PE=Proposed endangered; EXP=Experimental population, non-essential; T/SA=Threatened due to similarity of appearance

‡NE=No effect; MANLAA=May affect, not likely to adversely affect

Table C.2 - Critical habitats designated in Florida

Common Name	Scientific Name	Status†	Determination‡
Animals			
Reptiles			
American Crocodile	*Crocodylus acutus*	CH	NE
Key Ring-necked Snake	*Diadophis punctatus acricus*	PCH	NE
Loggerhead Sea Turtle	*Caretta caretta*	CH	NE
Rim Rock Crowned Snake	*Tantilla oolitica*	PCH	NE
Birds			
Piping Plover	*Charadrius melodus*	CH	NE
Cape Sable Seaside Sparrow	*Ammodramus maritimus mirabilis*	CH	NE
Everglade Snail Kite	*Rostrhamus sociabilis plumbeus*	CH	NE
Mammals			
Choctawhatchee Beach Mouse	*Peromyscus polionotus allophrys*	CH	NE
Florida Bonneted Bat	*Eumops floridanus*	PCH	NE
Perdido Key Beach Mouse	*Peromyscus polionotus trissyllepsis*	CH	NE
Silver Rice Rat	*Oryzomys palustris natator*	CH	NE
St. Andrew Beach Mouse	*Peromyscus polionotus peninsularis*	CH	NE
West Indian Manatee	*Trichechus manatus*	CH	NE
Amphibians			

Florida Keys Mole Skink	*Plestiodon egregius egregious*	PCH	NE
Frosted Flatwoods Salamander	*Ambystoma cingulatum*	CH	NE
Reticulated Flatwoods Salamander	*Ambystoma bishopi*	CH	NE
Insects			
Bartram's Hairstreak Butterfly	*Strymon acis bartrami*	CH	NE
Florida Leafwing Butterfly	*Anaea troglodyta floridalis*	CH	NE
Miami Tiger Beetle	*Cicindelidia floridana*	PCH	NE
Fish			
Gulf Sturgeon	*Acipenser oxyrinchus* (=*oxyrhynchus*) *desotoi*	CH	NE
Mussels			
Chipola Slabshell	*Elliptio chipolaensis*	CH	NE
Choctaw Bean	*Villosa choctawensis*	CH	NE
Fat Threeridge	*Amblema neislerii*	CH	NE
Fuzzy Pigtoe	*Pleurobema strodeanum*	CH	NE
Gulf Moccasinshell	*Medionidus penicillatus*	CH	NE
Narrow Pigtoe	*Fusconaia escambia*	CH	NE
Ochlockonee Moccasinshell	*Medionidus simpsonianus*	CH	NE
Oval Pigtoe	*Pleurobema pyriforme*	CH	NE
Purple Bankclimber	*Elliptoideus sloatianus*	CH	NE
Round Ebonyshell	*Fusconaia rotulata*	CH	NE
Shinyrayed Pocketbook	*Lampsilis subangulata*	CH	NE
Southern Kidneyshell	*Ptychobranchus jonesi*	CH	NE
Southern Sandshell	*Hamiota australis*	CH	NE
Suwannee Moccasinshell	*Medionidus walker*	CH	NE
Tapered Pigtoe	*Fusconaia burkei*	CH	NE
Crustaceans			
Panama City Crayfish	*Procambarus econfinae*	CH	NE
Plants			
Aboriginal Prickly-apple	*Harrisia* (=*Cereus*) *aboriginum* (=*gracilis*)	CH	NE
Cape Sable Thoroughwort	*Chromolaena frustrata*	CH	NE
Carter's Small-flowered Flax	*Linum carteri carteri*	CH	NE
Florida Brickell-bush	*Brickellia mosieri*	CH	NE
Florida Bristle Fern	*Trichomanes punctatum* ssp. *floridanum*	CH	NE
Florida Semaphore Cactus	*Consolea corallicola*	CH	NE
Golden Sedge	*Carex lutea*	CH	NE

†CH=Critical Habitat; PCH=Proposed Critical Habitat

‡NE=No Effect; No adverse modification

APPENDIX D
STATE-DESIGNATED THREATENED SPECIES AND STATE SPECIES OF SPECIAL CONCERN IN THE STATE OF FLORIDA

NUMERICAL SUMMARY OF SPECIES

Listed by the State of Florida as Federally designated Endangered **(FE)**, Federally designated Threatened **(FT)**, Federally designated Threatened due to Similarity of Appearance **[FT(S/A)]**, Federal Non-Essential Experimental Population **(FXN)**, State designated Threatened **(ST)**, or State Species of Special Concern **(SSC)**.

STATUS DESIGNATION	FISH	AMPHIBIANS	REPTILES	BIRDS	MAMMALS	INVERTEBRATES	TOTAL
FE	3(1)*	1	3(3)	8	21(5)**	13	**50(9)**
FT	4(1)	1	7(2)	7	2(1)	18	**39(4)**
FT(S/A)	0	0	1	0	0	3	**4**
FXN	0	0	0	1	0	0	**1**
ST	6	2	9	16	4	2	**39**
SSC	0	0	0	0	0	0	**0**
TOTAL	**13(2)**	**4**	**20(5)**	**32**	**28(6)**	**36**	**134(13)**

*Numbers in the parentheses are the number of species for which the FFWCC does not have constitutional authority. The status in Rule 68A-27.0031 is the Federal status these species had when the FFWCC was created by amendment to the Florida Constitution, adopted in 1998. The status of these species listed in here is their current Federal status as of December 2018.

**There is one additional species included in Rule 68A-27.0031 as a species for which the FFWCC does not have constitutional authority. This species is not included here because it has been determined to be extinct.

FLORIDA'S ENDANGERED AND THREATENED SPECIES LIST

VERTEBRATES

FISH

Common Name	Scientific Name	Status
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	FE
Blackmouth shiner	*Notropis melanostomus*	ST
Bluenose shiner	*Pteronotropis welaka*	ST
Crystal darter	*Crystallaria asprella*	ST
Giant manta ray	*Manta birostris*	FT
Gulf sturgeon	*Acipenser oxyrinchus [=oxyrhynchus] desotoi*	FT[1]
Key silverside	*Menidia conchorum*	ST
Nassau grouper	*Epinephelus striatus*	FT
Okaloosa darter	*Etheostoma okalossae*	FT
Saltmarsh topminnow	*Fundulus jenkinsi*	ST
Shortnose sturgeon	*Acipenser brevirostrum*	FE[1]
Smalltooth sawfish	*Pristis pectinate*	FE
Southern tessellated darter	*Etheostoma olmstedi maculaticeps*	ST

AMPHIBIANS

Common Name	Scientific Name	Status
Florida bog frog	*Lithobates okaloosae*	ST
Frosted flatwoods salamander	*Ambystoma cingulatum*	FT
Georgia blind salamander	*Eurycea wallacei*	ST

Reticulated flatwoods salamander	*Ambystoma bishopi*	FE
Striped newt	*Notophthalmus perstriatus*	ST

REPTILES

Common Name	**Scientific Name**	**Status**
American alligator	*Alligator mississippiensis*	FT(S/A)
American crocodile	*Crocodylus acutus*	FT
Atlantic salt marsh snake	*Nerodia clarkii taeniata*	FT
Barbour's map turtle	*Graptemys barbouri*	ST
Bluetail mole skink	*Plestiodon egregius lividus*	FT
Eastern indigo snake	*Drymarchon couperi*	FT
Florida brown snake	*Storeria victa*	ST3
Florida Keys mole skink	*Plestiodon egregius egregius*	ST
Florida pine snake	*Pituophis melanoleucus mugitus*	ST
Gopher tortoise	*Gopherus polyphemus*	ST
Green sea turtle	*Chelonia mydas*	FT1
Hawksbill sea turtle	*Eretmochelys imbricata*	FE1
Kemp's ridley sea turtle	*Lepidochelys kempii*	FE1
Key ringneck snake	*Diadophis punctatus acricus*	ST
Leatherback sea turtle	*Dermochelys coriacea*	FE1
Loggerhead sea turtle	*Caretta caretta*	FT1
Rim rock crowned snake	*Tantilla oolitica*	ST
Sand skink	*Plestiodon reynoldsi*	FT
Short-tailed snake	*Lampropeltis extenuata*	ST
Suwannee alligator snapping turtle	*Macrochelys suwanniensis*	ST

BIRDS

Common Name	**Scientific Name**	**Status**
American oystercatcher	*Haematopus palliatus*	ST
Audubon's crested caracara	*Polyborus plancus audubonii*	FT
Bachman's wood warbler	*Vermivora bachmanii*	FE
Black skimmer	*Rynchops niger*	ST
Cape Sable seaside sparrow	*Ammodramus maritimus mirabilis*	FE
Eastern black rail	*Laterallus jamaicensis jamaicensis*	FT
Eskimo curlew	*Numenius borealis*	FE
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	FE
Florida burrowing owl	*Athene cunicularia floridana*	ST
Florida grasshopper sparrow	*Ammodramus savannarum floridanus*	FE
Florida sandhill crane	*Antigone canadensis pratensis*	ST
Florida scrub-jay	*Aphelocoma coerulescens*	FT
Ivory-billed woodpecker	*Campephilus principalis*	FE
Kirtland's warbler (Kirtland's wood warbler)	*Setophaga kirtlandii (Dendroica kirtlandii*)	FE
Least tern	*Sternula antillarum*	ST
Little blue heron	*Egretta caerulea*	ST
Piping plover	*Charadrius melodus*	FT
Red-cockaded woodpecker	*Picoides borealis*	FE

Reddish egret	*Egretta rufescens*	ST
Roseate spoonbill	*Platalea ajaja*	ST
Roseate tern	*Sterna dougallii dougallii*	FT
Rufa red knot	*Calidris canutus rufa*	FT
Scott's seaside sparrow	*Ammodramus maritimus peninsulae*	ST
Snowy plover	*Charadrius nivosus*	ST
Southeastern American kestrel	*Falco sparverius paulus*	ST
Tricolored heron	*Egretta tricolor*	ST
Wakulla seaside sparrow	*Ammodramus maritimus juncicola*	ST
White-crowned pigeon	*Patagioenas leucocephala*	ST
Whooping crane	*Grus americana*	FXN
Worthington's marsh wren	*Cistothorus palustris griseus*	ST
Wood stork	*Mycteria americana*	FT

MAMMALS

Common Name	**Scientific Name**	**Status**
Anastasia Island beach mouse	*Peromyscus polionotus phasma*	FE
Big Cypress fox squirrel	*Sciurus niger avicennia*	ST
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	FE
Everglades mink	*Neovison vison evergladensis*	ST
Finback whale	*Balaenoptera physalus*	FE1
Florida bonneted bat	*Eumops floridanus*	FE
Florida panther	*Puma [=Felis] concolor coryi*	FE
Florida salt marsh vole	*Microtus pennsylvanicus dukecampbelli*	FE
Gray bat	*Myotis grisescens*	FE
Gray wolf	*Canis lupus*	FE2
Bryde's Whale (Gulf of Mexico subspecies)	*Balaenoptera edeni [unnamed subspecies]*	FE
Humpback whale	*Megaptera novaeangliae*	FE1
Indiana bat	*Myotis sodalis*	FE
Key deer	*Odocoileus virginianus clavium*	FE
Key Largo cotton mouse	*Peromyscus gossypinus allapaticola*	FE
Lower Keys rabbit	*Sylvilagus palustris hefneri*	FE
North Atlantic right whale	*Eubalaena glacialis*	FE1
Perdido Key beach mouse	*Peromyscus polionotus trissyllepsis*	FE
Red wolf	*Canis rufus*	FE
Rice rat	*Oryzomys palustris natator*	FE3
Sanibel Island rice rat	*Oryzomys palustris sanibeli*	ST
Sei whale	*Balaenoptera borealis*	FE1
Sherman's short-tailed shrew	*Blarina shermani*	ST
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	FT
Sperm whale	*Physeter macrocephalus*	FE1
St. Andrew beach mouse	*Peromyscus polionotus peninsularis*	FE
West Indian manatee (Florida manatee)	*Trichechus manatus* (Trichechus manatus latirostris)	FT1

INVERTEBRATES

CORALS

Common Name	Scientific Name	Status
Boulder star coral	*Orbicella franksi*	FT
Elkhorn coral	*Acropora palmata*	FT
Lobed star coral	*Orbicella annularis*	FT
Mountainous star coral	*Orbicella faveolata*	FT
Pillar coral	*Dendrogyra cylindricus*	FT
Rough cactus coral	*Mycetophyllia ferox*	FT
Staghorn coral	*Acropora cervicornis*	FT

CRUSTACEANS

Common Name	Scientific Name	Status
Black Creek crayfish	*Procambarus pictus*	ST
Panama City crayfish	*Procambarus econfinae*	FT
Santa Fe cave crayfish	*Procambarus erythrops*	ST
Squirrel Chimney Cave shrimp	*Palaemonetes cummingi*	FT

INSECTS

Common Name	Scientific Name	Status
American burying beetle	*Nicrophorus americanus*	FT
Bartram's scrub-hairstreak	*Strymon acis bartrami*	FE
Cassius blue butterfly	*Leptotes cassius theonus*	FT(S/A)
Ceraunus blue butterfly	*Hemiargus ceraunus antibubastus*	FT(S/A)
Florida leafwing	*Anaea troglodyta floridalis*	FE
Miami blue butterfly	*Cyclargus thomasi bethunebakeri*	FE
Miami tiger beetle	*Cicindelidia floridana*	FE
Nickerbean blue butterfly	*Cyclargus ammon*	FT(S/A)
Schaus swallowtail butterfly	*Heraclides aristodemus ponceanus*	FE

MOLLUSKS

Common Name	Scientific Name	Status
Chipola slabshell (mussel)	*Elliptio chiplolaensis*	FT
Choctaw bean	*Obovaria choctawensis*	FE
Fat threeridge (mussel)	*Amblema neislerii*	FE
Fuzzy pigtoe	*Pleurobema strodeanum*	FT
Gulf moccasinshell (mussel)	*Medionidus penicillatus*	FE
Narrow pigtoe	*Fusconaia escambia*	FT
Ochlockonee moccasinshell (mussel)	*Medionidus simpsonianus*	FE
Oval pigtoe (mussel)	*Pleurobema pyriforme*	FE
Purple bankclimber (mussel)	*Elliptoideus sloatianus*	FT
Round ebonyshell	*Reginaia rotulata*	FE
Shinyrayed pocketbook (mussel)	*Hamiota subangulata*	FE
Southern kidneyshell	*Ptychobranchus jonesi*	FE

Southern sandshell	*Hamiota australis*	FT
Stock Island tree snail	*Orthalicus reses [not incl. nesodryas]*	FT
Suwannee moccasinshell	*Medionidus walkeri*	FT
Tapered pigtoe	*Fusconaia burki*	FT

List Abbreviations

FWC	Florida Fish and Wildlife Conservation Commission
FE	Federally-designated Endangered
FT	Federally-designated Threatened
FXN	Federally-designated Threatened Nonessential Experimental Population
FT(S/A)	Federally-designated Threatened species due to similarity of appearance
NMFS	National Marine Fisheries Service
ST	State-designated Threatened
SSC	State Species of Special Concern
USFWS	United States Fish and Wildlife Service

List Notations

[1] A species for which the FWC does not have constitutional authority.
[2] Not documented in Florida.
[3] Lower Keys population only.

APPENDIX E
ADDITIONAL TARGET SPECIES THAT WS COULD ADDRESS IN FLORIDA

In addition to the species identified in Section 1.2, WS could also receive requests for assistance to manage damage and threats of damage associated with several additional nonnative species, but those requests would occur infrequently, or the requests would involve only a few individuals. Under Alternative 1, WS could receive requests for assistance to use lethal methods to remove those species when nonlethal methods were ineffective or were determined to be inappropriate using the WS Decision Model. The number of individuals from a target species that WS could remove from a population using lethal methods would be dependent on the number of requests for assistance received, the number of individual reptiles and amphibians involved with the associated damage or threat, and the efficacy of methods employed.

Because those reptile and amphibian species are not native species in Florida, maintaining a local and/or statewide population at the lowest level, including extirpation, could be the goal of tribal authorities, the FFWCC, and other governmental/organizational entities. Activities conducted by WS under the proposed action alternative would occur within the goals and strategies outlined for those populations by a tribal authority, the FFWCC, other governmental/organization entities, and the property owner. Maintaining a local and/or statewide population at the lowest level possible could be the goal of tribal authorities, the FFWCC, other governmental/organizational entities, and/or a property owner. WS' activities would occur pursuant to Executive Order 13112 and Executive Order 13751. Executive Order 13112 and Executive Order 13751 directs federal agencies to address invasive species to the extent practicable and permitted by law. WS Directive 2.320 provides guidelines for WS' actions in the management of invasive species in fulfillment of Executive Order 13112. Those additional nonnative amphibians and reptiles that WS could address in Florida are listed below.

AMPHIBIANS

FROGS/TOADS

- Family: Bufonidae
  - Asian black-spotted toad — *Duttaphrynus melanostictus*
  - Cane toad — *Rhinella marina*
- Family: Eleutherodactylidae
  - Coqui frog — *Eleutherodactylus coqui*
  - Greenhouse frog — *Eleutherodactylus planirostris*
- Family: Hylidae
  - Cuban treefrog — *Osteopilus septentrionalis*
- Family: Pipidae
  - African clawed frog — *Xenopus laevis*

SALAMANDERS/NEWTS

- Family: Salamandridae
  - Oriental fire-bellied newt — *Cynops orientalis*
  - Spotless stout newt — *Paramesotriton labiatus*

REPTILES

CROCODILIANS

- Family: Alligatoridae

- Chinese alligator — *Alligator sinensis*
- Black caiman — *Melanosuchus niger*
- Broad-snouted caiman — *Caiman latirostris*
- Yacare caiman — *Caiman yacare*
- Cuvier's dwarf caiman — *Paleosuchus palpebrosus*
- Schneider's smooth-fronted caiman — *Paleosuchus trigonatus*

- Family: Crocodylidae
  - African slender-snouted crocodile — *Mecistops cataphractus*
  - American crocodile — *Crocodylus acutus*
  - Australian freshwater crocodile — *Crocodylus johnstoni*
  - Cuban crocodile — *Crocodylus rhombifer*
  - Dwarf crocodile — *Osteolaemus tetraspis*
  - Morelet's crocodile — *Crocodylus moreletii*
  - Mugger crocodile — *Crocodylus palustris*
  - New Guinea freshwater crocodile — *Crocodylus novaeguineae*
  - Nile crocodile — *Crocodylus niloticus*
  - West African crocodile — *Crocodylus suchus*
  - Orinoco crocodile — *Crocodylus intermedius*
  - Philippine crocodile — *Crocodylus mindorensis*
  - Saltwater crocodile — *Crocodylus porosus*
  - Siamese crocodile — *Crocodylus siamensis*
- Family: Gavialidae
  - Gharial — *Gavialis gangeticus*
  - Tomistoma — *Tomistoma schlegelii*

LIZARDS

Suborder: Autarchoglossa

- Family: Cordylinae
  - Gorongosa girdled lizard — *Smaug mossambicus*
- Family: Helodermatidae
  - Gila monster — *Heloderma suspectum*
  - Mexican bearded lizard — *Heloderma horridum*
- Family: Scincidae
  - Cunninghams skink — *Egernia cunninghami*
  - Blue tongued skink — *Tiliqua scincoides*
  - Ocellated skink — *Chalcides ocellatus*
  - Five-lined mabuya — *Trachylepis quinquetaeniata*
- Family: Teiidae
  - Subfamily: Tupinambinae
    - Gold tegu — *Tupinambus teguixin*
  - Subfamily: Teiinae
    - Giant ameiva — *Ameiva ameiva*
    - Dusky giant ameiva — *Ameiva praesignis*
    - Giant whiptail — *Aspidoscelis motaguae*
    - Rainbow whiptail — *Cnemidophorus lemnicatus*
- Family: Varanidae

- White-throated monitor — *Varanus albigularis*
- Blue-tailed monitor — *Varanus doreanus*
- Peach-throated monitor — *Varanus jobiensis*
- Argus monitor — *Varanus panoptes*
- Roughneck monitor — *Varanus rudicollis*
- Crocodile monitor — *Varanus salvadorii*
- Asian water monitor — *Varanus salvator*

Suborder: Iguania

- Family: Agamidae
  - Subfamily: Agaminae
    - Bearded Dragon — *Pogona vitticeps*
    - Frilled Dragon — *Chlamydosaurus kingii*
  - Subfamily: Amphibolurinae
    - Chinese Water Dragon — *Physignathus cocincinus*
  - Subfamily: Draconinae
    - Oriental Garden Lizard — *Calotes versicolor*
  - Subfamily: Leiolepidinae
    - Common Butterfly Lizard — *Leiolepis belliana*
    - Red-Banded Butterfly Lizard — *Leiolepis rubritaeniata*
    - Hispaniolan Curlytail Lizard — *Leiocephalus schreibersii*
  - Subfamily: Uromasticinae
    - North African Spiny-tailed Lizard — *Uromastyx acanthinura*
    - Egyptian Uromastyx — *Uromastyx aegyptia aegyptia*
    - Leptien's Uromastyx — *Uromastyx aegyptia leptieni*
    - Arabian Spiny Tailed Lizard — *Uromastyx aegyptia microlepis*
    - Schmidt's Spiny-tailed Lizard — *Uromastyx alfredschmidti*
    - Yemeni spiny-tailed lizard — *Uromastyx benti*
    - Southern Saharan Spiny-tailed Lizard — *Uromastyx dispar dispar*
    - Banded Uromastyx — *Uromastyx dispar flavifasciata*
    - Mali Uromastyx — *Uromastyx dispar maliensis*
    - Geyr's Spiny-tailed Lizard — *Uromastyx geyri*
    - Macfadyen's Spiny-tailed Lizard — *Uromastyx macfadyeni*
    - Moroccan Spiny Tailed Lizard — *Uromastyx nigriventris*
    - Eyed Spiny-tailed Lizard — *Uromastyx ocellata*
    - Western Giant Spiny-tailed Lizard — *Uromastyx occidentalis*
    - Ornate mastigure — *Uromastyx ornata ornate*
    - Arabian Blue Uromastyx — *Uromastyx ornata philbyi*
    - Princely Spiny-tailed Lizard — *Uromastyx princeps*
    - Shobrak's Spiny-tailed Lizard — *Uromastyx shobraki*
    - Omani Uromastyx — *Uromastyx thomasi*
    - Rainbow Benti — *Uromastyx yemenensis*
- Family: Chamaeleonidae
  - Veiled Chameleon — *Chamaeleo calyptratus*
- Family: Gekkonidae
  - Golden Gecko — *Gekko badenii*
  - Tokay Gecko — *Gekko gecko*

- Yellow-headed Gecko — *Gonatodes albogularis*
- Common House Gecko — *Hemidactylus frenatus*
- Indo-Pacific Gecko — *Hemidactylus garnotii*
- Tropical House Gecko — *Hemidactylus mabouia*
- Flat-tailed Gecko — *Hemidactylus platyurus*
- Mediterranean House Gecko — *Hemidactylus turcicus*
- Mourning Gecko — *Lepidactylus lugubris*
- Golden Dust Day Gecko — *Phelsuma laticauda*
- Ocellated Gecko — *Sphaerodactylus argus*
- Ashy Gecko — *Sphaerodactylus elegans*
- White-spotted Wall Gecko — *Tarentola annularis*
- Moorish Gecko — *Tarentola mauritanica*

- Family: Iguanidae
  - Subfamily: Corytophanidae
    - Green Basilisk — *Basiliscus plumifrons*
  - Subfamily: Crotaphytidae
    - Baja Leopard Lizard — *Gambelia copeii*
  - Subfamily: Iguaninae
    - Mexican Spinytail Iguana — *Ctenosaura pectinate*
  - Subfamily: Phrynosomatidae
    - Texas Horned Lizard — *Phrynosoma cornutum*
  - Subfamily: Polychrotinae
    - Cuban Knight Anole — *Anolis equestris*
    - Giant Anole — *Anolis recordii*
    - Hispaniolan Green Anole — *Anolis chlorocyanus*
    - Puerto Rican Crested Anole — *Anolis cristatellus*
    - Large-headed Anole — *Anolis cybotes*
    - Bark Anole — *Anolis distichus*
    - Knight Anole — *Anolis equestris*
    - Jamaican Giant Anole — *Anolis garmani*
    - Cuban Green Anole — *Anolis porcatus*
    - Cuban Brown Anole — *Anolis sagrei*
    - Saint Vincent's Bush Anole — *Anolis trinitatus*
  - Subfamily: Tropiduridae
    - Peters lava lizard — *Tropidurus hispidus*

SNAKES

Suborder: Serpentes

- Family: Boidae
  - True boas — *Boa constrictor spp.*
    - Red-tailed boas — *Boa constrictor constrictor*
  - Northern boa — *Boa imperator*
  - Bevel-nosed boas or keel-scaled boas — *Candoia spp.*
  - West Indian boas — *Chilabothrus spp.*
  - Neotropical tree boas — *Corallus spp.*
  - Rainbow boas — *Epicrates spp.*

- Anacondas — *Eunectes spp.*
  - Green Anaconda — *Eunectes murinus*
  - Yellow Anaconda — *Eunectes notaeus*
  - DeSchauensee's anaconda — *Eunectes deschauenseei*
- Family: Pythonidae
  - Children's pythons — *Antaresia spp.*
  - Papuan olive python — *Apodora papuana*
  - Black-headed python — *Aspidites melanocephalus*
  - Woma python — *Aspidites ramsayi*
  - New Guinea pythons — *Bothrochilus spp.*
  - Water python — *Liasis fuscus*
  - Macklot's python — *Liasis mackloti*
  - Olive python — *Liasis olivaceus*
  - Reticulated pythons — *Malaopython spp.*
  - Amethystine python — *Morelia amethistina*
  - Bredl's python — *Morelia bredi*
  - Rough-scaled python — *Morelia carinata*
  - Scrub python — *Morelia kinghorni*
  - Oenpelli python — *Morelia oenpeliensis*
  - Carpet python — *Morelia spilota*
  - Green tree python — *Morelia viridis*
  - Indian python — *Python molurus*
  - Sumatran short-tailed python — *Python curtus*
  - Bornean short-tailed python — *Python breitensteini*
  - Angolan python — *Python anchietae*
  - Brongersma's short-tailed python — *Python brongersmai*
  - Myanmar short-tailed python — *Python kyaiktiyo*
  - Ball Python — *Python regius*
  - Scrub python — *Simalia amethistina*
  - Boelen's python — *Simalia boeleni*
  - Mollucan python — *Simalia clastolepis*
  - Australian scrub python — *Simalia kinghorni*
  - Tanimbar python — *Simalia nauta*
  - Oenpelli python — *Simalia oenpelliensis*
  - Halmahera python — *Simalia tracyae*
- Family: Colubridae
  - Subfamily: Colubrinae
    - Sinaloan milksnake — *Lampropeltis triangulum sinaloae*
    - Honduran milksnake — *Lampropeltis triangulum hondurensis*
    - Gray-banded kingsnake — *Lampropeltis alterna*
    - California Kingsnake — *Lampropeltis californiae*
  - Subfamily: Dipsadinae
    - Mussurana — *Clelia Clelia*
  - Non-front fanged Colubroids
    - Boomslang — *Dispholidus typus*
    - Vine snakes — *Thelotornis spp.*
    - Red necked keelbacks — *Rhabdophis spp.*

        - Montpelier snake — *Malpolon monspessulanus*
        - Lichtenstein's Green Racer — *Philodryas olfersii*
        - Asian green whipsnake — *Ahaetulla nasuta*
        - African many spotted snake — *Amplorhinus multimaculatus*
        - Sri Lankan keelback — *Balanophis ceylonensis*
        - Cat-eyed snakes — *Boiga spp.*
            - Brown tree snake — *Boiga irregularis*
        - Indian dog faced water snake — *Cerberus rhynchops*
        - African racer — *Coluber spp.*
        - African herald snake — *Crotaphopeltis hotamboeia*
        - Asian rainbow water snake — *Enhydris enhydris*
        - Madagascan snake — *Madagascarophis meridionalis*
        - African hooded malpolon — *Malpolon moilensis*
        - Egyptian Hissing Sand Snake — *Psammophis sibilans*
        - African skaapstekers — *Psammophylax spp.*
        - African tiger snake — *Telescopus semiannulatus*
- Family: Homalopsidae
    - Tentacled Snake — *Erpeton tentaculatum*
- Family: Acrochordidae
    - Javan Filesnake — *Acrochordus javanicus*
- Family: Lamprophiidae
    - Malagasy leaf-nosed snake — *Langaha madagascariensis*
    - Subfamily: Atractaspidinae
        - Glossy snakes — *Amblyodipsas spp.*
        - African rear fanged snakes — *Aparallactus spp.*
        - Stiletto snakes — *Atractaspis spp.*
        - Revoil's short snake — *Brachyophis revoili spp.*
        - Two-headed snakes — *Chilorhinophis spp.*
        - Jan's snake — *Elapotinus picteti*
        - Wedge-Snouted Burrowing Snake — *Hypoptophis wilsoni*
        - Kwazulu-Natal Black Snake — *Macrelaps microlepidotus*
        - Kenya two-headed snake — *Micrelaps bicoloratus,*
        - Muller's snake — *Micrelaps muelleri*
        - Somali two-headed snake — *Micrelaps vaillanti*
        - Cameroon Racer — *Poecilopholis cameronensis*
        - African rear fanged snakes — *Polemon spp.*
        - African rear fanged snakes — *Xenocalamus spp.*
- Family: Elapidae
    - Shield-nosed cobras — *Aspidelaps spp.*
    - Water cobras — *Boulengerina spp.*
    - Kraits — *Bungarus spp.*
    - Asian coral snakes — *Calliophis spp.*
    - Mambas — *Dendroaspis spp.*
    - Venomous garter snakes — *Elapsoidea spp.*
    - Rinkhals — *Hemachatus spp.*
    - Barred coral snakes — *Hemibungarus spp.*
    - Sonoran coral snake — *Micruroides euryxanthus*

- Venomous coral snakes — *Micrurus spp.*
- True cobras — *Naja spp.*
- King cobra — *Ophiophagus hannah*
- Many-banded Snake — *Paranaja multifasciata*
- Tree cobras — *Pseudohaje spp.*
- Desert Cobra — *Walterinnesia aegyptia*

- Family: Viperidae
  - African bush vipers — *Atheris spp.*
  - African puff adders — *Bitis spp.*
  - African night adders — *Causus spp.*
  - African horned adders — *Cerastes spp.*
  - Russell's viper — *Daboia russelii*
  - African & West Asian saw scaled vipers — *Echis spp.*
  - Eurasian vipers — *Macrovipera spp.*
  - Middle East horned vipers — *Pseudocerastes spp.*
  - European vipers — *Vipera spp.*
  - North American pit vipers — *Agkistrodon spp.*
  - Central American jumping pit vipers — *Atropoides spp.*
  - Central American palm pit vipers — *Bothriechis spp.*
  - South & Central American pit vipers — *Bothrops spp.*
  - Malayan pit viper — *Calloselasma rhodostoma*
  - Central American montane pit vipers — *Cerriphidion spp.*
  - Rattlesnakes — *Crotalus spp.*
  - Chinese hundred pace viper — *Deinagkistrodon acutus*
  - Asian terrestrial pit vipers — *Gloydius spp.*
  - Sri Lankan hump nosed vipers — *Hypnale spp.*
  - Central & South American bushmasters — *Lachesis spp.*
  - Central American horned pit vipers — *Ophryacus spp.*
  - Asian montane pit vipers — *Ovophis spp.*
  - Central American montane pit vipers — *Porthidium spp.*
  - North American pygmy rattlesnakes — *Sistrurus spp.*
  - Asian green pit vipers — *Trimeresurus spp.*
  - Asian tree vipers — *Tropidolaemus spp.*

Turtle/Tortoises

- Family: Testudinidae
  - Aldabra Giant Tortoise — *Aldabrachelys gigantea*
  - African Spurred Tortoise — *Centrochelys sulcata*
  - Red-footed Tortoise — *Chelonoidis carbonaria*
  - Yellow-footed Tortoise — *Chelonoidis denticulate*
  - Gopher Tortoise — *Gopherus polyphemus*
  - Asian Brown Giant Tortoise — *Manouria emys emys*
  - Home's Hingeback Tortoise — *Kinixys homeana*
  - Leopard Tortoise — *Stigmochelys pardalis*
  - Horsfield's Tortoise — *Testudo horsfieldii*
- Family: Emydidae
  - Southern Painted Turtle — *Chrysemys dorsalis*

- False Map Turtle — *Graptemys pseudogeographica pseudogeographica*
- Red-eared sliders — *Trachemys scripta elegans*