GOPHER TORTOISE MANAGEMENT PLAN

Gopherus polyphemus

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FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
620 South Meridian Street
Tallahassee, FL 32399-1600

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EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) published its first gopher tortoise (*Gopherus polyphemus*) management plan in 2007, and the gopher tortoise was reclassified from a Species of Special Concern to Threatened (68A-27 F.A.C.). This document is a revision of the 2007 Gopher Tortoise Management Plan, and is intended to guide the continued recovery of the gopher tortoise in Florida through 2022. Conservation objectives and actions from the original plan that have been completed or achieved in the first five years of implementation are included in Chapter 6 of this document. The listing history of the gopher tortoise in Florida also provides a good background and is included in Appendix 1.

Significant conservation and economic events have influenced revisions to this management plan. As a result, the revised goal and objectives shift the focus away from the regulation and permitting of gopher tortoises that was implemented under the 2007 draft of the plan, to additional conservation actions emphasizing a non-regulatory approach to conserving this species. The Gopher Tortoise Management Plan approved in 2007 included an extensive framework for new permitting guidelines to transition away from the now former incidental take and standard relocation permits. Working closely with stakeholders, FWC staff created detailed relocation guidelines based on the framework in the 2007 management plan; these high-priority permitting guidelines were approved by the Commissioners and were fully implemented in 2009. Additionally, it is important to note that the economy of Florida was much different when the first plan was drafted in 2006-2007. The plan was approved and implementation began at the start of a major recession. Although considerable progress was made, and many of the objectives were achieved, much of the foundation of the plan was based on a robust economy and booming development industry. Finally, the status of the gopher tortoise in the eastern portion of the species' range has also changed. In July 2011, the U.S. Fish and Wildlife Service (USFWS) completed the 12-month status review for the gopher tortoise and found that the species is warranted for federal listing as Threatened under the Endangered Species Act (ESA), but precluded due to higher priority listing activities. Because the gopher tortoise is currently a "Candidate" species, scientists and policy makers throughout the species' range have focused attention on proactively implementing beneficial conservation measures now to prevent it from becoming federally-listed in the future. Numerous other factors affecting the conservation of gopher tortoises have also played a role in revisions to the management plan; however, FWC staff and stakeholders have thoroughly considered these 3 significant events during the extensive revision of this plan.

The gopher tortoise is a moderate-sized, terrestrial turtle, averaging 23-28 cm (9-11 in) long. The species is identified by its stumpy, elephantine hind feet and flattened, shovel-like forelimbs adapted for digging. The shell is oblong and generally tan, brown, or gray. The gopher tortoise occurs in the southeastern Coastal Plain from southeastern South Carolina to extreme southeastern Louisiana (Auffenberg and Franz 1982). The gopher tortoise is endemic to the United States, and Florida represents the largest portion of the total global range of the species. Gopher tortoises remain widely distributed in Florida, occurring

in parts of all 67 counties. The burrows of the tortoise also provide refuge for more than 350 other species (called "commensals"), including some species that are currently state and federally listed in Florida.

The current cause of imperilment of the gopher tortoise, as identified by the final Biological Status Report (Enge *et al.* 2006a), is the rate of population decline, inferred from loss of habitat. The new Gopher Tortoise Permitting Guidelines (approved April 2008, as amended) ensure the humane and responsible relocation of all gopher tortoises from development sites. Furthermore, FWC no longer issues incidental take permits that allow entombment of tortoises. As a result of this new permitting program, the rate of decline of the species can no longer be evaluated solely by habitat loss. Therefore, the overarching objective for this management plan is to incur no net loss of gopher tortoises from the time of plan approval in 2012 through 2022. The ultimate goal for gopher tortoise conservation is to restore and maintain secure, viable populations of gopher tortoises throughout Florida so the species no longer warrants state listing. The plan establishes the measurable overarching objective that works towards decreasing the rate of population decline of the gopher tortoise because it is necessary to immediately decrease the rate of decline so that the ultimate conservation goal can be achieved (*i.e.,* < 30% over 3 generations to evaluate the Threatened designation and potentially delist the species if it does not meet any of the criteria for listing outlined in 68A-27 F.A.C.).

For this 10-year plan, the overarching objective of no net loss of gopher tortoises will be accomplished by meeting all of the following objectives:

(1) Minimize the loss of gopher tortoises by 2022 by ensuring humane and responsible relocation of all gopher tortoises from lands proposed for development, minimizing illegal harvest of tortoises, creating best management practices (BMPs) for agricultural and silvicultural lands, implementing methods to reduce juvenile mortality, reducing loss of tortoises to disease, and reducing vehicle-related mortality through education and exclusion measures.

(2) Increase and improve gopher tortoise habitat by 2022. This will require ongoing coordination with public agencies on the management of gopher tortoise habitat on protected lands in addition to restoring degraded lands with potential gopher tortoise habitat. Both public and private land acquisition averaging 57,000 acres per year will help to conserve the species distribution and maintain wildlife corridors between undeveloped lands. Identifying addition incentives to encourage habitat management and conservation easements on private lands is instrumental to increasing the acres of managed and protected habitat.

(3) Enhance and restore gopher tortoise populations where the species no longer occurs or has been severely depleted on protected, suitable lands by 2022. This will require an evaluation of protected lands to determine where gopher tortoise populations are depleted and the condition of the habitat. Implementation of a range-wide population monitoring protocol to help evaluate the status of the species throughout Florida will help to determine where gopher tortoise populations need to be restored.

(4) Maintain the gopher tortoise's function as a keystone species by 2022 by addressing specific management needs and creating guidelines for relocation of priority commensal species from development sites as appropriate. Best management practices for priority commensal species on agricultural and silvicultural lands will also be created, and land managers and the general public will be targeted with information about the broader role of the gopher tortoise as a keystone species.

The plan presents a suite of conservation strategies and actions that serve to achieve the conservation objectives. These strategies and actions are best accomplished by applying an adaptive management approach that allows for easy adjustments to policies, guidelines, and techniques based on observed conservation benefits/detriments and sound science. The actions are organized into the following broad sections: regulations, permitting, local government coordination, law enforcement, habitat protection, habitat management, population management, disease management, incentives, monitoring, education and outreach, and research. A new chapter addressing the conservation of commensals is included and contains a suite of actions that help to conserve priority commensals and more than 350 other animal species documented to use gopher tortoise burrows.

Conservation and recovery of the gopher tortoise through the implementation of this plan will require the cooperation of local governments; regional, state, and federal agencies; non-governmental organizations; business interests; and the public. Although this plan was developed by FWC in collaboration with the stakeholders, it cannot be successfully implemented without significant direct involvement of these agencies and non-governmental organizations.

Public comment and outside review were formally solicited and incorporated at several junctures during the revision of this management plan. A stakeholder core assistance group provided initial input on many of the revisions as they were completed. Additionally, 3 public stakeholder meetings provided an opportunity for the public to provide both verbal and written input on the revisions to the plan. These meetings were noticed through FWC's gopher tortoise listserv that reaches more than 230 members of the public. An additional public comment period was noticed in the Florida Administrative Weekly to solicit input on draft revisions of the management plan. In addition to soliciting input from the public, FWC reached out to its partners in Georgia, Alabama, and South Carolina; the U.S. Department of Defense; and the U.S. Fish and Wildlife Service to obtain their input on the revisions to the plan. Lastly, input from subject matter experts on gopher tortoises and associated conservation actions was obtained throughout the management plan revision process.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ARC	Acquisition and Restoration Council
ASPCA	American Society for the Prevention of Cruelty to Animals
BSR	Biological Status Report
CCA	Candidate Conservation Agreement
CCAA	Candidate Conservation Agreement with Assurances
CFR	Code of Federal Regulation
DEP	Florida Department of Environmental Protection
DOT	Florida Department of Transportation
ESA	Endangered Species Act
F.A.C.	Florida Administrative Code
FAQ	frequently asked question
FNAI	Florida Natural Areas Inventory
F.S.	Florida Statutes
FTE	full time equivalent
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute, FWC
FY	Fiscal Year
GIS	geographic information system
GPS	global positioning system
GTTAG	Gopher Tortoise Technical Assistance Group
HSC	FWC Division of Habitat and Species Conservation
INRMP	Integrated Natural Resource Management Plan
IUCN	International Union for Conservation of Nature
LE	FWC Division of Law Enforcement
NGO	non-governmental organization
OCO	operating capital outlay
NRCS	Natural Resources Conservation Service
SHA	Safe Harbor Agreement
TNC	The Nature Conservancy
URTD	upper respiratory tract disease
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service

GLOSSARY

anthropogenic - of human origins; human-related; caused by humans.

asters - plants in the sunflower family.

basal area – the cross-section area of a tree stem in square ft, usually measured at breast height (4.5 ft). The basal area of a forest stand is calculated by adding the basal area of all the trees and dividing by the acreage of land (expressed as square ft per acre).

best management practices (wildlife) - practical, cost-effective actions that agricultural and silvicultural producers can undertake to reduce the potential for take of state-listed species.

biodiversity - the variety of all forms of life. Gopher tortoises contribute to plant and animal diversity through their burrowing habits.

biomass - the total weight of living organisms in a given area.

burrow occupancy rate - also known as a correction factor, this is the percentage of gopher tortoise burrows on a particular site that are occupied at a given time (tortoises generally use more than 1 burrow over time).

canopy cover - layer of vegetation extending above head height, usually composed of tree branches.

carrying capacity - the maximum number of individuals of a species that an area can support, given the amount and quality of food, water, and cover.

clutch - all the eggs produced by 1 bird or reptile at a single time.

commensal - living in a relationship in which 1 animal derives food, refuge, or other benefits from another animal without hurting or helping the other animal. The term commensal in this document excludes exotic species and species rarely found in tortoise burrows. A species is considered a priority commensal species for this document due to its listed status, dependence on the gopher tortoise burrow community, or identification as such by stakeholders and biologists.

connectivity (habitat) - the desirable linking or joining of isolated small areas of similar habitat to create larger interconnected blocks to potentially reduce the effects of fragmentation.

conservation easement - a voluntary legal agreement between a landowner and a land trust or government agency that limits the type or amount of development on the landowner's property, thus protecting the land's conservation value while retaining private ownership.

degradation (habitat) - a lowering in quality of habitat for gopher tortoises, often related to lack of prescribed fire or other management.

donor site - the property, usually a development, from which tortoises are removed during relocations.

dorsal – situated on or toward the upper side of the body.

ecological niche - where an organism lives and what it does (*i.e.,* how it fits into its environment). If a gopher tortoise's habitat is its address, then its niche is its role or profession, biologically speaking.

endemic - exclusively native to a particular geographic area.

epidemiological – referring to the study of causes and distribution of disease in populations.

epizootic – an outbreak of disease affecting a large number of animals at 1 time within a particular region or geographic area.

fecundity - potential capacity of an organism or population to reproduce. In gopher tortoises, a low number of eggs and slow growth to sexual maturity translate to low fecundity.

flatwoods - common upland habitat characterized by flat terrain, moderately to poorly drained soils, scattered pine trees, saw palmetto, and various other shrubs, forbs, and grasses. Gopher tortoises tend to burrow in the better drained portions of this habitat.

forage - plant material, such as grasses, legumes, and other flowering plants, eaten by grazing animals.

forb - a flowering plant with a non-woody stem that is not a grass.

fossorial - refers to an animal adapted to digging and living underground.

founder effect – the reduced genetic diversity when a population is descended from a small population of colonizing ancestors.

fragmentation (habitat) - a process of environmental change, usually caused by human-related land clearing, where once connected habitats are now in (often scattered) pieces.

genotypic assemblage - gopher tortoise populations that have a similar genetic (hereditary) make-up and that occur in a certain area.

GIS - geographic information system: a computer-based system used for storage, retrieval, mapping, and analysis of geographic data. GIS is used for mapping potential gopher tortoise habitat in Florida.

gopher tortoise (*Gopherus polyphemus*) - a moderate-sized, terrestrial turtle, with stumpy, elephantine hind feet and flattened, shovel-like forelimbs adapted for digging.

ground cover - herbaceous plants and the lowest shrubs occupying an area: a generic term used to describe the mat of plants found on the forest floor.

ground truth - checking GIS or other computer-generated information by going to specific locations and performing observations and measurements to determine the accuracy of computer-based habitat mapping.

habitat - the place where a gopher tortoise lives that provides all its needs for food and shelter.

herbaceous - refers to non-woody plants, generally green and leafy in appearance and texture.

herpesvirus - an infectious agent that has been associated with respiratory disease and infections of the mouth and nasal passages.

human predation - the taking or harvest of gopher tortoises for food (now illegal).

incidental take - any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. As related to gopher tortoises, potential gopher tortoise mortality, direct (*e.g.,* heavy machinery) or indirect (*e.g.,* entombment), that could occur during land development.

invasive species – plants or animals that are not native to a region, which when introduced accidentally or intentionally out-compete native species for available resources, reproduce prolifically, and dominate regions or ecosystems.

invertebrate – an animal that lacks a backbone, *e.g.,* an insect.

iridovirus - an infectious agent that has been associated with respiratory disease and infections of the mouth and nasal passages.

keystone species - a plant or animal that increases or decreases the diversity of an ecosystem, depending on its abundance or rarity. The gopher tortoise is a keystone species in upland habitats in Florida.

legumes - plants in the bean family.

mark-recapture - method used in wildlife research that involves capturing animals, marking them, releasing them, then recapturing some of the same individuals during 1 or more recapture periods.

mesic (habitat) - having a moderate or well-balanced supply of moisture.

midstory - the middle layer, generally 3-9 ft in height, of trees and shrubs (in a multi-layered forest) shaded by taller trees.

minimum convex polygon - a method of determining the home range of an individual or group of animals by connecting the outermost known location data points for a particular period of time.

mitigation contribution - compensation, usually either in the form of monetary contributions or protected habitat donated, to offset the ill effects of human-related land change (*e.g.,* development) on gopher tortoise populations.

mitigation parks - select lands with gopher tortoise populations that have been acquired, permanently protected, and managed using mitigation funds. Such preserves help to offset the loss of habitat from urbanization.

mutualist – refers to a relationship between species where both derive benefits.

mycoplasma - an infectious agent (bacterium) that has been associated with upper respiratory tract disease in gopher tortoises.

obligate – a species confined to a narrow range of conditions; in this case, an obligate species would be dependent on gopher tortoise burrows.

on-site (relocation) - an area that is located within the same boundaries (as defined in the legal description or as identified by the county parcel identification number) of the development area from which tortoises or commensals are to be removed and which is under the same ownership as the development area.

parasite - an organism that lives in or on another (the host), from which it obtains food, shelter, or other requirements at the expense of the host.

plantar tubercles – small pads on the feet of Florida mice, used to distinguish them from other similar species.

population - a group of individuals of the same species that occur in a defined area at the same time and regularly interact or interbreed.

population augmentation - to enlarge or increase a population, in this case by adding individuals to a population not currently from that population.

potential gopher tortoise habitat - those land cover types and soil associations that are known to support the life history requirements of the gopher tortoise. These habitats include, but are not limited to, sandhill, scrub, scrubby flatwoods, pine flatwoods, dry prairie, coastal strand, xeric hammock, mixed pine-hardwoods, and disturbed habitats on suitably drained soils. Designation of an area as potential gopher tortoise habitat does not indicate that the area is currently inhabited by gopher tortoises.

predation - hunting and killing another animal for food.

prescribed fire (controlled burning) - a planned fire applied within a particular land area under the right weather conditions to accomplish specific, well-defined management objectives.

protected lands (habitat) - Public or private lands that provide significant conservation and protection for imperiled wildlife, in this case the gopher tortoise, and are protected from imminent development or alteration, thereby ensuring present and future generations' access to important wildlife resources. Habitat protection can be accomplished through fee simple ownership, acquisition of less-than-fee interests, or other agreements associated with landowner incentive programs.

radio-instrumentation (telemetry) - attaching a small radio transmitter to a gopher tortoise's shell to allow tracking of its movements. The transmitter emits radio signals that are detected using a hand-held antenna and receiver.

recipient site - the property where relocated tortoises are released. Different types of recipient sites are based on the habitat protection provided. The types of recipient sites include public or private lands with long-term protection, short-term protection, or no protection as defined in the Gopher Tortoise Permitting Guidelines.

refugia – areas in which organisms can survive during periods of unfavorable conditions.

relocation - deliberately moving wild gopher tortoises or commensal species.

rescue relocation - deliberately moving individuals or groups of tortoises to areas that are typically unprotected, and may be relatively small, disturbed, or inadequately managed to support long-term population viability. Rescue relocation is conducted primarily to remove wild gopher tortoises from human-caused harm.

responsible relocation - deliberately moving wild gopher tortoises into protected, managed, suitable habitat where their future survival and long-term population viability are very likely.

restocking - deliberately moving wild gopher tortoises into protected, managed, suitable habitat where resident densities are extremely low and where the tortoises' future survival and long-term population viability are very likely.

restocking site - an area of protected, managed, suitable habitat where gopher tortoise populations have been severely depleted or eliminated.

roller-chopping - a forestry method for preparing sites for planting pine trees; also used as a land management tool to reduce the height and density of understory vegetation. A bulldozer pulls a heavy cylindrical drum with cutting blades that chop vegetation.

sandhill - upland habitat on gently rolling terrain that has deep, sandy soils; longleaf pine; xeric-adapted oaks; and wiregrass.

scrub - upland xeric shrub habitat with or without sand pines, that has deep, sandy soils; evergreen oaks; and scattered bare patches of sand.

seronegative – negative blood test indicating no immune response to the bacteria that cause upper respiratory tract disease in gopher tortoises.

seropositive - positive blood test indicating an immune response (exposure) to the bacteria that cause upper respiratory tract disease in gopher tortoises.

seroprevalence - rate of occurrence of seropositive status in a population or sample; used as a criterion of comparison between populations or samples.

shrub - a woody plant (height variable) that has several stems arising from the base and lacks a single trunk.

silviculture - the art and science of establishing and growing healthy, high quality forests to meet human needs.

site fidelity - remaining within a particular area.

soft release (relocation) - those releases where relocated animals are contained in an enclosure at the recipient site for some period of time before being allowed to roam freely; this differs from hard releases where animals are turned loose without any period to acclimate to their new surroundings.

stewardship - taking good care of natural resources.

succession (habitat) - predictable and orderly changes in plant composition or structure over time.

take - to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in such conduct. The term “harm” in the definition of take means an act which actually kills or injures fish or wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. The term “harass” in the definition of take means an intentional or

negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering (Chapter 68A-27 F.A.C.[1]).

terrestrial - living on land.

understory - the lowest vegetative layer in a forest, consisting of woody and herbaceous growth less than 3 ft in height.

univoltine – refers to organisms having 1 brood per year.

upland (habitat) - high, generally dry, lands that are not wetlands (water).

upper respiratory tract disease - a disease that occurs in gopher tortoises, where infected individuals may show a discharge from the nasal passages or eyes, swelling of the eyelids or area around the eyes, or reddened third eyelid. These so-called clinical signs (*i.e.,* symptoms) come and go over time.

ventral - situated on or close to the abdomen or lower surface of the body.

viable population - a stable, self-sustaining population with a high likelihood (*e.g.,* more than 95%) of surviving for a long-term period (*e.g.,* 100 years).

waif tortoise - a gopher tortoise that has been removed from the wild but is not associated with a permitted relocation effort and is generally from an unknown location.

xeric (habitat) - very dry, in this case due to soil characteristics.

CHAPTER 1: BIOLOGICAL BACKGROUND

This chapter provides a brief summary of information on selected aspects of the biology and life history of the gopher tortoise. For more detailed reviews and information on the biology and conservation of this species, the reader may reference the Biological Status Report (BSR) for the Gopher Tortoise (Enge et al. 2006a), Mushinsky et al. 2006, or Ashton and Ashton 2008.

Taxonomic Classification

Gopher tortoises are members of the Class Reptilia, Order Testudines, and Family Testudinidae. Of five North American tortoise species (genus *Gopherus*), the gopher tortoise (*G. polyphemus*) is the only one that occurs east of the Mississippi River.

Life History and Habitat

The gopher tortoise is a moderate-sized, terrestrial turtle, averaging 23-28 cm (9-11 in) long. The species is identified by its stumpy, elephantine hind feet and flattened, shovel-like forelimbs adapted for digging. The shell is oblong and generally tan, brown, or gray; hatchlings are yellowish-orange.

The gopher tortoise typically inhabits uplands, especially those with relatively well-drained, sandy soils. The gopher tortoise is generally associated with longleaf pine (*Pinus palustris*) and xeric oak (*Quercus* spp.) sandhills but also occurs in scrub, xeric hammock, pine flatwoods, dry prairie, coastal grasslands and dunes, mixed hardwood-pine communities, and a variety of disturbed habitats (Auffenberg and Franz 1982; Kushlan and Mazzotti 1984; Diemer 1986, 1987, 1992b; Breininger *et al.* 1994; Ashton and Ashton 2008). Gopher tortoises dig burrows that average 4.5 m (14.8 ft) long and 2 m (6.6 ft) in depth (Hansen 1963). Ashton and Ashton (2008) recorded their longest burrow as 20.5 m (67 ft). These burrows, which provide protection from temperature extremes, moisture loss, and predators, serve as a refuge for 350-400 other species, including listed commensal species such as the gopher frog (*Lithobates capito*), eastern indigo snake (*Drymarchon couperi*), Florida pine snake (*Pituophis melanoleucus mugitus*), and Florida mouse (*Podomys floridanus*) (Cox *et al.* 1987, Jackson and Milstrey 1989, Witz *et al.* 1991, Kent *et al.* 1997).

The gopher tortoise is slow to reach sexual maturity, has low fecundity, and has a long life span (Landers 1980). Females reach sexual maturity at 9-21 years of age, depending on local resource abundance and latitude; males mature at a slightly younger age (Landers *et al.* 1980, Diemer and Moore 1994, Mushinsky *et al.* 1994, Aresco and Guyer 1999). The breeding season is generally March - October (Johnson *et al.* 2007). Nests are excavated (often in burrow mounds) from mid-May to mid-June, and only 1 clutch is produced annually (Landers *et al.* 1980). Clutch size is usually 5 to 9 eggs, with an average of 6 (Diemer and Moore 1994, Butler and Hull 1996; see summary in Ashton *et al.* 2007). Incubation period is approximately 80-100 days, depending on latitude

The gopher tortoise is slow to reach sexual maturity, has low fecundity, and has a long life span.

(Iverson 1980, Landers *et al.* 1980). Predation on nests and hatchlings is heavy (Alford 1980, Landers *et al.* 1980, Butler and Sowell 1996, Smith 1997, Pike and Seigel 2006).

Gopher tortoise densities and movements are affected by the amount of herbaceous ground cover.

Gopher tortoises feed primarily on broadleaf grasses, wiregrass, grass-like asters, legumes, and fruits (Garner and Landers 1981, Macdonald and Mushinsky 1988), but they are known to eat >400 species of plants (Ashton and Ashton 2008). Tortoise densities and movements are affected by the amount of herbaceous ground cover (Auffenberg and Iverson 1979). Generally, feeding activity is confined to within 50 m (164 ft) of the burrow (Auffenberg and Franz 1982), but a tortoise may travel ≥100 m (328 ft) from its burrow for specific forage requirements (Ashton and Ashton 2008). Home range size varies with habitat type, season, and sex of the tortoise; moreover, considerable individual variation has been found (Diemer 1992b). Reported average home ranges for males have varied from 0.5 to 1.9 ha (1.2 to 4.7 ac). Females generally have smaller home ranges, with reported averages ranging from 0.1 to 0.6 ha (0.2 to 1.6 ac) (McRae *et al.* 1981, Diemer 1992b, Smith *et al.* 1997, Eubanks *et al.* 2003; see summary in Pike 2006). Each tortoise typically uses several burrows (McRae *et al.* 1981, Auffenberg and Franz 1982, Diemer 1992b), which complicates estimates of population density (McCoy and Mushinsky 1992b).

Distribution and Population Status

The gopher tortoise occurs in the southeastern Coastal Plain from southeastern South Carolina to extreme southeastern Louisiana (Auffenberg and Franz 1982); Figure 1. The gopher tortoise is endemic to the United States, and Florida represents the largest portion of the total global range of the species. Gopher tortoises remain widely distributed in Florida, occurring in parts of all 67 counties; however, their current range in south Florida is limited because of unsuitable habitat and increased urbanization (Diemer 1987, Mushinsky *et al.* 2006). Tortoise populations occur as far south as Cape Sable and on islands off Florida's east and west coasts (Auffenberg and Franz 1982, Kushlan and Mazzotti 1984).

Population estimates for the gopher tortoise in Florida are based on 2003 geographic information system (GIS) data indicating that the current extent of gopher tortoise habitat is approximately 3.3 million acres (Enge *et al.* 2006a). Using density information from McCoy *et al.* 2002 and population ratios of adult to immature tortoises from Diemer 1992a, the estimated number of adult tortoises approximately 785,000 (see Enge *et al.* 2006a for more detailed explanations of acreage and population estimates).

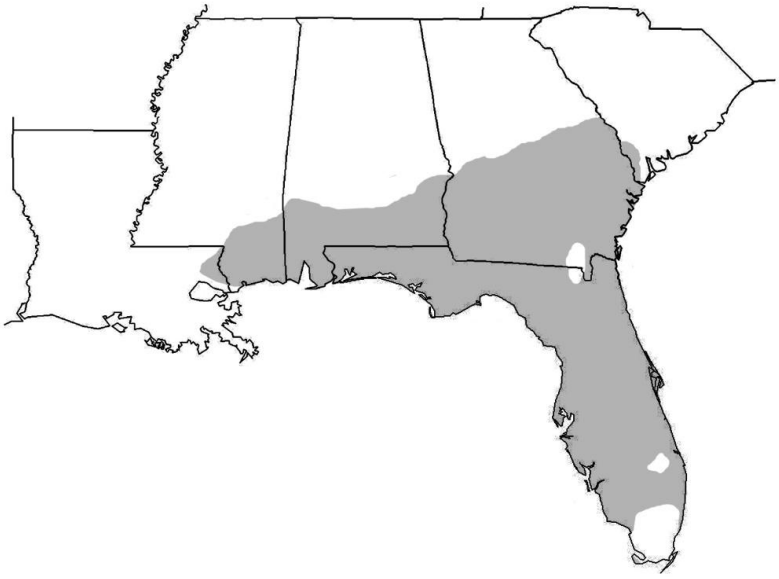


Figure 1. Distribution of the gopher tortoise in the southeastern United States.

Historic and Ongoing Conservation Efforts

Harvest of gopher tortoises has been regulated in Florida since 1972, and the species was fully protected in 1988 (Appendix 1). The introduction of toxic substances into burrows (*e.g.,* gassing to force rattlesnakes from their retreats) was prohibited in 1978, and the racing of gopher tortoises for charity purposes was ended in 1989. By the mid-1980s, impacts from development necessitated increasing regulatory focus. From 1984 to 2011, various policies, protocols, guidelines, and rules have addressed the impacts from urbanization on this imperiled species. In June 2006, the Florida Fish and Wildlife Conservation Commission (FWC) amended its rules to clearly provide protection to the burrows of gopher tortoises.

Originally state-listed as Threatened in 1975, the gopher tortoise was reclassified as a Species of Special Concern in 1979 when Florida's imperiled species listing criteria were modified. The species' status classification remained unchanged for nearly three decades. Associated with the Biological Status Report (BSR) published in 2006 (Enge *et al.* 2006a) and the approval of the original management plan, the gopher tortoise was reclassified as Threatened in 2007.

The gopher tortoise is currently listed by the U.S. Fish and Wildlife Service (USFWS) as Threatened in accordance with the federal Endangered Species Act (ESA) for populations occurring west of the Mobile and Tombigbee Rivers in Alabama, Mississippi, and Louisiana (50 CFR §17.11). The status of the gopher tortoise in its eastern range was evaluated by the USFWS in 2010-2011. The 12-month status review was published in the Federal Register (76(144):45130-45162) in July 2011 and included the finding that the species is warranted for federal listing under the ESA as Threatened, but precluded from

listing due to higher priority listing activities (U.S. Fish and Wildlife Service 2011). As such, it is currently considered as a Candidate species under the ESA. Candidate species are not subjected to federal regulations under the ESA, and current conservation actions can potentially help preclude the need for future federal listing in the eastern portion of the species' range. To foster an increased level of collaboration to actively conserve gopher tortoises, the Department of Defense, U.S. Forest Service, USFWS, FWC, Georgia Department of Natural Resources, South Carolina Department of Natural Resources, Alabama Division of Wildlife and Freshwater Fisheries, tribal organizations, and several non-governmental organizations (NGOs) entered into a Candidate Conservation Agreement (CCA) for the gopher tortoise in 2008 (as revised). The purpose of this voluntary agreement is to implement proactive and coordinated conservation activities that can, in turn, help preclude the need to list the gopher tortoise under the ESA.

Habitat protection has been and continues to be an important element of FWC's conservation strategy for this species. Past land acquisition efforts by FWC and other state agencies have focused on securing high quality natural communities because of the values these habitats provide to tortoises, burrow commensals, and other wildlife species. However, acquisition of conservation lands under Florida Forever has significantly decreased since the Gopher Tortoise Management Plan was approved in 2007. This is a result of the current economic downturn that has affected all of Florida (and most of the United States). Therefore, the revision of this plan includes a new approach to habitat protection through incentives and partnerships, more so than outright acquisition by FWC and other public agencies. Protection of quality native habitats will continue to be a priority, but restoration of potential habitat for gopher tortoises on public and private lands will also take priority when these activities contribute toward recovery of the gopher tortoise.

Many local governments have also made significant contributions to the conservation of gopher tortoises, primarily by preserving and managing habitat through various conservation programs, screening development activities to determine the need for a permit from FWC, and directly limiting impacts on tortoises. The FWC has coordinated with a number of counties regarding gopher tortoise mitigation and conservation since the 1980s and, under the plan, has organized annual workshops for local governments to enhance coordination and disseminate information critical to local conservation efforts.

CHAPTER 2: THREAT ASSESSMENT

Reason for Listing

In May 2002, Florida Fish and Wildlife Conservation Commission (FWC) staff introduced a petition (Gruver 2002) to reclassify the gopher tortoise from a "Species of Special Concern" (68A-27.005, F.A.C.) to a "Threatened" species (68A-27.004, F.A.C.). A team of scientists completed the Biological Status Report[2] (Enge *et al.* 2006a), and FWC Commissioners agreed that reclassification of the gopher tortoise was warranted. The status review found that the species meets Criterion A (population size reduction-inferred from loss of habitat) for classification as a Threatened species. The gopher tortoise was reclassified as Threatened in September 2007 following the management plan approval by the FWC Commission.

Present and Anticipated Threats

The primary threat to gopher tortoises in Florida is habitat destruction, fragmentation, and degradation, particularly from urbanization and development, agriculture, and phosphate/heavy metals mining (Diemer 1986, 1987; Berish [Diemer] 1991; McCoy and Mushinsky 1995; Berish 2001; Smith *et al.* 2006). Tortoise populations in the Florida Panhandle have been severely depleted by human predation and from habitat degradation resulting from fire suppression and planting dense stands of sand pine *(Pinus clausa*) in sandhill habitat (Auffenberg and Franz 1982; Diemer 1986, 1987; Berish 2001). Formerly large tortoise populations in the northern peninsula have been depleted by agriculture, human predation, and increasing development (Taylor 1982, Diemer 1987). In central Florida, urban growth and development, phosphate mining, and citrus production are the primary threats (Auffenberg and Franz 1982; Diemer 1986, 1987). In south Florida, tortoise habitat has been destroyed or degraded by urbanization, intensive agriculture, and invasive exotic plant species (Berish [Diemer] 1991, Berish 2001). Habitat fragmentation of rural areas by roads and increased vehicular traffic due to development result in increased road mortality of gopher tortoises, which are often drawn to roadsides because of available forage (Franz and Auffenberg 1978; Landers and Buckner 1981; Landers and Garner 1981; Lohoefener 1982; Diemer 1986, 1987; Berish 2001; Mushinsky *et al.* 2006).

The primary threat to gopher tortoises in Florida is habitat destruction, fragmentation, and degradation.

Degradation of tortoise habitat on silvicultural lands occurs when the canopy of pine plantations becomes closed and little or no understory forage is available to tortoises (Landers and Buckner 1981; Landers and Garner 1981; Auffenberg and Franz 1982; Diemer 1986, 1987; Berish 2001). Site preparation associated with pine silviculture reduces native ground cover, and the sparse cover of legume and non-legume forbs provides poor forage, resulting in slower tortoise growth rates and delayed sexual maturity (Aresco and Guyer 1999). Lack of prescribed fire or suppression of natural fires also results in canopy closure and reduced tortoise forage plants (Landers and Speake 1980; Landers and Garner 1981; Auffenberg and Franz 1982; Diemer 1986, 1987; Berish 2001). Local isolated populations of

gopher tortoises may persist for decades in overgrown habitat, but recruitment of young into these populations declines as the canopy increases and habitat quality decreases (McCoy and Mushinsky 1992a, Mushinsky and McCoy 1994).

Lack of prescribed fire or suppression of natural fires results in canopy closure and reduced tortoise forage plants.

The spread of exotic plant species such as Brazilian pepper (*Schinus terebinthifolius*), Australian pine (*Casuarina equisetifolia*), cogongrass (*Imperata cylindrica*), and hairy indigo (*Indigofera hirsuta*) also degrades tortoise habitat (Berish [Diemer] 1991, Hicklin 1994, Berish 2001, Basiotis *et al.* 2005, Smith *et al.* 2006). Cogongrass from Asia can quickly form a tall, dense ground cover that is unsuitable for the gopher tortoise, particularly on rangelands, pastures, roadsides, and reclaimed phosphate mines (Shilling *et al.* 1997, Mushinsky *et al.* 2006).

Gopher tortoise eggs and hatchlings are preyed upon by mammals, birds, and snakes (Douglass and Winegarner 1977, Fitzpatrick and Woolfenden 1978, Landers *et al.* 1980, Butler and Sowell 1996, Smith 1997, Pike and Seigel 2006). Approximately 80-90% of nests are typically depredated, primarily by predators such as the raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), gray fox (*Urocyon cinereoargenteus*), and opossum (*Didelphis virginiana*) (Hallinan 1923, Ernst and Barbour 1972, Douglass and Winegarner 1977, Landers *et al.* 1980). More than 90% of hatchlings may not survive their first year (Witz *et al.* 1992, Butler and Sowell 1996, Epperson and Heise 2003, Pike and Seigel 2006). Adults are usually immune to predation, but some are killed by dogs (*Canis familiaris*) and coyotes (*C. latrans*) (Douglass and Winegarner 1977, Causey and Cude 1978, Hawkins and Burke 1989, Mushinsky *et al.* 2006). Gopher tortoise populations can typically sustain themselves despite natural predation pressure, with only 1 to 3 of every 100 eggs probably producing a breeding adult (Landers 1980). However, predator populations, such as raccoons and crows (*Corvus* spp.), can be artificially high in some habitats because of anthropogenic factors (Smith and Engeman 2002). Also, new tortoise predators have invaded Florida via human transport or habitat alteration: nine-banded armadillo (*Dasypus novemcinctus*), coyote, monitor lizards (*Varanus* spp.), and red imported fire ant (*Solenopsis invicta*) (Douglass and Winegarner 1977, Auffenberg and Iverson 1979, Main *et al.* 2000, Epperson and Heise 2003, Enge *et al.* 2004, Owens *et al.* 2005). Recently, Argentine tegu lizards (*Tupinambis merianae*) have been found using gopher tortoise burrows near Tampa; their impact on tortoises is currently unknown (Enge *et al.* 2006b).

Heavy human predation on the gopher tortoise occurred in the past in Florida, especially in the Panhandle and northern peninsula (Harcourt 1889, Fisher 1917, Anderson 1949, Alberson 1953, Hutt 1967, Matthews 1979, Auffenberg and Franz 1982, Taylor 1982, Diemer 1986, Mickler 1986, Diemer 1987, Berish 2001). Prior to the closure of tortoise harvest in the late 1980s, a community in Okaloosa County held an annual tortoise cookout. Although tortoise protection and decreased tortoise populations have reduced human consumption rates, some tortoise populations may still be depleted by continued human predation (Mushinsky *et al.* 2006). Road development facilitates human access into remote areas and may lead to exploitation of additional gopher tortoise populations. Evidence of sporadic, localized harvest of tortoises still exists (T. Thomas, pers. comm.).

Beginning in the 1990s, upper respiratory tract disease (URTD) was identified as a potential threat to the gopher tortoise (Brown *et al.* 2002), and relatively large die-offs (100-300+ shells) that might be linked to URTD were documented on several public lands in Florida (McLaughlin 1997; Smith *et al.* 1998; Brown *et al.* 1999; Diemer Berish *et al.* 2000, 2010; Gates *et al.* 2002; Rabatsky and Blihovde 2002; Siegel *et al.* 2003). At least 2 *Mycoplasma* (bacteria) species have been shown to cause URTD in gopher tortoises (Brown *et al.* 1995, 2004; Brown *et al.* 1999), and other pathogens, including herpesvirus and iridovirus, may cause similar disease (Origgi *et al.* 2004, Johnson *et al.* 2010). Pathogens may be partially responsible for declines in some gopher tortoise populations. However, URTD may have a long evolutionary history as a gopher tortoise disease (McCoy *et al*. 2007). There are several possibilities why URTD has only been discovered relatively recently: (1) increased research on gopher tortoises, (2) increased stress on gopher tortoise populations from habitat fragmentation and degradation has lowered their resistance to pathogens, (3) a more virulent form of the pathogen has evolved, or (4) URTD was introduced by humans via exposure to infected captive tortoises (Brown *et al.* 1999, Mushinsky *et al.* 2006).

Epidemiological studies to date have not clarified impacts from URTD. Throughout the gopher tortoise's range, this disease has been documented primarily in mature adults; social behavior is believed to play a critical role in the spread of mycoplasma in wild populations, with immature tortoises having minimal direct interactions with adults, thereby limiting their exposure to the pathogen (Wendland *et al*. 2010b). On Sanibel Island, 87% of gopher tortoises tested were seropositive for exposure to the pathogen, and at least 1 population on the island appears to have experienced a 25-50% reduction in breeding age adults (McLaughlin 1997, McLaughlin *et al.* 2000). In a follow-up survey of selected public lands, however, McCoy *et al.* (2007) reported that gopher tortoise declines did not appear to be related to the presence of *M. agassizii* in the specific populations studied. Using mark-recapture data collected over a 4-year period, Ozgul *et al.* (2009) reported that apparent survival of seropositive (exposed) tortoises was higher (0.99) than that of seronegative tortoises (0.88); however, another plausible model suggested that susceptible (seronegative) tortoises in high seroprevalence ($\geq$25% seropositive) sites had lower apparent survival rates than did susceptible tortoises in low seroprevalence (<25% seropositive) sites, indicating a possible acute effect of infection. This same study reported that the number of tortoise carcasses detected during annual surveys increased significantly with increasing site seroprevalence, from approximately one to approximately five shell remains per 100 individuals. Perez-Heydrich *et al*. (2011) found that even relatively URTD-free tortoise populations showed decline, with no evidence to indicate that URTD was the sole or primary cause of gopher tortoise population decline. The models also indicated that the impact of disease on host populations depended primarily on how often a population underwent an epizootic state, rather than how long the epizootic persisted in the exposed population. Thus, impacts of mycoplasmal URTD are not clear at this time. In the case of a chronic disease in a long-lived species, actually quantifying the impacts may require decades of data to document long-term, small-scale impacts.

CHAPTER 3: CONSERVATION GOAL AND OBJECTIVES

Conservation Goal

The ultimate conservation goal for the gopher tortoise is to restore and maintain secure, viable populations of gopher tortoises throughout Florida so the species no longer warrants listing. Achieving this goal will also assist in securing populations of the many commensal species dependent on the burrows and habitat of the gopher tortoise, and may prevent these species from becoming more imperiled in the future. The current cause of imperilment of the gopher tortoise is the rate of population decline, inferred from loss of habitat. Accomplishing this ultimate goal will require reducing the rate of gopher tortoise population decline and maintaining or increasing populations on protected habitat until the species qualifies for delisting. The new Gopher Tortoise Permitting Guidelines (approved April 2008, as amended) ensure the humane and responsible relocation of all gopher tortoises from development sites. Furthermore, FWC no longer issues incidental take permits that allow entombment of tortoises. As a result of this new permitting program, the rate of decline of the species can no longer be evaluated solely by habitat loss. The desirable end state for this goal is:

The Goal: Restore and maintain secure, viable populations throughout Florida so the species no longer warrants listing.

- Viable gopher tortoise populations remain present in every county in Florida.
- Total tortoise population stabilizes at carrying capacity of protected habitat (public and private).
- Genetic diversity and integrity of total population and subpopulations are retained.
- Protected locations of sufficient area and population size to be perpetually stable.

Realizing this goal will take many years, in part because of the magnitude of the challenges facing this species, and in part due to the inherent biology of these slow growing, long-lived animals. Progress toward this ultimate goal must therefore be incremental, step by step, strategically and practically directed to optimize the use of available resources. Therefore, the overarching objective for this management plan is to incur no net loss of gopher tortoises from the time of plan approval in 2012 through 2022. The plan establishes the measurable overarching objective that works towards decreasing the rate of population decline of the gopher tortoise because it is necessary to immediately decrease the rate of decline so that the ultimate conservation goal can be achieved (*i.e.,* < 30% over 3 generations to evaluate the Threatened designation and potentially delist the species if it does not meet any of the criteria for listing outlined in 68A-27 F.A.C.).

Conservation Objectives

Conservation objectives and strategies provide bench marks to measure progress towards achieving the management plan goal. The objectives will be met through the implementation of the series of conservation actions that serve to achieve the conservation objectives and strategies. This plan proposes the following objectives that will be monitored over the plan period.

*The **conservation objectives** involve minimizing the loss of gopher tortoises, managing and protecting habitat, restoring gopher tortoises, and maintaining the tortoise as a keystone species.*

Objective 1: Minimize the Loss of Gopher Tortoises

Strategy 1.1 - Ensure responsible relocation of all gopher tortoises from development sites through the implemented permitting guidelines. (p. 17)

Action 1.1.1: Accommodate additional gopher tortoises displaced by development on other lands to address specific conservation, educational, or humane needs. (p. 19)

Strategy 1.2 - Improve permitting compliance and enforcement effectiveness through partnerships with local governments in all counties by 2017. (p. 28)

Strategy 1.3 - By 2014, develop best management practices (BMPs) to avoid and minimize incidental take of gopher tortoises on agricultural and silvicultural lands. (p. 18)

Action 1.3.1: Work with FWC's Conservation Planning Services (CPS) section, private agricultural and silvicultural interests, and stakeholder groups to develop BMPs that will avoid and minimize incidental take of gopher tortoises and/or burrows. (p. 18)

Strategy 1.4 - Reduce hatchling predation on sites, as appropriate, where population viability and persistence have been compromised. (p. 53)

Action 1.4.1: In extreme cases where hatchling success is documented to be unusually low or where sustained juvenile mortality is occurring, consider implementing predator exclusion, head-start programs, or both, where juveniles are protected until large enough to minimize the predation risk**.** (p. 53)

Strategy 1.5 - Reduce the anthropogenic transmission of tortoise diseases.

Action 1.5.1: Establish an educational campaign to warn the public of the risks to gopher tortoise populations from transmission of infectious agents when gopher tortoises are moved illegally. (p. 56)

Action 1.5.2: Provide disinfection and sanitation protocols for those persons conducting permitted relocations or tortoise research. (p. 56)

Action 1.5.3: Provide protocol for accommodating clinically ill tortoises during permitted relocations. (p. 56)

Strategy 1.6 - Increase knowledge of disease impacts on tortoise populations. (p. 56)

Action 1.6.1: Establish a procedure for carcass recovery and pathological investigation of sick and dead tortoises in instances of large-scale mortality events (*e.g.,* more than 20 dead tortoises in a relatively restricted geographical area and time period). (p. 56)

Action 1.6.2: Create a gopher tortoise mortality event database and coordinate with other agencies and local governments to document incidences of unusual or large-scale die-offs. (p. 56)

Action 1.6.3: Participate in range-wide gopher tortoise health working group to facilitate exchange of information and issues on tortoise health evaluation and disease monitoring. (p. 56)

Action 1.6.4: Conduct periodic follow-up assessments (*e.g.*, serology; nasal flushes) of tortoise populations known to have high incidence of disease to determine impacts over time. (p. 56)

Action 1.6.5: Conduct study to sample serology of tortoises on select recipient sites following multiple relocations to determine exposure status to mycoplasma and, if possible, iridovirus. (p. 56)

Action 1.6.6: Provide link on FWC website to *Handbook on Gopher Tortoise (Gopherus polyphemus) Health Evaluation Procedures for Use by Land Managers and Researchers* to assist with determination of tortoise health and illness. (p. 56)

Strategy 1.7 - Gather the necessary information to effectively manage resident and relocated tortoise populations over the long-term. (p. 69)

Action 1.7.1: Conduct follow-up studies of marked populations to determine dynamics, immigration, and emigration over 1 or more decades. (p. 70)

Action 1.7.2: Evaluate forage and nutritional needs that affect movements and habitat use. (p. 70)

Action1.7.3: Identify and implement marking technique for juvenile tortoises that will persist over time. (p. 69)

Action 1.7.4: Find improved method to more accurately determine tortoise age. (p. 70)

Action 1.7.5: Evaluate usefulness of satellite telemetry for intensive monitoring of tortoise movements. (p. 69)

Action 1.7.6: Conduct baseline and follow-up studies of fragmented or insular populations to provide insights on minimum patch size/viable population. (p. 70)

Action 1.7.7: Evaluate survival of older juvenile and subadult size classes to help alleviate detection problem associated with hatchling tortoise burrows. (p. 69)

Action 1.7.8: Evaluate best methods to detect hatchling and juvenile burrows, *e.g.*, post-burn surveys; use of canines to locate burrows. (p. 69)

Action 1.7.9: Gather additional data on opportunistic sheltering, use of microhabitats, and dispersal by juvenile tortoises. (p. 69)

Action 1.7.10: Determine if winter burns contribute to calcium depletion in juvenile tortoises. (p. 69)

Action 1.7.11: Evaluate the impacts of herbicides on tortoises. (p. 72)

Action 1.7.12: Identify impacts of exotic wildlife on tortoise populations. (p. 72)

Action 1.7.13: Conduct follow-up surveys of tortoises inhabiting burrows on sites undergoing development and of tortoises retained in on-site preserves. (p. 72)

Action 1.7.14: Conduct follow-up studies of tortoises moved under temporary exclusion permits to determine response to temporary displacement along linear, disturbed habitats. (p. 69)

Action 1.7.15: Determine habitat use and movements of tortoises in relatively poorly-drained soils, especially in South Florida. (p. 73)

Strategy 1.8 - Reduce the decline of gopher tortoises through targeted education and outreach to specific audiences. (pp. 66-67)

Action 1.8.1: Create various outreach products to increase the awareness of motorists on the issue of road mortality. (p. 67)

Action 1.8.2: Develop a tortoise-wise community program to educate residents on the tortoise's role as a keystone species, road mortality, laws and regulations, impacts on tortoises by pets, and compatible yard planting that provide forage for gopher tortoises. (p. 67)

Objective 2: Increase and Improve Gopher Tortoise Habitat

Strategy 2.1 - Increase the amount of protected, potential habitat from recent estimates (2003 data; Enge *et al.* 2006a) of 1,340,000 acres to 1,955,000 acres. This will include an

additional 615,000 acres by both acquisition of new public lands and permanently protecting private lands with conservation easements. (p. 30)

Action 2.1.1: Continue public acquisition of potential habitat by all sources at an average of 41,000 acres per year through 2022. (p. 30)

Strategy 2.2 - Increase protection of potential habitat on private lands (*e.g.,* through conservation easements) to an average of 16,000 acres per year through 2022. This is approximately 12% of the 1.98 million acres of potential tortoise habitat currently in private ownership. (p. 30)

Action 2.2.1: Mechanisms for achieving this objective include FWC recipient site permits, state and local government partnerships, and private land stewardship programs. (p. 30)

Strategy 2.3 - Manage vegetation to optimize gopher tortoise forage and shelter needs on public and private lands. (p. 37)

Action 2.3.1: Manage habitat to meet management parameters in Table 6. (p. 42)

Action 2.3.2: Target the percent of canopy cover on protected, occupied, or potential habitat to be less than 60% to promote an increase of herbaceous forage. (p. 42)

Strategy 2.4 - Develop cooperative agreements, outreach capacity, technical assistance, and cooperation with other local, state, and federal land management agencies to encourage them to manage available tortoise habitat. (p. 28)

Strategy 2.5 - Provide incentives and assistance for appropriate habitat management on private lands. (p. 47)

Action 2.5.1: Work with Landowner Assistance Program (LAP) to educate private landowners regarding identification of and proper land management in gopher tortoise habitats. (p. 51)

Action 2.5.2: In cooperation with LAP and FWC's Comprehensive Conservation Blueprint, develop new incentives and payment for ecosystem services programs to encourage proper gopher tortoise habitat management. (p. 51)

Action 2.5.3: Participate in or organize workshops and other outreach to educate private landowners and the general public on appropriate habitat management. (p. **Error! Bookmark not defined.**)

Strategy 2.6 - Promote the use of Habitat Conservation Plans (HCPs), conservation banking, and Candidate Conservation Agreements with Assurances (CCAA) to interested public and private landowners. (p. 50)

Action 2.6.1: Coordinate with FWC and USFWS staff and evaluate these incentive tools as a means to provide a conservation benefit for gopher tortoises, and provide incentives to the landowner for the added conservation benefit. (p. 47)

Strategy 2.7 - Monitor the amount and condition of habitat over time to determine if populations are declining, stable, or increasing. (p. 59)

Action 2.7.1: Develop ways to monitor or assess gopher tortoise habitat at the landscape scale using remote sensing or other means. (p. 59)

Strategy 2.8 - Work with private partners and other agencies to seek funding to restore habitat and increase gopher tortoise carrying capacity and review the application of FWC land acquisition funds for this purpose. (p. 30)

Strategy 2.9 - Investigate initial and subsequent response of tortoises to various fire frequencies and seasons. (p. 73)

Action 2.9.1: Identify best practices for areas where fire is prohibited or limited. (p. 73)

Objective 3: Enhance and Restore Gopher Tortoise Populations

Strategy 3.1 - Enhance gopher tortoise populations in degraded habitats and restore gopher tortoises on suitable public conservation lands where populations have been severely depleted or eliminated. (p. 53)

Action 3.1.1: Coordinate with public land management agencies to identify sites that could benefit from either facilitated or directed population restoration. (p. 53)

Action 3.1.2: Determine best sources of gopher tortoises for population restoration on select publicly owned conservation lands. (p. 53)

Strategy 3.2 - Continue to work with willing private landowners to determine if either facilitated or directed population restoration would benefit their tortoise populations. (p. 53)

Strategy 3.3 - Gather the necessary information to effectively manage resident and relocated tortoise populations over the long-term. (p. 69)

Action 3.3.1: Determine which factors enhance site fidelity and overall relocation success, *e.g.*, source, number, and size/sex of tortoises; habitat type; season of relocation. (p. 71)

Strategy 3.4 - Monitor population status of gopher tortoises using the range-wide monitoring protocol. (p. 59)

Action 3.4.1: In cooperation with LAP, FDACS, or other entities involved in monitoring voluntary BMP compliance, gather and analyze data from observations of gopher tortoises and burrows on participating lands. (p. 18)

Objective 4: Maintain the Gopher Tortoise's Function as a Keystone Species

Strategy 4.1 - Create guidelines for relocation of priority commensal species from development sites as appropriate. (p. 75)

Action 4.1.1: Develop interim recommendations for relocation of commensals when relocating gopher tortoises. (p. 75)

Action 4.1.2: Determine the necessary habitat and population conditions on recipient sites to accommodate for the relocation of commensals. (p. 75)

Action 4.1.3: Identify appropriate recipient sites for each priority commensal species. (p. 75)

Action 4.1.4: As appropriate, develop procedures for relocation that will maximize survival of the individuals and conservation of the species. (p. 75)

Strategy 4.2 - Develop guidelines for specific management needs of priority commensal species. (p. 75)

Action 4.2.1: Coordinate with the FWC Florida mouse management plan team to incorporate management recommendations. (p. 76)

Action 4.2.2: Coordinate with the FWC Florida pine snake management plan team to incorporate management recommendations. (p. 76)

Action 4.2.3: Coordinate with the FWC gopher frog management plan team to incorporate management recommendations. (p. 76)

Action 4.2.4: Coordinate with USFWS staff to incorporate appropriate recommendations from the eastern indigo snake recovery plan. (p. 76)

Strategy 4.3 - By 2014, develop BMPs for select priority commensal species on agricultural and silvicultural lands. (p. 18)

Strategy 4.4 - For the duration of this management plan, continue to educate land managers and the general public about the broader role of gopher tortoises in maintaining biodiversity of upland ecosystems. (p. 37)

Strategy 4.5 - By 2017, identify data gaps with regard to management and conservation of priority commensal species from development sites. (p. 75)

Action 4.5.1: Perform a literature review to identify data needs regarding the impacts of agricultural practices on commensal species and their use of gopher tortoise burrows. (p. 75)

Action 4.5.2: Develop effective relocation strategies and guidelines for each species as appropriate. (p. 75)

Action 4.5.3: Conduct surveys of genetic variation to determine subpopulations and the level of gene flow among subpopulations. (p. 75)

Action 4.5.4: Identify habitat characteristics that influence home range sizes, habitat utilization, and species densities in scrub and sandhill habitats. (p.75)

Action 4.5.5: Determine and implement effective methods for surveying priority commensal populations on areas where gopher tortoises occur. (p. 75)

Action 4.5.6: Develop monitoring protocols for priority commensals that are relocated to collect data and inform future management. (p. 75)

Action 4.5.7: Monitor relocated priority commensals to assess the survivorship and behavior of those individuals and impacts on recipient populations. (p. 75)

Action 4.5.8: Identify and prioritize appropriate recipient sites for commensal species when relocated. (p. 75)

Action 4.5.9: Evaluate disease susceptibility and transmission in advance of relocating priority commensals. (p.75)

Action 4.5.10: Conduct surveys for invertebrate commensals to determine distribution and habitat; and collate species specimens and data for analyses. (p. 75)

Action 4.5.11: Determine best protocols for releasing commensals at recipient sites that increase their chance for survival. (p. 75)

CHAPTER 4: CONSERVATION ACTIONS

This chapter presents conservation actions which serve to achieve the conservation objectives and strategies outlined in Chapter 3. These actions are best accomplished by applying an adaptive management approach that allows for easy adjustments to policies, guidelines, and techniques based on observed conservation benefits or detriments, and sound science. Although science serves as the basis for management actions, there are instances where the Florida Fish and Wildlife Conservation Commission (FWC) and its partners must project beyond available knowledge to help reduce the rate of this species' decline. As new information becomes available, it will be incorporated into ongoing gopher tortoise conservation.

The actions are organized into the following broad sections: regulations, permitting, local government coordination, law enforcement, habitat protection, habitat management, incentives, population management, disease management, monitoring, education and outreach, and research. Each section contains specific management actions and timelines for implementation.

Regulations

The FWC amended agency rules (Chapter 68A-27, F.A.C.) in 2007 to reclassify the gopher tortoise from a Species of Special Concern to Threatened, and to implement protections necessary to achieve the objectives of this plan. In 2011, FWC revised the rules relating to endangered and threatened species. The 2011 revision of rule 68A-27, however, did not alter the protections provided for gopher tortoises. A history of the regulation of gopher tortoises is included in Appendix 1. Sub-paragraph 68A-27.003(2)(d)3 , F.A.C. states:

> *The Gopher tortoise is hereby declared to be State-designated Threatened Species and shall be afforded the protective provisions specified in this subparagraph. No person shall take, attempt to take, pursue, hunt, harass, capture, possess, sell or transport any gopher tortoise or parts thereof or their eggs, or molest, damage, or destroy gopher tortoise burrows, except as authorized by Commission permit or when complying with Commission approved guidelines for specific actions which may impact gopher tortoises and their burrows. A gopher tortoise burrow is a tunnel with a cross-section that closely approximates the shape of a gopher tortoise. Permits will be issued based upon whether issuance would further management plan goals and objectives.*

In 2007, when the Gopher Tortoise Management Plan was first approved by FWC, a new permitting framework was outlined and included as a high priority implementation item of the plan. The Gopher Tortoise Permitting Guidelines (April 2008, as amended) were developed and approved by FWC and remain in effect for specific actions which may impact gopher tortoises and their burrows. Permits are issued based upon whether issuance would further management plan goals and objectives [68A-27.003(2)(d)3, F.A.C.].

Rule 68A-27.007 F.A.C. also provides some exceptions to the permitting requirement for actions that are consistent with FWC-approved species management plans or for emergency purposes as described in the rule.

Permitting

The gopher tortoise has been protected in Florida for over 30 years, since 1979 as a Species of Special Concern, and since 2007 as a Threatened species. Historically, gopher tortoise permits have been issued for impacts incidental to carrying out an otherwise lawful activity. The former permit system authorized the "take" of tortoises and did not require humane relocation prior to land clearing and development commencing. The new permitting system implemented under the 2007 management plan was restructured to ensure that all gopher tortoises are relocated out of harm's way and the resulting action provides a greater conservation benefit to the species.

The Species Conservation Planning Section at FWC issues permits for protected species including development related permits, scientific research, education, and other specific purposes for gopher tortoises. Issuance of these permits is intended to authorize and facilitate land management, scientific collection, and educational activities under conditions that provide safeguards and conservation benefits to protected species. Most scientific and educational use permits require approved research proposals or educational outreach plans. Additional information is located on the MyFWC.com website under the Protected Wildlife Permitting webpage.[3]

Guidelines

Following approval of the Gopher Tortoise Management Plan in 2007, FWC worked with stakeholders to develop the highest priority implementation item in the plan. The Gopher Tortoise Permitting Guidelines were approved by the Commission in 2008 and fully implemented in 2009. Subsequent revisions have been made, with input from stakeholders, which have improved the permitting process and provided additional permitting options specific to types of impacts. All permitted activities for the gopher tortoise also help to ensure that all gopher tortoises are relocated out of harm's way prior to the commencement of development activities while providing a conservation benefit to the species. The guidelines specify prohibited actions that impact gopher tortoises and their burrows. Information about gopher tortoise permitting, including the Gopher Tortoise Permitting Guidelines, can be accessed online at MyFWC.com/GopherTortoise.[4]

New options and requirements for relocating gopher tortoises are detailed in the Gopher Tortoise Permitting Guidelines. These options further assist in achieving conservation objectives by directing entities developing properties where gopher tortoises would be impacted by such activities, obtain a gopher tortoise relocation permit and contribute to the conservation of the species. Permit-based incentives encourage permitted entities to relocate tortoises to long-term protected and managed recipient sites that provide the greatest assurance for long-term conservation of the species.

The Gopher Tortoise Permitting Guidelines are adaptive in nature. Working closely with stakeholders, FWC has revised and improved the guidelines multiple times since initial approval in 2008. As more information becomes available, FWC will continue to work with stakeholders to update and improve the guidelines that help achieve the conservation objectives for the species.

Online Permitting System

Since April 2009, most permits can be applied for and obtained electronically at MyFWC.com/GopherTortoise. The FWC online permitting system was created to better track the relocation of tortoises from development sites to permitted recipient areas, thus contributing to minimizing the loss of tortoises. Once registered, applicants can complete and submit permit applications and associated mitigation. The system also provides a means to send and receive official communications between FWC and applicants, and to issue and retrieve permits online. Although paper applications remain available, applications submitted online help to expedite the review process and ensure the information entered is consistent. The online permitting system also provides the capability for the general public to search for and view all permit applications and issued permits related to gopher tortoises. In addition to the online permitting system, the MyFWC.com/GopherTortoise website includes an enhanced mapping tool allowing any user to find authorized agents, relocation permits, and recipient sites by geographic location.

Since April 2009, most permits can be applied for and obtained electronically at MyFWC.com/GopherTortoise.

The online permitting system is supported by powerful database management technology that allows sophisticated retrieval and analysis of information from this complex dataset. This database also provides permit reporting services that allow FWC staff to easily access important data collected from the online permitting system. This information is useful to FWC for determining progress toward achieving the objectives of this plan, through tracking, verifying, and monitoring permitted activities throughout the state. Future enhancements to the online system will include the electronic submission of the monitoring reports from permitted recipient sites, and the capability to record the management activities conducted on these protected lands.

The online permitting system helps track the progress made towards meeting the overall goal and objectives of the Gopher Tortoise Management Plan. Additional enhancements to the system in the future will help ensure sufficient capacity is available at recipient sites and track habitat management activities on those sites. Furthermore, the online system allows for the submission of data on commensal species encountered and relocated during the relocation of gopher tortoises. Assessment of burrow use by other species and documenting the relocation of these other species helps FWC ensure the continued function of gopher tortoises as a keystone species.

Agricultural, Silvicultural, and Wildlife Management Activities

Approximately 61 percent of Florida's landscape is in some form of agricultural or silvicultural land use (National Agricultural Statistics Service 2007, U.S. Forest Service 2007).

Florida's fish and wildlife, including many state-listed species, occur on lands utilized for agriculture. The FWC has long recognized that agriculture provides a valuable benefit to the conservation and management of fish and wildlife in Florida, including species designated under Rule 68A-27.003, F.A.C. On March 6, 2008, the FWC Executive Director issued a General Policy Statement on the application of the FWC permitting requirements for Agricultural, Silvicultural and Wildlife Management Activities as they relate to gopher tortoises. The Policy Statement is included in Appendix 2 of this plan and in the Gopher Tortoise Permitting Guidelines (April 2008, as amended). The policy provides in part:

> *This policy is for the purpose of enforcement of Chapter 68A-27 relating to gopher tortoises with respect to agricultural and silvicultural activities or activities intended to improve native wildlife habitat. The adoption of the Gopher Tortoise Burrow rule does not expand pre-existing gopher tortoise regulatory prohibitions or change existing policy or practice with respect to agricultural and silvicultural activities… Gopher tortoise or gopher tortoise burrow permits are not required to conduct agricultural activities, silvicultural activities, or activities intended to improve native wildlife habitat. Such activities include, but are not limited to: tilling, planting, mowing, harvesting, prescribed burning, mowing, disking, roller-chopping and tree-cutting.*

In November 2011, the FWC amended its rules relating to Endangered or Threatened Species, Chapter 68A-27 F.A.C. Once again, recognizing agriculture's contribution to fish and wildlife conservation and management, Rule 68A-27.007(2)(d), F.A.C., provides that agriculture conducted in accordance with best management practices (BMPs) adopted by the Department of Agriculture and Consumer Service does not require an incidental take permit from the FWC. In accordance with this Rule, FWC will work with the Florida Department of Agriculture and Consumer Services, landowners, and other stakeholders to legislatively authorize, develop, and adopt BMPs to protect wildlife species. Until such time that the BMPs are developed, refined and adopted, the General Policy Statement attached in Appendix 2 will remain in effect. It is anticipated that as agriculture opts into the adopted BMP program, the General Policy Statement will be phased out of both the Gopher Tortoise Management Plan and the Gopher Tortoise Permitting Guidelines.

Management of Gopher Tortoises on U.S. Military Installations

The FWC acknowledges federal law prohibits the U.S. military from paying for mitigation and that the State of Florida cannot compel the U.S. military to obtain a State permit unless a waiver to this stipulation is granted by Congress; all military actions on its installations are exempt from state authorizations typically required for impacts to gopher tortoises. The U.S. Department of Defense (DoD) military service branches provide vital national security. The U.S. military and Florida National Guard bases and installations serve the DoD to successfully achieve its goals and mission to protect Americans and the security of the United States of America. Due to this, FWC categorically excludes Florida National Guard Camp Blanding Military Reservation from state authorizations otherwise required for impacts to gopher tortoises.

This categorical exclusion for the National Guard and the following paragraph apply to on-installation activities and as specified in each installation's Integrated Natural Resource Management Plan (INRMP).

The FWC recognizes that military installations in Florida provide significant conservation benefits for gopher tortoises. Along with the State of Florida, DoD is a party to the Gopher Tortoise Candidate Conservation Agreement (CCA) of 2008, and has committed to implementing proactive gopher tortoise conservation measures across the species' eastern range. While the CCA is voluntary, FWC understands the DoD's deep commitment to acting in compliance therewith, to include a commitment to submit data to FWC reflecting completed relocation activities within a reasonable timeframe. Additionally, Federal law, the Sikes Act Improvement Act (SAIA), 16 U.S.C. §670 *et. seq.*, requires military installations conduct a program that provides for the conservation and rehabilitation of natural resources, including imperiled wildlife species, according to each installation's INRMP. Wildlife related conservation activities may include, but are not limited to, habitat management (especially prescribed fire), habitat restoration, and wildlife surveys and monitoring. Florida's military installations comprise 737,315 acres (Florida Natural Areas Inventory 2012). Habitat management activities conducted on installations benefit a vast array of wildlife. Therefore, FWC will continue to work with military partners in Florida (*i.e.*, Air Force, Navy, Army, and Marines) to ensure INRMPs provide for mission requirements and conservation measures that benefit species on military installations, including but not limited to the gopher tortoise.

Waif Tortoises

Unless an individual tortoise is noticeably injured, the best option for gopher tortoises is to leave them where they are found.

Despite their documented decline over the last century, one of the many special qualities of gopher tortoises is that they remain a widely-distributed species, occurring in parts of all counties in Florida. They are also quite adaptable to their environments and are habitat generalists that can survive in a variety of dry, grassy landscapes. Because of these characteristics, gopher tortoises are known to co-exist with humans in suburban areas where remnant patches of habitat may still exist in utility corridors or in yards and neighborhoods. Although gopher tortoises spend most of their time in their burrows, they nevertheless are often observed basking on their burrow mounds or foraging along roadsides. Unless an individual tortoise is noticeably injured, the best option for gopher tortoises is to leave them where they are found. It is also illegal to possess gopher tortoises for any reason without authorization from FWC.

However, if a gopher tortoise is found in a metropolitan, urban area where virtually no grassy areas remain, the person who encountered this tortoise should immediately call FWC's wildlife alert hotline (toll free: 1-888-404-3922) to receive guidance. In many cases, once a tortoise is removed from an area and cannot be returned, the outcome for the tortoise is living out the remainder of its long life in captivity; this is especially true if the tortoise's origin is unknown or if there are health concerns. These individuals are referred to by FWC as waif gopher tortoises. In other cases, waif tortoises can be released into specially designated areas (see below). The FWC strives to keep wild gopher tortoises in the wild, and to prevent displaced

tortoises from being indiscriminately released into wild areas where they may disrupt resident tortoise populations or transmit diseases.

Conservation efforts involving educating the public and locating permanent placement sites for waif tortoises are not new to FWC. Educational brochures have been created and are available to the public at MyFWC.com/GopherTortoise or from FWC regional offices. Therefore, it is important to include these efforts as part of an integrated approach for conserving the species to help minimize the number of waif tortoises throughout Florida. A major part of the conservation efforts focused on waif tortoises is education of the general public. It is important for all residents and visitors of Florida to know the laws protecting native wildlife. The FWC understands that people's compassion for wildlife and their willingness to assist in its survival can be an incredible conservation asset, but sometimes the actions of well-intentioned people can result in a negative impact on an individual animal or to wildlife populations. Some examples of scenarios that typically result in a gopher tortoise being designated as a "waif" include but are not limited to: removing a tortoise from an undeveloped natural area, retrieving a tortoise from a suburban area where remnant grassy areas still exist, and placing a tortoise in a vehicle to rescue it from a roadway. In many cases, it may be possible to return temporarily displaced or "rescued" tortoises to their home areas *if locality information is available* (*e.g.,* GPS location or mileage to a notable landmark), thereby reducing the number of waifs.

Permitting Guidelines for Accommodating Waif Tortoises

Over the last decade, FWC staff has contended with how to best accommodate waif gopher tortoises and find appropriate placement of these individual animals. Nonetheless, finding permanent "homes" for them has proven difficult, requiring input from a variety of resources, including FWC permitting staff, gopher tortoise biologists, wildlife rehabilitators, local governments, educational facilities, and the general public. Establishing standardized guidelines for their accommodation will greatly increase efficiency while providing opportunities for conservation through education and repatriation. Detailed permitting guidelines for accommodating waif tortoises will be developed and included in the Gopher Tortoise Permitting Guidelines at the next revision opportunity.

Releasable and Non-Releasable Waif Tortoises

Once a displaced tortoise is identified by FWC and classified as a waif gopher tortoise, the animal can no longer be released back into the wild where natural wild populations of gopher tortoises occur. It is important when a tortoise is identified as a waif to further determine whether it is a releasable waif gopher tortoise or a non-releasable waif gopher tortoise.

Releasable waif gopher tortoises may be eligible for release on an FWC-designated waif tortoise recipient site. A waif tortoise recipient site is a natural area that does not have an existing gopher tortoise population, or where the resident population has been severely depleted. Fewer criteria and restrictions will apply for these sites than those required for long-term protected recipient sites permitted by FWC. Conversely, there may be special requirements such as permanent fencing, or special enclosures for the release of juveniles. To be classified as releasable, tortoises should show no visible signs of illness, need no medical care (tortoises may have received previous medical attention), not require human intervention for continued survival,

and have been exposed to no diseased tortoises while in captivity. Juvenile tortoises hatched in captivity may be considered for release into the wild in some cases.

Non-releasable waif tortoises are not candidates for release into wild, natural areas due to conditions associated with that particular tortoise. These conditions may include one or more of the following: exhibit signs of illness; require ongoing medical care; are sufficiently disabled to preclude successful burrowing or foraging; have been exposed to diseased tortoises while in captivity; or require human intervention for continued survival.

Options for Accommodating Waif Tortoises

To ensure their safety and survival, and to contribute to the overall conservation of gopher tortoises, it is imperative that adequate options be available for the placement of waif tortoises. The FWC provides a no-cost permit option for individuals or facilities seeking permission to possess a waif gopher tortoise. After obtaining a permit, education facilities, schools, and zoos can use non-releasable waif tortoises to help educate local residents about the importance of this species.

The FWC is also working with public and private landowners to identify and establish recipient sites for releasable waif tortoises to receive individuals or groups of waifs that can be accommodated in natural areas. Sites for releasable waif tortoises must be suitable set-aside areas that are undisturbed by construction activities and that provide a safe environment. Waif recipient sites are generally established on smaller properties that may not meet the criteria for establishing a recipient site as outlined in the Gopher Tortoise Permitting Guidelines. Landowners interested in establishing a waif recipient site should understand that receiving waif tortoises may not provide the economic benefits normally associated with the relocation of tortoises displaced from development sites.

Providing a variety of placement options for waif tortoises is important to help reduce unauthorized releases that could adversely impact wild populations. Guidelines for accommodating waif tortoises will be provided in greater detail in the Gopher Tortoise Permitting Guidelines at the next revision opportunity.

Use of Waifs to Assist Other States in Population Restoration

Assisting with population restoration efforts in other states is another option for waif tortoise placement under appropriate circumstances. Such placements may occur when groups of waif tortoises are in need of placement at one time; this is the most difficult type of waif placement, encumbering significant FWC resources. One option currently being explored is assisting other states with population restoration efforts using waifs on protected lands where gopher tortoise densities have been severely depleted. The FWC, in partnership with the South Carolina Department of Natural Resources and the Savannah River Ecology Lab, will implement a pilot project of restoring gopher tortoise populations to the 1,500-acre Aiken Gopher Tortoise Preserve. Details for such interstate collaborations will be specified in Memorandums of Understanding (MOUs) and could include periodic post-relocation burrow surveys, and, preferably, initial intensive follow-up using mark-recapture or radio-telemetry.

Table 1. Proposed timeline for implementing permitting actions.

Permitting Actions	2013	2014	2015	2016	2017
Revise permitting guidelines for consistency with the changes in the management plan, and thereafter as necessary.					
Distribute revised guidelines to Authorized Agents and permittees. Coordinate with Authorized Agent training providers to ensure that curricula content is updated and accurate.					
Review FWC staffing strategy (as necessary) to accommodate changes in permitting volume.					
Modify the online permit system as needed to be consistent with permitting guidelines' revisions.					
Analyze 2011 user survey results on the website and permit system and make necessary changes to improve ease of use.					
Create summary reports as needed for monitoring gopher tortoise permitting activity.					
Enhance the online permitting system to collect better documentation on relocation of commensal species.					
Develop BMPs for gopher tortoises.					
Work with military partners on INRMPs to accommodate on-base activities that impact gopher tortoises					
Reduce 'dumping' of tortoises on public lands through effective messaging on what to do with tortoises if encountered.					
Distribute the waif tortoise fact sheet.					
Coordinate with other states to restore tortoise populations throughout the species' range using waifs.					
Work with landowners to establish releasable waif tortoise recipient sites.					
Encourage environmental educators to accept waifs to use for education purposes.					
Distribute Captive Tortoise Care guidelines to waif permit holders and licensed wildlife rehabilitators.					
Coordinate with FWC's captive wildlife program to develop guidance on the proper release of rehabilitated tortoises.					

Local Government Coordination

Florida's growth management law places significant responsibility for land and water use decisions on local governments. Achieving Florida's species conservation plans will necessitate local government land and water use plans and regulations that recognize important state fish and wildlife resources, including habitat, and provide adequate provision for their conservation. The FWC will collaborate with and provide information to local governments regarding species management plans, permitting guidelines, and assistance programs that are available to landowners, as well as the general public.

Part II of Chapter 163 Florida Statutes requires that county comprehensive growth management plans include a conservation element. The conservation element must include the identification of areas within the county where important fish, wildlife, or habitat resources, including state-listed species, are located. This element must contain principles, guidelines, and standards for conservation that restrict activities known to adversely affect the survival of these species. Through the state commenting clearinghouse and FWC's commenting process, FWC staff reviews and provides input on county growth management plans and plan amendments to ensure important state fish, wildlife, and habitat resources are adequately considered. Further, land development regulations require conditions on land or water use specifying how those uses will be administered consistent with the conservation element of the county growth management plan.

The Florida Constitution gives FWC the regulatory and executive powers of the state with respect to wildlife, including gopher tortoises. Accordingly, county growth management plans and land development regulations provide the avenue by which FWC, through its agency commenting process, can inform and influence land and water uses relevant to the conservation of Florida's fish and wildlife, including state-listed species. This management plan identifies areas known, or having potential, to harbor gopher tortoises. The plan also identifies the threats to the gopher tortoise that warrants its Threatened status, and FWC has implemented permitting guidelines providing means for affected parties to avoid, minimize, or mitigate the threats to the gopher tortoise associated with development activities. The FWC provides technical assistance to local governments during growth management plan development, plan amendments, associated development proposals, and with the development of habitat management plans on public lands under their jurisdiction. Therefore, coordination between FWC and local governments in implementing components of this plan is essential to FWC's successful conservation and management of this species.

Local governments, and regional or state agencies (*e.g.,* water management districts), often are the first to conduct site inspections of properties where clearing or building permits are being sought. These on-site inspections typically occur early in the permit process and provide the opportunity to confirm the presence or absence of gopher tortoises, and to inform landowners and builders about required FWC permits and authorizations. This action by local governments or other agencies provides a mechanism to assure that necessary FWC permits can be issued earlier in the permit approval process, prior to local government land clearing or building permits being issued. Coordination with local governments will improve FWC's efforts to minimize the loss of gopher tortoises.

Local governments and other agencies also play a substantial role in gopher tortoise conservation and management by providing protected and managed areas for gopher tortoises (*i.e.,* by maintaining habitat for existing gopher tortoise populations, making suitable habitat available as gopher tortoise recipient sites, and restoring lands with potential gopher tortoise habitat to act as future recipient sites). A number of local governments have created habitat acquisition programs. These programs can provide important assistance for achievement of this plan's goal and objectives through the acquisition and management of gopher tortoise habitat. Despite important successes by some local governments, most still lack sufficient funds to restore and manage (through mechanical means and prescribed fire) the vast majority of their lands as conservation areas for gopher tortoises and other wildlife. As a result, lands protected by local governments can become unsuitable for gopher tortoises, burrow commensals, and other upland wildlife over time. Since 2009, FWC has offered financial assistance to local governments to promote and assist in gopher tortoise habitat management. Appropriately managing gopher tortoise habitat at a local level is essential for FWC to achieve its objective of increasing and improving gopher tortoise habitat. Assistance will continue to be available based on funding.

Additionally, local governments may lack the information necessary to make important decisions regarding gopher tortoise conservation including: what lands under their protection have suitable habitat for displaced gopher tortoises; what lands are in need of restocking; and what levels of habitat management or restoration are needed to maintain resident gopher tortoise populations or make lands suitable for gopher tortoise restocking. The FWC offers technical assistance to local governments to help improve their gopher tortoise conservation efforts.

Coordination between local governments and FWC will be crucial in efforts to increase funding for habitat acquisition and management. The FWC will encourage local governments to support FWC efforts to assure adequate funding within the Florida Forever successor program for the acquisition and management of listed species habitat, including management of existing publicly owned or controlled land. The FWC will coordinate with local governments to help ensure that local acquisition programs, and their implementing ordinances and policies, are: (1) consistent with the goal and objectives of this gopher tortoise management plan; and (2) focus on core acquisition priorities for gopher tortoises, listed burrow commensals, and other important wildlife species.

The FWC will also partner with other Florida land-managing agencies and programs in the development of a common habitat management tracking system to help prioritize local government lands in need of management assistance. Local government lands will be represented in a GIS model to identify gopher tortoise priority habitat. Priority habitat listed in this database will receive management assistance funding as available from FWC and will be referred to The Nature Conservancy Resource Management Support Team within the region (Chapter 4, Habitat Management). These strike teams provide technical assistance and support for both mechanical management and fire management of upland habitats. For a list of habitat management and prescribed fire resources, refer to the Habitat Management section.

Effective cooperation and communication between FWC and local governments can streamline the FWC permit review process, improve regulatory compliance, and improve management of county and city-owned or controlled lands for gopher tortoises and other upland wildlife.

FWC will assist and encourage local governments to:

- Stay current with FWC regulations related to gopher tortoises and other listed species. Staff involved with all aspects of development review and planning should be familiar with these regulations.

- Include a question on clearing and building permit applications as to what listed species surveys have been conducted on the property.

- Inspect parcels undergoing development review for the presence or absence of gopher tortoises and, when gopher tortoise burrows are present (as confirmed through site visits by trained county staff, FWC staff, or environmental consultant reports/data), require listed species surveys before issuance of clearing or building permits. Or, at a minimum, notify FWC staff of sites where burrows have been documented to help insure compliance with FWC gopher tortoise rules and guidelines.

- Consider assisting FWC with verification of gopher tortoise surveys on proposed development sites to ensure compliance with FWC guidelines for such surveys.

- Draft a standard permit condition for locally-issued development permits (*i.e.*, clearing or building permits) to ensure FWC gopher tortoise permits are obtained prior to commencing development activities in areas known to support gopher tortoises.

- Notify FWC of wildlife complaints regarding potential FWC rule violations through FWC's wildlife alert number. Coordinate with FWC law enforcement in providing supporting information for FWC law enforcement investigations.

- Identify, protect, manage, and restore important gopher tortoise habitat on lands owned or controlled by local governments and state agencies, and monitor resident tortoise populations on these protected lands.

- Establish recipient sites for relocation of gopher tortoises, thereby providing a local option for county projects that can help retain regional populations and reduce relocation costs.

- Establish, within land development codes, incentives that will enhance local governments' ability to acquire gopher tortoise habitat and manage lands under their control.

- Establish local ordinances to protect gopher tortoise habitat.

- Use Memorandums of Understanding (MOU) or other agreements with FWC to implement any of the above actions.

FWC will:

- Promote technical assistance and incentives available to landowners by providing information to local governments regarding species management plans, permitting options, and incentive programs available to applicants, developers, and landowners, as well as the general public.

- Develop conservation measures and best management practices (BMPs) to address the gopher tortoise and its habitat needs, and provide them to local governments for incorporation into their local land development regulations.

- Disseminate outreach materials for local governments, landowners, and the general public to foster better understanding and compliance with this plan, FWC regulations, and incentives for landowners.

- Develop additional outreach materials as needed based on need or demand.

- Create partnerships with non-profit organizations and other public entities to assist with management of gopher tortoise habitat on lands protected through local government acquisition programs that lack sufficient staff to conduct burns or other habitat management on their own.

- Assist local governments in obtaining recipient site permits (*e.g.,* conduct a pre-application site visit) on lands they own and manage which are potential gopher tortoise recipient sites.

- Through a future multi-agency habitat management tracking system, identify incentives for habitat management on publicly owned or controlled lands located within priority gopher tortoise habitat.

- Consider opportunities within the gopher tortoise permitting system to provide incentives to local governments to set aside conservation lands as potential restocking or otherwise responsible relocation sites for gopher tortoises.

- Assist local governments in establishing local ordinances and incentives in land development codes to better restore and manage publicly owned or controlled land to provide habitat for gopher tortoises and other upland wildlife.

- Schedule workshops with local governments. Such workshops will involve in-depth dialogue on key gopher tortoise conservation issues such as current topics, highlights of new information, and other FWC programs.

Table 2. Proposed timeline for implementing local government coordination actions.

Proposed Local Government Coordination Actions	2013	2014	2015	2016	2017
Disseminate educational materials for local governments, homeowners, landowners, etc.					
Coordinate with local governments and state agencies in requesting funding for habitat management, acquisition, and restoration through the Florida Forever successor program.					
Conduct workshops with local governments to enhance gopher tortoise conservation at the local level.					
Partner with The Nature Conservancy Resource Management Support Team program to assist local governments with habitat management activities.					
Assist local governments with drafting of permit conditions, Memorandums of Understanding, and ordinances.					
Provide gopher tortoise habitat assistance funding for habitat management activities on county/city owned conservation lands (annual funding dependant).					
Explore incentives for local government staff to obtain training necessary to qualify for an Authorized Gopher Tortoise Agent permit.					

Law Enforcement

The FWC Division of Law Enforcement (LE) helps ensure that all entities developing property within gopher tortoise habitat comply with the Gopher Tortoise Permitting Guidelines (2008, as revised), and abide by the Florida Statutes and FWC rules, policies, guidelines, and permits which protect the species. The FWC developed and implemented a training manual, *Law Enforcement Nongame Wildlife Training Manual* (November 2010), for training new FWC law enforcement recruits. The manual outlines appropriate steps for conducting investigations, and includes a protocol for officer response to gopher tortoise complaints. Since 2010, training for new recruits on gopher tortoise rules and regulations has been incorporated as standard curriculum at the LE training academy. The Gopher Tortoise Enforcement Policy (Appendix 2) also assists officers with enforcement of existing rules.

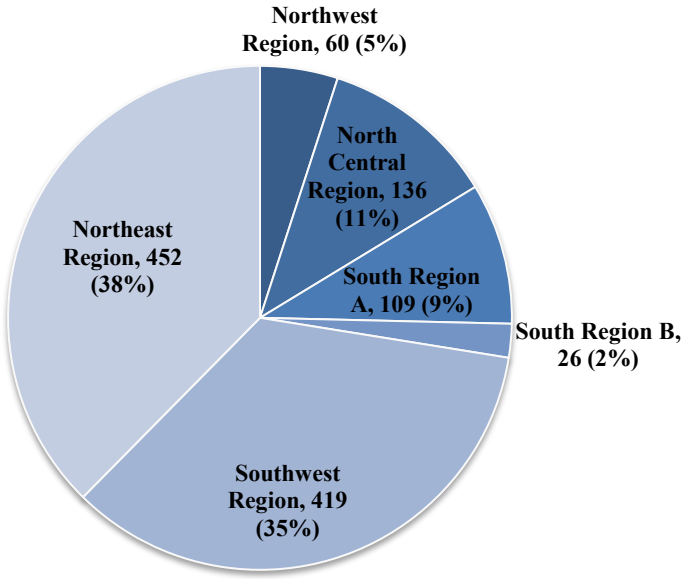
Training of existing field personnel will be prioritized by geographic area based upon analysis of dispatch call data for complaints regarding gopher tortoises. The chart below (Figure 2) displays call volume by FWC region related to gopher tortoise complaints over the most recent 3 years for which data are available. Based in part upon analysis of the underlying data summarized in this chart, FWC LE expects to begin incorporating gopher tortoise enforcement as

a component of its law enforcement officers' formal annual work plans in the Brooksville Ridge area (*e.g.,* Citrus, Sumter, Hernando, and Pasco counties) by 2013. As such, this activity will be routinely tracked, analyzed, and evaluated for effectiveness.

Officers will continue responding to complaints and conducting proactive patrols to investigate gopher tortoise violations.

The Division of Law Enforcement will assist the FWC Species Conservation Planning Section with coordination and partnerships with counties and local government agencies related to gopher tortoise enforcement, permitting, and complaint response. The FWC LE will have primary enforcement responsibility in cooperative endeavors with local government agencies.

Figure 2. Gopher Tortoise Complaints Received by FWC Law Enforcement (2009-2011)



Officers will continue responding to complaints and conducting proactive patrols to investigate gopher tortoise violations. Officers will determine whether violations have occurred using the gopher tortoise enforcement protocol. At the conclusion of investigations, officers will work with the affected state attorney's office and FWC permitting personnel to ensure appropriate charges are prepared and appropriate mitigation imposed.

Additionally, LE will continue working to ensure that those in possession of valid tortoise permits adhere to, and abide by, the specific terms and conditions of the permit and FWC guidelines. Violators may be issued a written warning or citation and may face suspension, revocation, or non-renewal of their current permit(s) as well as loss of future permit privileges.

Table 3. Proposed timeline for implementing law enforcement actions.

Proposed Law Enforcement Actions	2013	2014	2015	2016	2017
Develop training on gopher tortoises and associated burrow commensals for state attorneys offices.					
Update LE training manual to reflect changes in rule and permitting guidelines.					
Conduct training sessions for LE field officers.					
Continue training sessions at LE recruit academy.					
Implement gopher tortoise enforcement component into law enforcement officers' work plans in the Brooksville Ridge area.					
Create a fact sheet for LE dispatch personnel to assist with complainant calls.					
Conduct proactive patrols and efficient response to complaints regarding gopher tortoises and development.					
Evaluate calls for service and complaints to prioritize law enforcement efforts and investigate which calls resulted in enforcement action.					
Develop a self study guide to be posted on the LE web page to assist officers with gopher tortoise enforcement methods.					

Habitat Protection

The objective to increase the acres of protected gopher tortoise habitat by an additional 615,000 acres sets the bar high for habitat acquisition and other forms of permanent protection. Since the Gopher Tortoise Management Plan was approved in 2007, the state has acquired 32,120 acres (5% of 615,000 acres) of upland habitat under the public lands acquisition program, Florida Forever. Acquisition of these lands in fee simple is only one way to achieve the goal, and this plan encourages the use of less-than-fee interests, and other habitat protection measures such as partnerships between governmental agencies and private landowners. Such partnerships may include those that advance the restoration, enhancement, management, or repopulation of imperiled species habitat on state lands. Conservations easements, land protection agreements, and non-state funded tools such as rural land stewardship areas, sector planning, and mitigation should be used, where appropriate, to bring environmentally sensitive tracts under an acceptable level of protection at a lower financial cost to the public. These approaches provide private landowners with the opportunity to enjoy and benefit from their property at the same time.

Accomplishing this objective will require close partnerships among regional, state, and federal agencies; local governments; and non-governmental organizations (NGOs). For these alternative options to work effectively, viable economic landowner incentives will need to be realized, particularly related to the relocating of tortoises on privately owned lands. Approaches to protecting wildlife habitat, particularly gopher tortoise habitat, through means other than fee

simple ownership are being explored, developed, or implemented in Florida. Some of the promising approaches are discussed below and later in the "Incentives" section of this plan.

History of Public Lands Protection in Florida

Prior to 1964, the federal government was responsible for the establishment of the majority of public conservation lands in Florida, including the national forests and Everglades National Park. In addition, the federal government donated to Florida its first state parks including Highlands Hammock, O'Leno, and Torreya, and sold it the lands that eventually became the Withlacoochee and Blackwater River state forests. By 1964, the state had accumulated approximately 530,000 acres of forests, parks, wildlife management areas, and water management areas, in addition to the federal land holdings.

Significant Florida legislative actions to address the high rate of loss of native habitats and recreationally important lands essentially began in 1964 with the establishment of a $20 million bond program to acquire outdoor recreation lands. This was followed by a variety of land conservation programs over the intervening years, including most recently the $3 billion Florida Forever Program, established in 1999 and funded through 2010. These programs provided more than $6.5 billion in funding for purchase of environmentally sensitive and outdoor recreation lands. Through these programs, Florida has conserved approximately 2.5 million acres of land for conservation.

Although FWC received limited legislative appropriations for land acquisition prior to 1990, the advent of the Preservation 2000 and Florida Forever programs, each of which directed a portion of total funding to FWC, provided the agency with a significant, long-term source of funds for acquisition of additions and inholdings to lands managed by the Commission. This funding stream was created in recognition that the agencies responsible for the management of lands acquired through the larger acquisition programs, such as Florida Forever, are in a better position to identify those parcels necessary to protect resources, complete the resource boundary of the project, and to aid in their management and use.

In addition to the state land purchase programs, many of Florida's counties and cities have implemented their own land conservation acquisition programs. These programs, along with private land trusts and non-profit organizations, have acquired a significant amount of conservation lands. Not all of the lands acquired under these various programs contained habitat suitable for gopher tortoises; nevertheless, these programs have been the primary factor in conserving wildlife habitat including gopher tortoise habitat.

Since the recession that began in 2007, public funding for land conservation acquisition programs has, understandably, been dramatically reduced or eliminated altogether. Although more than $6 billion were appropriated by the State on land conservation acquisition in the P-2000 and Florida Forever programs through 2008, only $15 million have been appropriated since 2008. Since fiscal year (FY) 2006-07, the State, including the water management districts, acquired approximately 238,000 acres of land (both fee and less-than-fee conservation easements) statewide for conservation. The bulk of that acreage was acquired in FY2006-07 and FY2007-08, totaling approximately 169,000 acres. Since the start of FY2008-09, approximately

69,000 acres have been acquired by the State and its water management districts. Although this is a significant amount of conservation land, it represents a continuing decline in public land acquisition at the state level.

As Table 4 illustrates, Florida Forever funded acquisitions resulted in approximately 526,950 acres of upland conservation lands since 2001 (both fee and less-than-fee conservation easements). The bulk of those lands were acquired prior to 2007, as economic conditions after that date substantially reduced the funding for public land acquisition programs in Florida.

Table 4. Florida Forever Funded Acquisitions

Year of Closing	Total Acres	Upland Acres	% Upland
2001	6,284	4,470	71.1%
2002	145,887	94,060	64.5%
2003	129,028	78,515	60.9%
2004	57,657	47,061	81.6%
2005	105,031	82,004	78.1%
2006	113,367	98,775	87.1%
2007	66,404	53,105	80.0%
2008	32,595	28,009	85.9%
2009	18,325	13,789	75.2%
2010	22,372	18,110	80.9%
2011	11,341	9,053	79.8%
2001 - 2011	****708,291**	***526,950**	**74.4%**
2007 - 2011	**151,036**	***122,065**	**80.8%**

*Approximate upland ratio from macro GIS analysis ** County, City and Private acq. not shown

Private Lands Protection Mechanisms in Florida

As economic conditions have reduced funding for public land acquisition, the importance of private lands for conservation has grown. Consequently, creation of conservation initiatives and mechanisms that function as alternatives to traditional conservation land acquisition programs to conserve wildlife habitat are increasingly important. Although many of these initiatives began prior to completion of the 2007 Gopher Tortoise Management Plan, economic conditions have accelerated their emphasis and growth. Among these are a substantial increase in new alternative conservation mechanisms and initiatives that have begun in Florida. Major programs are discussed below, and additional detail is provided in the Incentives section of this chapter.

Conservation Easements

Conservation easements involve the acquisition through purchase or donation of a portion of the rights associated with the land to provide some degree of protection to natural resources on

the land. There are several advantages of this approach as the land in most instances stays on the tax rolls and the private landowner maintains responsibility for managing the property while still retaining some level of continued use. Although the cost could be as low as 50 percent of the cost of fee simple, the price depends on many factors, such as the number of rights purchased, the degree to which the landowner's use of the land is curtailed, and the development pressure on the land. Federal, state, and regional agencies all use this tool to protect lands.

Some new federal and state initiatives have been enacted recently to make conservation easements more attractive to private landowners. The Wetlands Reserve Enhancement Program (WREP) and Reserved Rights Pilot Program, a new program in the Federal 2008 Farm Bill, provide the added incentive to the private landowner to participate in the WREP because the landowner may reserve grazing rights if the reservation is compatible with restoration goals.

On November 4, 2008, Florida's citizens approved an amendment to the Florida Constitution, (FL Const. art. XII, § 28) providing an opportunity for private landowners to receive ad valorem or real property tax reductions or exemptions in return for the designation of either short-term or perpetual conservation easements on their lands. The Florida Legislature approved legislation to implement the new conservation easement plan during the 2009 legislative session. Private landowners seeking to apply for the new conservation easement/tax exemption or reduction will either apply to the respective County Tax Collector's office or the Acquisition and Restoration Council, depending upon the amount of acreage involved. The constitutional amendment encourages increased conservation efforts by private landowners to conserve Florida's natural resources on privately owned lands.

Along with other conservation agencies and organizations within Florida, FWC is working with landowners to inform and assist them on the availability of this new conservation incentive. The agency is developing internal guidelines regarding acceptance of conservation easement donations. Additionally, the Acquisition and Restoration Council (ARC) has developed guidelines to determine eligibility for tax exemptions on conservation easements 40 acres or less in size.

The State of Florida holds conservation easements and land protection agreements over 176,181 acres. According to the Florida Natural Areas Inventory, there were 655,873 acres protected statewide by conservation easements held by the State of Florida, the federal government, five water management districts, local governments, and private entities as of February 2012. This program of conservation easements continues to be well-received by landowners with whom the state holds easements or land protection agreements. Compliance with terms and conditions of easements and land protection agreements remains good.

FWC's Optimal Conservation Planning Boundary Tool

The Optimal Conservation Planning Boundary Tool was developed by FWC to help designate optimal planning boundaries, a required element of the State's conservation lands management plans. The Optimal Conservation Planning Boundary Tool is designed to aid in implementing a comprehensive and proactive approach to long-term conservation planning and actions in and around protected lands. Advantages of this tiered approach include:

- Closes conservation planning gaps with a resource-based approach.
- Aids in development of habitat conservation and restoration opportunities.
- Promotes proactive, long-term conservation planning, acquisition, and management.
- Provides comprehensive agency-wide and stakeholder input.
- Enhances consistency with the Florida Forever and ARC recommendations.
- Eliminates gaps between qualifying Florida Forever criteria and timely acquisitions.
- Aides in identifying and conserving other important natural and cultural resources not previously identified.
- Results in the creation of a Conservation Action Strategy unique to each conservation area.

Although the Optimal Conservation Planning Boundary Tool was developed primarily for use in FWC's conservation planning and management unit, this new conservation planning tool can be used in a wide variety of conservation and land use planning settings.

Military Buffering

Increasingly, the Department of Defense thru the Readiness and Environmental Protection Initiative (REPI), and the State of Florida have emphasized the importance of buffering Florida's military bases through conservation acquisition programs from development that would impede their mission. These win-win partnerships acquire easements or other interests in land from willing sellers to preserve compatible land uses and sustain wildlife habitat near installations and ranges where the military operates, tests, and trains.

Some of the military buffering initiatives, such as the Northwest Florida Greenway which is designed to conserve a corridor of lands stretching from the Apalachicola National Forest to Eglin Air Force Base, have the potential to conserve a considerable amount of wildlife habitat. There are also several Florida Forever projects located within the boundary of the greenway, such as Seven Runs Creek (Nokuse Plantation), which contain large tracts of potential gopher tortoise habitat.

To date, these partnerships have led to the fee and less-than-fee acquisition of over 24,000 acres around six different installations in the state. Included in these acquisitions is 17,137 acres around Camp Blanding Joint Training Center in located Clay County. Those acquired as fee simple will be managed by the State of Florida for the conservation of rare and imperiled species.

Habitat Conservation Plan Land Acquisition (HCPLA) Grants

This federal grant program awards funds to promote the recovery of threatened and endangered species via habitat protection of areas adjacent to established Habitat Conservation Plans (HCP). These land acquisitions are meant to complement, rather than replace, private mitigation responsibilities required by the HCP (see Incentives section below). In addition to listed species, these acquisition grants can have important benefits for ecosystems that support proposed and Candidate species. The FWC currently works with local governments to apply for

and obtain Habitat Conservation Plan Land Acquisition grants and will expand these efforts to include gopher tortoises where appropriate. Additional information about Habitat Conservation Plan Land Acquisition grants is available on the USFWS website.[5]

Conservation Banks

The creation and establishment of conservation and wetland mitigation banks to offset the impacts of development have also provided potential alternative mechanisms that may result in a net increase in the amount of wildlife habitat, including gopher tortoise habitat, being conserved in Florida. Additional information on conservation banking is included in the Incentives section below.

Other Conservation Planning Initiatives

Critical Lands and Waters Identification Project

The Florida Natural Areas Inventory (FNAI) collaborated with the University of Florida's GeoPlan Center and FWC on a Critical Lands and Waters Identification Project (CLIP) for the state's Century Commission for a Sustainable Florida. The CLIP is a scientifically-based statewide landscape tool that identifies Florida's important lands and critical green infrastructure. The goal of CLIP is to provide the best available planning tool to assist citizens and decision-makers to envision and ensure a sustainable future. Further information about CLIP is available on the FNAI website.[6]

Florida's Wildlife Action Plan

The FWC is the lead entity for the development of Florida's Wildlife Action Plan. This plan uses a habitat-based approach to identify threats to Florida's fish and wildlife and the actions needed to address them. To support this effort, FWC established Florida's Wildlife Legacy Initiative in 2004. Major statewide conservation issues identified in the FWC Strategy include:

- Habitat loss and fragmentation.
- Degradation of water resources.
- Incompatible fire management.
- Invasive plants and animals.
- Management of the physical environment (*i.e.*, dredging and shoreline hardening activities, etc.).

The Initiative's priorities also include the Cooperative Conservation Blueprint, a statewide geographic information and decision support system for long-term land use planning. The Blueprint will identify Florida's critical lands and waters and incorporate broad input from citizens, agencies, landowners, and businesses to create a common 50 to 100 year vision for Florida's land use. More information can be found on Florida's Wildlife Legacy Initiative's section[7] at MyFWC.com.

Florida Wildlife Conservation Guide

The Florida Wildlife Conservation Guide, which was published online in 2009, is a partnership project between FWC, USFWS, and FNAI. The guide is intended to enhance the technical assistance capabilities of these agencies, in a passive sense, by providing basic project planning information specific to the needs of fish and wildlife, at an easy-to-find-and-use location.

The guide is designed to assist the user in identifying those landscape elements that support many common species of wildlife and identifying important natural history details, survey protocols, management considerations, and population monitoring guidelines for rare or imperiled fish and wildlife species. Finally, the guide provides information on regulatory requirements where they exist with suggestions for land use planning alternatives. The FWC solicited input from all levels of government as well as landowners, researchers, developers, and non-profit organizations to ensure that the guide would be user friendly. The Florida Wildlife Conservation Guide[8] is available from MyFWC.com.

Summary

Collectively, these alternative conservation mechanisms and initiatives, along with the traditional publicly funded conservation acquisition programs, despite their current limitations, provide a strong framework to promote the conservation of wildlife habitat and gopher tortoise habitat in particular. Reliance primarily on public acquisition programs since 2007 resulted in acquisition of approximately 5% of the overall gopher tortoise habitat protection objective. Each of the above listed mechanisms aids in increasing the opportunities for conserving wildlife habitat, including gopher tortoise habitat, thereby increasing the potential to double the gains of the past five years and to realize 20% of the habitat preservation objective within the next ten years if current trends continue. Actions that address this objective include:

- Continue to emphasize support of conservation acquisition projects through FWC's role as a principal on the Acquisition and Restoration Council (ARC) to promote state land acquisition projects that acquire and/or protect upland communities important to listed wildlife such as the gopher tortoise and associated commensals.

- Emphasize acquisition of severely imperiled upland habitats such as sandhill, scrub, and coastal dunes, as well as other gopher tortoise habitats (particularly those with viable populations), by coordinating with the following:

    - Department of Environmental Protection
    - Water Management Districts
    - County environmental offices
    - Florida Natural Areas Inventory
    - The Nature Conservancy and Trust for Public Land
    - Department of Defense and Florida's Military Bases

- Continue to acquire suitable upland habitats that are in need of restoration, restore the necessary ecological components for that habitat type, and restock tortoises if populations are severely depleted (based on the habitat, relative to the site's carrying capacity).

- Continue to emphasize habitat connectivity by acquiring and/or protecting upland habitats that are adjacent to other preserved lands or that serve as corridors to link preserves.

- Highlight acquisition projects, and whenever possible, acquire uplands with adjoining or integrated wetland communities to provide habitat for burrow commensals.

- Support continued funding of the Florida Forever program to allocate sufficient funds necessary to acquire and manage suitable or potentially suitable habitat for imperiled species, including the gopher tortoise, to meet the habitat and land acquisition objective of this and other Commission management plans over the next 10 years.

- Create economic incentives for private landowners to place their properties under conservation easements (see Incentives below).

Table 5. Proposed timeline for implementing habitat protection actions.

Proposed Habitat Protection Actions	2013	2014	2015	2016	2017
Continue to collaborate with the ARC to promote state land acquisition projects that acquire and/or protect upland communities important to listed wildlife such as the gopher tortoise.					
Continue working with local governments and NGOs to emphasize acquisition of severely imperiled upland habitats such as sandhill, scrub, and coastal dunes.					
Continue to encourage land acquisition of suitable upland habitats in need of restoration.					
Continue efforts to increase habitat connectivity by acquiring and/or protecting upland habitats adjacent to other preserved lands.					

Habitat Management

This plan places great importance on the ability of protected lands to support gopher tortoise populations at levels that will ensure the long-term security of the species. Appropriate habitat management, including protecting and managing existing high quality habitat as well as

improving and restoring degraded habitat, is critical to ensuring that gopher tortoise populations continue to persist in Florida. Active habitat management programs that benefit gopher tortoises must occur on both public and private lands in order to achieve the goal and objectives outlined in this plan.

The Role of Public Conservation Lands

Currently, the 1.34 million acres of potential gopher tortoise habitat in public ownership represents 40% of the estimated 3.32 million acres of gopher tortoise habitat remaining in the state. With such an important portion of existing gopher tortoise habitat falling under public ownership, public agencies bear a significant responsibility for undertaking appropriate habitat management.

Public lands afford a high level of security to "at risk" populations of wildlife because of statutory requirements and provisions for long-term management funding. Consequently, this plan advocates increased management focus and intensity on public lands capable of supporting the habitat and life history requirements of the gopher tortoise. There is concern, however, that current land management funding levels are insufficient to achieve desired levels of upland habitat management on publicly owned lands. Successful implementation of this plan may require a legislative commitment to supply management agencies with the necessary personnel, equipment, and funding to undertake required management actions.

Many public conservation lands are required to have a management plan approved by the Acquisition and Restoration Council (ARC) or their governing board. Specifically, s. 253.034(5) of the Florida Statutes (F.S.) says in part, all land management plans shall include an analysis of the property to determine if significant natural resources including listed species occur on the property. If significant natural resources occur, the plan shall contain management strategies to protect the resources. The Florida Forever Act (s. 259.105 F.S.) adds that all state lands that have imperiled species habitat shall include as a consideration in the management plan restoration, enhancement, management, and repopulation of such habitats. For lands identified by the lead management agency as having gopher tortoise populations or the potential to support gopher tortoise populations, FWC will be consulted as statutorily required, and the lead management agency is encouraged to include FWC as part of the management plan advisory group. During consultation and when appropriate, FWC staff will ensure that short-term and long-term management objectives outlined in each plan are compatible with and help advance the goal and objectives of the Gopher Tortoise Management Plan.

To assist in management plan development consistent with requirements of s. 253.034 F.S. and s. 259.105 F.S., FWC staff recommends that managers consider using the following text in an area's management plan when the gopher tortoise has been identified as a significant natural resource on the property:

- Xeric uplands and natural communities that support the gopher tortoise will be managed to achieve/maintain vegetative parameters comparable to those found in comparable reference sites. Frequent prescribed fire is the preferred tool, but other treatments will be used when necessary. Maintaining these communities in a manner that replicates their

natural form and function helps ensure they meet the needs of the gopher tortoise and the other species dependent on these communities.

Guidance on drafting Measurable Objectives within Management Plans: ARC-approved management plans are now required to have measurable objectives. The FWC is not dictating that any specific property plan should have a gopher tortoise measurable objective; however, should an agency choose to include a species-specific objective for the gopher tortoise, the following is guidance on a possible objective:

- Once an area has quantified the acres of potential habitat, the first bullet above could be made into a measurable objective. As an example, a measurable objective could be "for the duration of this plan, use appropriate management to maintain XX acres of xeric upland habitat with vegetative parameters comparable to those of reference sites." On areas in which habitat restoration is required, a reasonable short or long-term measurable objective could be "initiate efforts to restore XX acres of xeric upland habitat so vegetative parameters are similar to those for reference sites." On areas where restocking is required, a short or long-term measurable objective could be "stock XX acres of appropriate habitat to appropriate densities."

The Role of Private Lands

The remaining 2,167,453 (62%) acres of potential gopher tortoise habitat not in public ownership in Florida is held by private landowners. With the decline in availability of funding for public land acquisition associated with recent economic circumstances, it is increasingly clear that privately held land will have an important role in ensuring protection of appropriate gopher tortoise habitat. According to the 2012 Florida Natural Areas Inventory, 193,214 acres of these privately held potential gopher tortoise habitat lands are under some form of conservation protection. The various forms of protection for private lands in existence or being proposed are discussed in detail in the Habitat Protection and Incentives sections of this chapter, and the Incentives section outlines mechanisms available to attract more landowners to place some form of formal protective measures on their land. Even without such formal measures, however, many private landowners are interested in managing their lands for the benefit of wildlife. The following techniques and management tools are appropriate for all land managers regardless of the ownership structure or protection status of the land being managed.

Setting Land Management Strategies

Faced with limited resources, it becomes important to establish priorities. The FWC recommends that the highest priority for managing gopher tortoise habitat is to maintain habitat already in maintenance condition to prevent degradation. The second priority is to improve degraded habitat, starting with patches adjacent to patches in maintenance condition or that have a good concentration of gopher tortoises. The third priority is to restore habitat on areas that have been so severely altered that they no longer function as a natural community and require significant attention to return to the historic condition. Again, the preference is to start with patches adjacent to or near good concentrations of gopher tortoises to allow for population expansion.

Prioritization of habitat patches for management to benefit gopher tortoises *(1= highest)*

1. Habitat in maintenance condition and inhabited by good concentrations of gopher tortoises.
2. Habitat in maintenance condition, regardless of gopher tortoise densities.
3. Slightly degraded habitat (that will be moved towards maintenance condition with treatment) adjacent to a patch in maintenance condition or has a good concentration of gopher tortoises.
4. Slightly degraded habitat regardless of location.
5. Severely altered habitat (needing complete restoration) adjacent to maintenance condition habitat or adjacent to good densities of gopher tortoises.
6. Severely altered habitat (needing complete restoration) regardless of location.

Managing the Habitat

Gopher tortoises will occupy most upland plant communities that contain relatively well-drained soils for burrowing, and sufficient herbs and grasses for forage (Ashton and Ashton 2008). Historically, the recurrence of lightning-ignited fire was pivotal in influencing vegetative succession and shaping species composition and structure of Florida's upland plant communities. The frequency and periodicity of these fires provided a competitive advantage to fire-tolerant vegetation, resulting in open pine stands and lush ground cover, conditions well-suited to the life history needs of the gopher tortoise (Myers and Ewel 1990).

The regular application of prescribed burning is critical for the maintenance of habitat conditions preferred by the gopher tortoise. Prescribed burning reduces shrub and hardwood encroachment, and stimulates growth of tortoise forage plants such as grasses, forbs, and legumes. This allows greater sunlight penetration to reach ground level, which promotes establishment of understory species used by the tortoise as forage. Fire also promotes conditions necessary for gopher tortoise egg incubation. Early growing season fires (April – June) cause a more pronounced vegetative response when compared to burning during the period of plant dormancy. These early growing season burns stimulate flowering in many warm season grasses, increase species composition among understory plants, and result in higher understory biomass production (See Prescribed Fire sub-section below).

Increased urbanization and societal intolerance of prescribed burning represent serious threats to gopher tortoise populations and their habitat. Consequently, maintaining habitat conditions preferred by gopher tortoises requires a commitment by resource managers to plan and initiate vegetation management practices.

Setting Desired Future Conditions

Land managers across Florida may have differing ideas on what constitutes good natural community conditions for gopher tortoises. Therefore, FWC provides the following guidance on effective management actions and the desired future conditions of various natural communities to support healthy gopher tortoise populations. In general, FNAI's Guide to the Natural

Communities of Florida 2010 Edition[9] is an excellent source of information on each community's natural processes and the associated management considerations.

The FNAI has identified a number of "reference natural communities"[10] where the ecological condition of the community is high quality. These reference natural communities provide examples of what conservation managers might strive to accomplish in managing the natural communities under their care. The FNAI provides an interactive map[11] to assist land managers in identifying nearby reference natural communities. For each reference natural community, FNAI provides a document describing the area, including the recommended range of values for a number of vegetative parameters for that natural community, and the average value for each parameter at that reference site. Familiarity with these values can help guide managers in determining appropriate vegetative parameter values for their property. When using this guide, it is important to understand the Reference Area Sampling Station Design[12] and vegetative parameter definitions[13] prior to using the reference site values to create area-specific desired vegetative parameter values. The use of different techniques to measure parameter values will result in parameter values that may not be comparable. For instance, using 2 techniques to estimate a value at 1 location may generate 2 different values, even though the condition is the same.

In the documentation for some reference sites, FNAI provides a *Notable Species Management Considerations* section that will inform the reader if the reference site is within recommended guidelines for specific imperiled species. A table of the recommended range of vegetative parameter values by natural community is included in Table 6. For scrub management, FWC worked with FNAI to develop the Scrub Management Guidelines for Peninsular Florida.[14]

Although FWC encourages management that strives to achieve the FNAI recommended range of vegetative parameter values for a natural community, meeting gopher tortoise objectives may necessitate using a range that differs from the FNAI recommendation, or that favors one end of the range of possible values for some attributes. For instance, a manager striving to create optimal gopher tortoise habitat may be consistently in the lower range of values for basal area and in the higher range of values for percent ground cover.

Reference site values can provide insight into setting area-specific values. Familiarity with the conditions of the reference site, the average values of the reference site, and the species supported by the reference site provides the basis for making an informed decision in setting area-specific desired values. Managers should always consider the habitat needs of other wildlife, especially those considered imperiled, during the decision making process for setting desired future conditions.

Table 6. General characteristics for plant communities commonly used by the gopher tortoise including associated fire frequency, and parameters and related values used to define optimum gopher tortoise habitat in Florida (adapted from FNAI's *Guide to Natural Communities*).

	mesic flatwoods (northern FL)	**mesic flatwoods (peninsular FL)**	**upland pine**	**sandhill**	**scrubby flatwoods**	**scrub**	**dry prairie**
Basal Area of Pine (sq ft per acre)	20-80	10-50	20-80	20-60	20-60	0-20	0.0
Maximum Canopy Cover (%)	60	60	50	50	40	40	10
Bare Ground (%)	<5	<10	<5	1-10	10-20	10-40	1-10
Herb Cover (%)	>25	>25	>50	>25	1-10	<5	>10
Wiry Grasses Cover (%)	>10	>10	>25	>10	1-10	<5	>10
Average Maximum Palmetto Height (ft)	<3	<3	<3	<3	<3	<3	<1.5
Palmetto Cover (%)	10-25	10-25	<5	<5	5-15	0-10	5-20
Average Maximum Shrub Height (ft)	<2	<2	<2	<3	<3	<5	<2
Shrub Cover (%)	<25	<25	<10	10-20	10-40	20-40	10-40
Fire return interval (years)[1]	1-3	1-3	1-3	1-3	3-8	variable	1-2

Note: Some of these habitat characteristics may not support higher gopher tortoise densities.

[1] These fire return intervals will help maintain desired conditions; however, degraded habitats may need more than the application of fire to restore an area to maintenance condition.

Management Tools

Proactive habitat management on both public and private lands requires application of land management activities to enhance conditions for gopher tortoise foraging (diverse herbaceous ground cover) and reproduction (open, sunlit sites for nesting). Land managers have a number of tools they can use to enhance the condition of the natural community in ways that benefit the gopher tortoise. Prescribed fire and timber thinning are two of the most beneficial of these tools, and often the most cost-effective. Habitat in maintenance condition usually can be maintained using only prescribed fire. However, in cases where past management has allowed for alteration or degradation of the habitat, the application of other management tools may be necessary to facilitate the effective use of prescribed fire. The following land management practices are effective for improving habitat quality and could be incorporated into the management framework for public and private conservation lands. The measures below are meant to serve as general guidance rather than a specific prescription to manage habitat. Land managers should research appropriate land management tools specific to their areas and conditions of their site to choose what management tool is most appropriate.

Prescribed Fire: Managers can use prescribed fire to maintain habitat already in maintenance condition, or use it in conjunction with other tools to restore degraded natural communities to a more natural form and function. The preference is for gopher tortoise habitat to receive prescribed fire at the interval recommended in Table 6. Although growing season fire is favored in most instances, in order for managers to meet the recommended fire return intervals, managers on most properties will need to apply fire throughout the year making use of as many good burn days as possible. Further, if a patch is due for a burn and conditions are not suitable during the growing season, it may be better to maintain the frequency of the fire return interval by applying a dormant season burn rather than waiting for the following growing season. Diversity in the application of fire benefits the habitat and the gopher tortoise. Additionally, the frequent application of fire is a major contributing factor to high species richness (Glitzenstein *et al.* 2012). In any 12-year period, a habitat patch in a natural community that has a 1-3 year preferred fire return interval should experience some burns at a 12-18 month interval, some at an 18-30 month interval, and some at a 30-36 month interval, with some fires occurring during the growing season and some during the dormant season.

The management tools are meant to serve as guidance rather than a specific prescription to manage habitat.

The existing fire strike teams can be used to enhance the number of acres burned or otherwise treated for the benefit of the gopher tortoise. Strike teams are available primarily to assist in increasing the amount of prescribed fire implemented on the ground, and are accessible to both public and private landowners. However, these teams are also able to conduct site preparation activities (such as preparing fire lines and roller chopping) and invasive exotic control in addition to applying prescribed fire. Over the long-term, the technical assistance provided by the strike teams should enable many landowners to create their own self-sustaining habitat management programs. One important focus of the teams is application of prescribed fire near the wildland-urban interface.

To minimize potential negative impacts to gopher tortoises associated with a prescribed fire program, it is important to ensure that tortoises are not killed when disking or using other equipment to prepare safe lines. Fortunately, tortoises are readily visible, and this is easily accomplished. When practical, prescribed fire should be avoided in September and October. This is a period when hatchlings are more numerous and vulnerable (Ashton and Ashton 2008).

Prescribed Fire Resources: Prescribed fire in Florida is governed by Chapter 590, Florida Statutes, and Chapter 5I-2, Florida Administrative Code. Information on becoming a certified burner can be accessed online from the Florida Forest Service.[15] The University of Florida School of Forest Resources and Conservation *Fire in Florida*[16] program provides information and resources for land managers, homeowners, educators, and extension agents on prescribed fire. The Nature Conservancy Resource Management Support Team[17] provides 'on the ground' technical assistance. The goal is to improve targeted uplands by assisting with prescribed fire and invasive species control. The National Interagency Prescribed Fire Training Center[18] (PFTC) teams assist with or conduct prescribed burns; contact The Nature Conservancy at (407) 682-3664, or the PFTC at (850) 523-8630 for more information. Other resources are available to assist land managers and owners with prescribed fire, including Florida's Prescribed Fire Councils[19] and the Southern Fire Exchange. The Councils bring together the collective knowledge and skills of these groups, providing a forum for information sharing. The Southern Fire Exchange[20] (SFE) Resource Center consolidates southern fire information, and provides access to fire data, documents, projects, tools, and websites related to fire and natural resource management via the Southern Fire Portal[21] (SFP).

Heavy Equipment: Many of the treatments in this list require the use of heavy equipment. Although the effect of the treatment on the habitat is beneficial, there can be negative effects if minimization measures are not implemented to avoid direct mortality of tortoises and to minimize burrow collapse. Rather than repeating this mitigation measure in each treatment, it is provided here, for use in all treatments that require use of heavy equipment.

Equipment operators should be made aware of tortoises and instructed to avoid them. Marking the location of burrows (often done with flagging) in advance of the treatment helps equipment operators avoid collapsing burrows and is encouraged whenever feasible. When practical, minimize use of heavy equipment during September and October since hatchlings are more numerous and vulnerable at this time, and it is difficult for individuals operating equipment to see hatchlings (Ashton and Ashton 2008). As tortoises tend to be most active during coolest times in the warm months, and the warmest time during the cool months, adjusting the times when heavy equipment is used may reduce the risk to gopher tortoises.

Timber Thinning: Timber thinning can be an important tool in maintaining or enhancing habitat for the gopher tortoise. For areas in maintenance condition, once basal area approaches the upper value for the natural community (Table 6), applying a timber harvest can help move the condition to the lower range in the value, benefiting gopher tortoises. As basal area increases, the canopy becomes denser and less sunlight reaches the forest floor,

which influences the ground cover. Timber thinning also may be a necessary tool to enhance slightly degraded stands. Thinning will open the canopy and create conditions more suitable to the safe application of prescribed fire. Further, the equipment used for timber thinning typically knocks down excessive shrubs and hardwoods in the stand. Thus, thinning can have multiple positive effects on the stand. Areas converted to sand pine (*Pinus clausa*) may require a clear cut before initiating natural community restoration.

Following the guidance provided for 'Heavy Equipment' (above) will help minimize potential negative effects to gopher tortoises that might be associated with a timber harvest, and help avoid direct mortality of tortoises and minimize burrow collapse. Areas of more intense activity associated with the harvest, such as slash piles, logging decks, and skid trails should be placed in areas without burrows. Planning for regeneration while simultaneously accommodating the needs of the gopher tortoise includes avoiding overstocking the stand, using less intensive site prep (to minimize impacts to the soil and ground cover), and planting longleaf pine where appropriate.

Whole Tree Removal: Although not an option everywhere, there are some portions of the State that contain biofuel plants or other facilities that are willing to purchase hardwoods, or have citizens willing to cut and remove hardwoods for firewood. When the stand under management has an excessive hardwood component, whole tree removal is the preferred method of stand enhancement. Unlike other hardwood reduction techniques, whole tree removal does not result in excessive debris covering the forest floor post-treatment. Excessive debris on the forest floor can inhibit ground cover growth, with negative effects on gopher tortoises. Whole tree removal can be affected via firewood sales, or sales to harvesters who use typical forest thinning equipment to harvest and remove the hardwoods. The minimization measures for timber thinning and heavy equipment (above) may be appropriate for this treatment.

Chopping: Roller chopping may be an appropriate tool in stands with excessive shrub or palmetto cover. Typically, single drum chopping is preferred. It is important to prescribe the right equipment to reduce the shrubs and palmetto with minimal soil disturbance. Chopping reduces the shrub and palmetto in a way that enhances safe application of prescribed fire. Further, chopping may be preferred over mulching or shredding, as mulching and shredding leave a dense matt of mulch that may hamper ground cover response. However, it is important to follow chopping with prescribed fire (Menges and Gordon 2008). Chopping without follow-up prescribed fire has minimal benefits to the gopher tortoise.

To minimize potential negative effects to gopher tortoises associated with roller chopping, follow the heavy equipment minimization techniques suggested above. When practical, apply roller chopping during cooler periods or periods of reduced gopher tortoise activity. However, it is important to apply the treatment so as to achieve the intended management objective, while allowing for follow-up prescribed fire at an appropriate time.

Mulching or Shredding: Mulching or shredding is an additional management tool to reduce excessive shrubs, palmetto, or young hardwoods. As these treatments usually result in a thick layer of mulch-like material being deposited on the ground, it is critically important that these treatments be followed with prescribed fire to remove this layer and allow for ground

cover response. These tools may be especially useful as a pre-treatment to areas prior to ground cover restoration plantings. Typically, there is little chance of negative impacts on gopher tortoises from these applications in such stands as these stands tend to have no tortoises and little intact ground cover.

To minimize potential negative effects to gopher tortoises associated with mulching or shredding, follow the heavy equipment minimization techniques suggested above. To minimize the amount of mulch material on the ground post treatment, use the equipment to drop vegetation, without necessarily grinding or mulching all of the plant material. It is better to leave larger trees intact on the ground rather than completely mulching them. When practical, apply these treatments during cooler periods or periods of reduced gopher tortoise activity. However, it is important to apply the treatment so as to achieve the intended management objectives, while allowing for follow-up prescribed fire at an appropriate time.

Mowing: Mowing is a useful tool for maintaining open grass-dominated stands, pastures, or roadside conditions. Mowing used in conjunction with disked fire lines can increase fire line effectiveness during the prescribed burn. Keep mower blades or cutters at least 18 inches above the ground to avoid injury to tortoises when mowing natural areas known to contain tortoises. See the minimization approach suggested in Heavy Equipment (above).

Herbicides: Herbicides can be effective for controlling infestations of invasive exotic plants. Left untreated, invasive exotic plants can reduce native plant species composition or interfere with the application of habitat management practices such as mowing and prescribed burning. Herbicides may also be useful in reducing excessive shrub and hardwood densities. When using herbicides for this purpose, select an herbicide and appropriate application that has the desired effect on the shrubs and hardwoods, but that does not have a significant negative effect on native, herbaceous ground cover.

Ground Cover Restoration: Ground cover restoration techniques should be applied on degraded and agriculturally disturbed sites to restore natural plant community functions and create suitable habitat for use by gopher tortoises and associated commensal species. In many cases, it is best to restore the ground cover first, and then restore the pine component after the ground cover has successfully regenerated and has carried prescribed fire.

Table 7. Proposed timeline for implementing habitat management actions.

Proposed Habitat Management Actions	2013	2014	2015	2016	2017
Implement appropriate habitat management practices on upland natural plant communities to restore community dynamics and functions on lands managed by FWC.					
Implement ground cover restoration techniques on degraded and agriculturally disturbed sites to restore natural plant community functions and create suitable habitat for use by gopher tortoises and associated commensal species.					
Recommend to the ARC that Land Management Reviews of state-managed lands include a separate assessment to determine if upland habitat management is consistent with the goal and objectives of gopher tortoise conservation.					
Coordinate with partner organizations to identify and prioritize local government and state lands in need of assistance with management activities.					
Continue to support existing prescribed fire strike teams to enhance the number of gopher tortoise habitat acres burned or otherwise treated.					
Coordinate with FWC's Landowner Assistance Program and partner agencies to provide support and technical assistance to private landowners for managing gopher tortoise habitat.					

Incentives

As discussed in the previous sections on habitat protection and management, private lands will play an increasingly important role in achieving the goal and objectives for gopher tortoise conservation in Florida. Public lands alone are inadequate to recover the species; it will also take the collaboration of private property owners. The challenge faced in this regard is to find ways to attract and engage more private landowners in conservation activities that benefit wildlife. Through ongoing habitat management practices and prescribed fire, private landowners can have a profound impact on the conservation of gopher tortoises and the habitat on which they, and more than 350 commensal species, depend on private landowners. Private landowners also play a significant role in increasing protection of habitat and conservation efforts for the gopher tortoise, thereby helping to reduce the

threats that the gopher tortoise faces. However, it can be challenging at times for private landowners to continue beneficial land practices due to changes in economic conditions.

Conservation-based incentives typically provide financial payments, regulatory assurance, or both, and help further the goals and objectives of species' conservation plans. Conservation-based incentives can assist landowners to continue the good work they are already doing that benefits wildlife, and can help to increase the landowner base conserving gopher tortoises in Florida. Private lands comprise more than 60% of all potential gopher tortoise habitat in Florida. Collectively, private landowners throughout the eastern range of the tortoise have the ability to help preclude federal listing of the species. The plan is structured to provide incentives to partners encouraging their action and participation. These incentives are intended to promote an increase in the acreage of protected and managed tortoise habitat (Chapter 3, Objective 2), and focus FWC permitting efforts on activities providing the best long-term conservation benefits to the species. The FWC will continue to work with partners and stakeholders to identify and develop new incentive-based conservation opportunities in addition to those included in the Gopher Tortoise Management Plan.

Implementation of this management plan will further require the cooperation of many agencies and partners outside FWC. The FWC will continue to work with other state and federal agencies to develop incentives for active conservation measures on publicly owned lands such as state lands and military installations and bases. Available incentives can be categorized as either being associated with the revised permit system or with state and federally administered landowner assistance programs.

Permit-Based Incentives

Permit-based incentives can be divided into 3 categories, those that: (1) waive permit requirements for activities specifically intended to improve habitat for native wildlife (*e.g.,* prescribed burning); (2) authorize increased stocking densities on approved recipient sites exceeding minimum habitat quality criteria; and (3) require smaller mitigation contributions for responsible relocations.

Gopher tortoise permit requirements will continue to be waived on public or private lands for activities specifically intended to improve habitat for native wildlife. These activities generally include prescribed burning, mowing, roller-chopping, and tree stand thinning. However, permits are required when these activities are conducted as a precursor to property development.

Higher stocking densities are allowed on recipient sites that exhibit desirable tortoise habitat attributes, such as those containing well-drained soils, open or sparse tree canopy, or a healthy ground cover of herbaceous plants. Habitat criteria necessary for higher stocking densities are outlined in the Gopher Tortoise Permitting Guidelines.

The permit system requires smaller mitigation contributions from permittees that responsibly relocate tortoises to permanently protected private or publicly owned lands. This

economic incentive helps guide developers towards mitigation that provides the maximum long-term conservation benefit.

Candidate Conservation Agreement

Candidate Conservation Agreements (CCAs) are voluntary conservation agreements between the USFWS and one or more public or private parties. The USFWS works with its partners to identify threats to candidate species, plan the measures needed to address the threats and conserve these species, identify willing landowners, develop agreements, design and implement conservation measures, and monitor their effectiveness.

In 2006, the USFWS received a petition to federally list the gopher tortoise throughout its non-listed range, which includes Florida, Georgia, and parts of Alabama and South Carolina. As a response to this listing petition, stakeholders representing the four states' fish and wildlife agencies, branches of the Department of Defense, and related non-profit organizations drafted and executed a Candidate Conservation Agreement (CCA). The purpose of the CCA is to address species management and conservation throughout its non-federal-listed range. In November 2008, the CCA was fully signed and implementation began. New partners signed on to the agreement in 2009 and, currently, additional state, federal, and non-profit organizations are also considering entering into this partnership agreement. The CCA provides incentives for future regulatory relief should the conservation activities conducted by the parties help to preclude the need to federally list the gopher tortoise. A copy of the CCA for the gopher tortoise can be downloaded from the USFWS website.[22]

Candidate Conservation Agreement with Assurances

Candidate Conservation Agreement with Assurances (CCAA) are proactive, voluntary agreements between the USFWS and a private party that provides significant conservation benefits for Candidate species on non-federal lands, while providing regulatory assurances to the landowner should the species become federally listed under the Endangered Species Act (ESA). A CCAA allows a property owner to voluntarily implement conservation measures on lands that benefit and provide conservation lift for species covered by the agreement. In exchange, the property owner receives a permit from the USFWS which provides assurances that further conservation actions or additional land use restrictions will not be required if the species becomes listed in the future, provided the CCAA is in good standing. The assurances obtained under the agreement provide regulatory certainty to landowners regarding their activities on lands included in the agreement.

The USFWS works with interested landowners to develop CCAAs. These voluntary agreements allow landowners to manage their property in ways that benefit Candidate species. These agreements also can be developed to provide regulatory certainty for landowners should the species become listed under the ESA. The FWC will work cooperatively with landowners and the USFWS to develop CCAAs for the gopher tortoise in Florida. For further information on CCAAs, visit the Candidate Conservation section of the USFWS website.[23]

Habitat Conservation Plans

Habitat Conservation Plans (HCP) are planning documents originally developed as an element of the application for issuance of an incidental take permit for federally listed species. HCP planning grants are available to assist with the development of a HCP. These plans outline the effects of anticipated future impact and proposed actions to be undertaken to minimize and mitigate such impacts. HCPs can include listed species, non-listed species, and Candidate species. This planning approach allows for conservation efforts to be taken before a species' status degrades to the extent that it becomes threatened with extinction, thereby providing early benefits and broader conservation options, and may preclude the need for federal listing under the ESA. As HCPs are developed for large scale projects, multiple incidental take permits are allowed under one HCP, making it a planning effort to address species and habitat conservation on a landscape-level while still meeting regulatory requirements. HCPs include the following: information assessing potential future impacts to listed species; measures to monitor, minimize, or mitigate those impacts; funding available to support the plan; alternative actions available to avoid impacts; and justification for the chosen alternative. HCPs are approved on the basis that the take is incidental to a lawfully permitted activity that impacts will be minimized and mitigated to the extent practicable, that adequate funding is identified and committed to implement the HCP, and that take of the species will not noticeably reduce the likelihood of survival and recovery of the species.

Several HCPs currently being developed in Florida include gopher tortoises in their plans. The FWC does not allow entombment of gopher tortoises, and current permitting requirements for gopher tortoises apply under all HCPs in Florida. The gopher tortoise program and FWC's Incentive Based Conservation Program will work together to ensure that the gopher tortoise is included where appropriate in all future HCP planning efforts. Additional information regarding HCPs is available on the USFWS website.[24]

Conservation Banking

Conservation banks are another program available to private landowners for lands that are permanently protected through the use of perpetual conservation easements. The owner of such lands agrees to place the property under an easement and to manage for any listed species, Candidate species, or any other at-risk species. In exchange for these conservation measures, the bank owner is awarded conservation credits which may be sold to individuals or developers needing to mitigate adverse impacts of their projects on affected species. Conservation banking may have broad utility for numerous landowners through preservation, enhancement, restoration, or establishment of habitat for listed species. Through proper habitat management, lands used for ranching, farming, or silviculture may qualify for the program.

Establishing a conservation bank requires the following actions be taken: a banking agreement must be established between the landowner, FWC, and USFWS; an easement granted to a third party, precluding future development and outlining appropriate land uses; a long-term management plan created for the site; and provision made for long-term management and monitoring of the easement through a non-wasting endowed trust. Once

these criteria are met, the owner receives and is able to sell conservation credits to offset development impacts within a defined service area.

The FWC does not issue permits for the incidental take of tortoises; however, conservation banks may provide an opportunity for the use of credits based on ecosystem services or for habitat credits. This would provide a financial incentive for landowners who have quality tortoise habitat which is already at optimal carrying capacity. The FWC has a strong partnership with the USFWS in establishing conservation banks for federally listed species and has included tortoise recipient sites under the conservation easement. The FWC will continue to examine the full range of utility that banking may provide. For further information on conservation banking, visit the USFWS website.[25]

Cooperative Conservation Blueprint

One approach to encourage the participation of private landowners to conserve wildlife habitat identified in the Cooperative Conservation Blueprint is to develop a Payment for Ecosystem Services (PES) program. The USDA Natural Resources Conservation Service provides funding for the development of PES and other market-based conservation tools through their Conservation Innovation Grants. The FWC is currently working with multiple partners to develop a proposal for a PES program that would incorporate some form of compensation to landowners who provide critical habitat for the Florida panther, gopher tortoise, and/or aquatic species that would expand on similar programs targeting water quality or quantity.

Landowner Assistance Programs

The FWC's Landowner Assistance Program (LAP) administers or assists other agencies with the application of several landowner incentive programs for meeting wildlife conservation goals. Among these are the Forest Stewardship Program, Wildlife Habitat Incentives Program, Environmental Quality Incentives Program, Partners for Fish and Wildlife Program, Common Species Common, and the Wetland Reserve Program (Appendix 7). These programs are voluntary and some may provide financial incentives, depending on annual appropriation, for wildlife conservation and habitat management on private lands.

The LAP provides technical guidance and review to focus and approve the distribution of these cost share funds for specified wildlife management activities. The FWC will coordinate internally with its landowner assistance program to enhance the application of these programs on appropriate privately owned uplands for gopher tortoise conservation. This program includes technical advice and outreach to landowners on opportunities for establishment of conservation easements, revenue generation as gopher tortoise recipient sites, technical and financial assistance with habitat management (*e.g.,* prescribed burning, vegetation management), and development of written management plans. The FWC is currently creating improved outreach and evaluation of landowner needs and preferences to increase the effectiveness of this program. The gopher tortoise conservation goal and objectives will be integrated into this program.

Safe Harbor Agreement

The Safe Harbor Agreement (SHA) has the potential to increase the value of landowner incentives, although its application to gopher tortoise conservation in Florida is not compatible at this time. Should SHAs become a viable incentive for landowners in Florida, FWC will explore the application of the SHA in the context of the management plan actions. Additional information regarding Safe Harbor Agreements can be accessed on the USFWS website.[26]

In principle, an SHA allows an agency to assure a landowner that successful land management conservation will not subject the landowner to increased regulatory burden if the landowner agrees to perform specific activities that enhance the habitat. The voluntary agreement is a contract between the USFWS and landowner, specifying an agreed baseline level of regulated wildlife that the landowner will not be able to impact without obtaining a permit. Further, the agency agrees not to penalize landowners should changes in their land use practices result in an increase in the regulated species numbers above the agreed baseline level. This gives landowners certainty about future regulatory responsibilities, thereby assuring landowners that their management activities which encourage wildlife will not cause an increased future regulatory burden. A potential drawback of creating an SHA is that conservation benefits created under the agreement can be reversed if the landowner chooses to change land use. However, widespread application of the SHA suggests this occurs in only a small number of cases, and the freedom from fear of future regulatory jeopardy fosters cooperative wildlife management in many examples. The SHA has been notably successful in supporting private conservation areas for the federally protected red-cockaded woodpecker (*Picoides borealis*) in Florida.

Tax-based Incentives

Florida provides tax incentives including property tax exemptions for landowners that put a perpetual conservation easement on their land. This allows landowners interested in maintaining their current conservation or agricultural practices into the future to receive a break from property taxes for excluding additional development on their property. These tax reduction incentives encourage greater conservation of gopher tortoise habitat. In Florida, voters approved an amendment to the state Constitution to allow for property tax exemption and classification and assessment of land dedicated in perpetuity and used for conservation purposes (FL Const. art. XII, § 28[27]). Written management plans developed through FWC's Landowner Assistance Program can provide documentation to support applications for these tax incentives. Additional information regarding property tax incentives is available on the Florida Forest Stewardship website.[28]

Additional Conservation-based Incentive Programs

There are many other conservation-based incentive opportunities for landowners who want to help conserve imperiled wildlife and specifically the gopher tortoise. A comprehensive list of federal and state programs is included in Appendix 7.

Table 8. Proposed timeline for implementing incentives actions.

Proposed Incentives Actions	2013	2014	2015	2016	2017
Assess the effectiveness of permit-based incentives toward achievement of the management plan conservation objectives.					
Coordinate internally with FWC staff that provide technical assistance and outreach to private landowners to identify cost share opportunities for landowners who manage gopher tortoise habitat on private lands.					
Coordinate with FWC and USFWS staff and evaluate Habitat Conservation Plans (HCPs), conservation banking, and Candidate Conservation Agreements with Assurances (CCAA) as means to provide a conservation benefit for gopher tortoises, and provide incentives to the landowner.					
Implement as appropriate Habitat Conservation Plans (HCPs), conservation banking, and Candidate Conservation Agreements with Assurances (CCAA) to benefit the conservation of gopher tortoises with interested landowners.					
Identify practices and land use changes that result in a positive habitat value for gopher tortoises on agriculture and silviculture lands.					
Develop Payment for Ecosystem Services pilot incentive program for landowners.					

Population Management

Preserving, managing, and restoring gopher tortoise habitats are key components in achieving the conservation goal; however, addressing the needs of tortoise populations also plays a role in the success of a long-term species conservation plan. In general, resource managers undertake activities to enhance the required burrowing, foraging, and nesting habitat, with the understanding that tortoise individuals and populations will benefit through improved nutrition, increased fecundity, and positive effects on growth rates and age to sexual maturity. However, as populations become increasingly fragmented and impacted by anthropogenic factors, managers will need to take a more direct, hands-on, approach to conserving this Threatened species. In addition to maintaining viable gopher tortoise populations where they exist, the strategies related to population management are: to enhance gopher tortoise populations in degraded habitats; to restore gopher tortoises on public conservation lands where populations have been severely depleted or eliminated; and,

where necessary, to reduce hatchling predation on select sites where population viability and persistence have been compromised.

Population Restoration

There are two primary approaches to population restoration. ***Facilitated population restoration*** is used in areas with severely altered or degraded habitat that also has some habitat patches supporting tortoises. By undertaking specific land management actions to restore the altered or degraded habitat, the manager increases the amount of suitable habitat and facilitates the natural growth of the existing population over time. Gopher tortoise populations on a number of conservation lands around the state could be enhanced by this approach. Moreover, although restoring populations takes time for this long-lived, slow-growing species, such natural increases can help overcome some of the past decline and contribute positively to overall tortoise population growth in Florida. ***Directed population restoration*** is the deliberate and planned restocking of wild gopher tortoises on public conservation lands where resident densities are extremely low and where the tortoises' future survival and long-term population viability are very likely. This approach can be used in a variety of circumstances, including areas where habitat has been restored or created but lacks a local source of tortoises to repopulate the restored habitat. For example, select portions of the Florida Panhandle may qualify for restocking where past harvest has severely depleted or eliminated the local tortoise resource over vast acreages. Additionally, reclaimed mining sites in northern and central Florida have been restocked in the past, and new sites may serve a similar function in the future.

Facilitated restoration of depleted tortoise populations through habitat improvement and natural population growth is a preferred population management tool, just as prescribed fire is a premier habitat management tool. An initial step will be determination of which public lands might best benefit from either of the two approaches to population restoration. Restocking will be considered in situations where the habitat has either been restored or is already in good condition, but where no available surrounding tortoises exist to rebuild the population naturally, or where the population is so severely depleted that viability is compromised. Guyer *et al.* (in press) found that at densities below 0.4/ha, tortoises alter movements in ways that might affect population viability because of changes in social structure. If restocking is necessary, sources of tortoises will be carefully considered to enhance the success of the population restoration. Insights from genetic studies (*e.g.*, Osentoski and Lamb 1995; Schwartz and Karl 2006; Sinclair-Winters *et al.,* in prep.) will be factored into restocking decisions. During 2011, other Florida land management agencies worked with FWC to create detailed guidelines for restocking tortoise populations on publicly owned conservation lands (Appendix 12, Gopher Tortoise Permitting Guidelines). The focus of such restocking efforts is to establish viable populations on protected, well-managed lands.

Head-start Programs and Predator Exclusion

In other states within the gopher tortoise's range (*e.g.,* Georgia and Mississippi), head-starting of juvenile tortoises has been undertaken (C. Powell, M. Hinderliter, pers. comm.). Eggs are retrieved from the wild and incubated in a laboratory, and the resulting

hatchlings are raised for 1 or more years in a captive setting free of predation. Florida has not yet embarked on a head-start project, but this population management tool remains a possibility for resident tortoise populations on select sites. Additionally, because juvenile tortoises are less likely to carry upper respiratory tract disease (Wendland *et al.* 2010b) and may be more easily assimilated into populations (Berry 1986), head-starting older juveniles could ease some of the concerns regarding relocation and also reduce mortality due to the typically high predation rates on hatchlings and yearlings.

Predator exclusion is another related population management tool that may be useful for increasing nest and hatchling survival (Smith *et al.*, in press). Installing predator-proof fencing and removing mammals like raccoons could be undertaken in special circumstances. Such intensive population manipulations would be considered primarily in cases where other management tools are not adequately working to keep a regionally or locally significant protected tortoise population viable.

Actions associated with population management include the following:

- Coordinate with public land management agencies to identify sites that could benefit from either facilitated or directed population restoration.

- Determine best sources of gopher tortoises for restocking on select publicly owned conservation lands.

- Continue to work with willing private landowners to determine if either facilitated or directed population restoration would benefit their tortoise populations.

- In extreme cases where hatchling success is documented to be unusually low or where sustained juvenile mortality is occurring, consider implementing predator exclusion, head-start programs, or both, where juveniles are protected until large enough to minimize the predation risk**.**

Table 9. Proposed timeline for implementing population management actions.

Proposed Population Management Actions	2013	2014	2015	2016	2017
Coordinate with public land management agencies to identify sites that could benefit from either facilitated or directed population restoration.					
Determine best sources of gopher tortoises for restocking on select publicly owned conservation lands.					
Continue to work with willing private landowners to determine if either facilitated or directed population restoration would benefit their tortoise populations.					
In extreme cases where hatchling success is documented to be unusually low or where sustained juvenile mortality is occurring, consider implementing predator exclusion, head-start programs, or both, where juveniles are protected until large enough to minimize the predation risk**.**					

Disease Management

Disease can greatly impact the health and population demographics of wildlife. The effects of disease can be increased or confounded when populations are fragmented or stressed by human activity. Gopher tortoises are known to be subject to several diseases that potentially affect their well-being and survival (*e.g.,* mycoplasmal upper respiratory tract disease [URTD], iridovirus, and herpesvirus). Yet, recent epidemiological studies have not clarified the impacts of URTD or other diseases on gopher tortoise populations. Although primarily a disease of adult tortoises due to social factors (Wendland *et al*. 2010b), URTD's effects on gopher tortoise reproduction and productivity are not fully understood (Perez-Heydrich *et al*. 2011). URTD is a chronic disease that can be characterized by high morbidity (*i.e.,* incidence of illness) but low mortality (McLaughlin 1997, Diemer Berish *et al*. 2010). McCoy *et al.* (2007) and Perez-Heydrich *et al.* (2011) both noted that decline in the populations that they studied was not necessarily related to the presence of mycoplasma; however, some disease models indicated that the frequency of URTD epizootics in populations could elevate the impact of this disease (Perez-Heydrich *et al.* 2011). Relocation could be one mechanism for introducing ill tortoises and triggering an epizootic. Some studies have also indicated that previously exposed captive tortoises became ill more quickly when re-exposed (McLaughlin 1997). Other disease models (Ozgul *et al.* 2009) have indicated that susceptible (seronegative) tortoises in populations with higher seroprevalence ($\geq$25% seropositive, *i.e.*, exposed) may have lower survival than tortoises in populations with lower seroprevalence. Finally, population models have indicated relatively severe population

decline if both URTD-related mortality of adults and increased predation of juveniles occurred (Miller 2001).

Previous attempts to control the spread of mycoplasmal URTD in Florida by requiring serological testing of a sample of tortoises prior to relocation were recognized as insufficient with detrimental consequences to tortoise populations, and the requirement was suspended in August 2006. The insufficiency of the requirement stemmed from the blood test's ability to solely detect exposure (antibodies) and not the presence of the pathogen (a potential on-going source of infection); moreover, the significance and ramifications of a seropositive result are still not fully comprehended. Yet the mere presence of a seropositive tortoise on a development site meant that the tortoises were not relocated, resulting in incidental take and other types of mitigation (*e.g.,* habitat protection). The loss of individual tortoises and populations as a consequence of blood test results was not contributing to overall tortoise conservation in Florida.

Since FWC's suspension of mandatory mycoplasmal URTD testing in 2006, additional findings on URTD in desert tortoises (Hunter *et al.* 2008, Sandmeier *et al.* 2009) have cast further scientific shadows on the true meaning of a seropositive result from the current blood test (known as an ELISA, or enzyme-linked immunosorbent assay). Moreover, these recent papers have generated controversy over which test or combination of tests constitutes the most accurate diagnostic tool. Using a different diagnostic test (known as a Western blot) from that presently used for gopher tortoises, Hunter *et al.* (2008) concluded that desert tortoises have natural antibodies to *M. agassizii* that could compromise the determination of infection status by the commonly used ELISA. Wendland *et al.* (2010a) countered that the current ELISA is the only diagnostic test for mycoplasmal URTD that has undergone rigorous validation and for which results have been correlated with clinical disease, culture, and lesions in the nasal passages; they also cited what they believe to be inherent problems with the Western blot test used by Hunter *et al.* (2008) that could result in false negatives. Sandmeier *et al.* (2009) thoroughly reviewed the knowledge on URTD in Mohave desert tortoise populations and echoed concerns over potential problems with the conventional (ELISA) blood test. They also noted a pattern of geographic and possibly temporal variability in seroprevalence, prevalence of symptomatic tortoises, and effects of mycoplasmal URTD in Mohave desert tortoise populations. Similarly, McCoy *et al.* (2007) found that declines in specific populations of gopher tortoises were not necessarily correlative with exposure to *M. agassizii.* Despite the controversy over optimal diagnostic tests, mycoplasmal URTD can perhaps be best described as a context-dependent disease, rather than a disease that causes consistent morbidity and mortality across wide geographic areas (Sandmeier *et al.* 2009).

The effects of iridovirus and herpesvirus on Florida's gopher tortoise populations are unknown at this time; these diseases have not been as intensively studied as mycoplasmal URTD. Johnson *et al.* (2010) found extremely low seroprevalence (1.2% of 658 tortoises) to iridovirus in free-ranging tortoises sampled in Florida; however, they indicated that this finding may not represent the true seroprevalence, potentially because turtles and tortoises may die quickly following exposure. Even less is known about herpesvirus in gopher tortoises and what impact it might have on wild populations. Gopher tortoises also harbor various internal and external parasites (*e.g. Amblyomma tuberculatum*, the gopher tortoise

tick), but their effect on the well-being of individual tortoises and populations is not known. Recently, a novel spotted fever group *Rickettsia sp.* was detected in gopher tortoise ticks from Florida, Georgia, and Mississippi; however, additional research is warranted to determine the virulence and pathogenicity of this new species of bacteria on vertebrate hosts, including humans (Zemtsova *et al.* 2012).

Continued management and study of disease are necessary to achieve the plan's goal and objectives. Related strategies are to reduce the anthropogenic transmission of tortoise diseases and to increase knowledge of disease impacts on tortoise populations. Specific disease management actions include the following:

- Establish an educational campaign to warn the public of the risks to gopher tortoise populations from transmission of infectious agents when gopher tortoises are moved illegally.

- Provide disinfection and sanitation protocols for those persons conducting permitted relocations (Appendix 6, Gopher Tortoise Permitting Guidelines) or tortoise research.

- Provide protocol for accommodating clinically ill tortoises during permitted relocations (Appendix 6, Gopher Tortoise Permitting Guidelines).

- Establish a procedure for carcass recovery and pathological investigation of sick and dead tortoises in instances of large-scale mortality events (*e.g.*, more than 20 dead tortoises in a relatively restricted geographical area and time period).

- Create a gopher tortoise mortality event database and coordinate with other agencies and local governments to document incidences of unusual or large-scale tortoise die-offs.

- Participate in a range-wide gopher tortoise health working group to facilitate exchange of information and issues on tortoise health evaluation and disease monitoring.

- Conduct periodic follow-up assessments (*e.g.,* serology; nasal flushes) of tortoise populations known to have high incidence of disease to determine impacts over time.

- Conduct study to sample serology of tortoises on select recipient sites following multiple relocations to determine exposure status to mycoplasma and, if possible, iridovirus.

- Provide link on FWC website to *Handbook on Gopher Tortoise (Gopherus polyphemus) Health Evaluation Procedures for Use by Land Managers and Researchers* (Wendland *et al.* 2009) to assist with determination of tortoise health and illness.

Table 10. Proposed timeline for implementing disease management actions.

Proposed Disease Management Actions	2013	2014	2015	2016	2017
Establish an educational campaign to warn the public of the risks to gopher tortoise populations from transmission of infectious agents when gopher tortoises are moved illegally.					
Provide disinfection and sanitation protocols for those persons conducting permitted relocations or research.					
Provide protocol for accommodating clinically ill tortoises during permitted relocations.					
Establish a procedure for carcass recovery and pathological investigation of sick and dead tortoises in instances of large-scale mortality events (*e.g.*, more than 20 dead tortoises in a relatively restricted geographical area and time period).					
Create a gopher tortoise mortality event database and coordinate with other agencies and local governments to document incidences of unusual or large-scale tortoise die-offs.					
Participate in range-wide gopher tortoise health working group to facilitate exchange of information and issues on tortoise health evaluation and disease monitoring.					
Conduct periodic follow-up assessments (*e.g.,* serology; nasal flushes) of tortoise populations known to have high incidence of disease to determine impacts over time.					
Conduct study to sample serology of tortoises on select recipient sites following multiple relocations to determine exposure status to mycoplasma.					
Provide link on FWC website to *Handbook on Gopher Tortoise (Gopherus polyphemus) Health Evaluation Procedures for Use by Land Managers and Researchers* to assist with determination of tortoise health and illness.					

Monitoring

Monitoring serves a variety of purposes in this plan, including tracking progress towards meeting conservation objectives, assessing declines in available gopher tortoise habitat using geographic information system (GIS) analysis, and directly monitoring the

health and stability of tortoise populations on key protected areas. Monitoring is divided into nine categories below.

Acquisition of Public Lands

Securing gopher tortoise populations into the future depends upon preserving enough suitable and potential habitat to support viable populations (Objective 2). The FWC, other agencies, and local governments acquire upland habitat through a variety of different programs. Acquisition of habitat suitable for gopher tortoises will be tracked as described below.

- Each year, FWC will track and summarize the number of acres of gopher tortoise habitat acquired with its share of Florida Forever Land Acquisition Program funds and those from any other state environmental lands acquisition program. Additionally, FWC will contact other agencies participating in this program to estimate their annual acquisition of potential tortoise habitat.

- FWC will annually summarize additional gopher tortoise habitat acquired and permanently protected by non-government organizations (NGO), or through conservation easements.

- FWC will develop a questionnaire for obtaining estimated acreage of potential gopher tortoise habitat acquired by local governments during the reporting period. Local governments will be surveyed and the data summarized annually using this questionnaire.

Protected Gopher Tortoise Habitat on Private Lands

Acquisition of new public lands is one of several methods for permanently preserving gopher tortoise habitat. Although a number of approaches to protecting private lands from future development are being explored, conservation easements are in use in Florida, and are an important component to the conservation objectives of this plan (Objective 2). The number of acres of suitable gopher tortoise habitat acquired in this manner will be recorded and totaled each year. This information will help track progress towards plan objectives, and help identify properties where assistance with habitat management activities to restore, maintain, or improve suitability for gopher tortoises may be needed.

- FWC will continually track the number of acres of private lands protected through the gopher tortoise permitting system.

- FWC will create and use a conservation easement database to track the total number of conservation easements and total acreage protected thereby. The database will also identify appropriate or potential gopher tortoise acreage conserved through FWC efforts outside of the gopher tortoise permitting program.

- Each year, FWC will coordinate internally and with other agencies and organizations to assess the acreages of private lands protected under conservation easements through other programs.

Habitat Management Actions

Proper management of gopher tortoise habitat (Objective 2) maintains the landscape at an early successional stage where canopy and shrub cover is minimal, and is crucial to enhancing and restoring gopher tortoise populations (Objective 3). Prescribed fire and mechanical treatment of tree and shrub layers are the primary tools of wildlife managers. These management practices allow growth of herbaceous forage essential to the long-term survival of tortoises.

Tracking habitat management activities allows for recognition of landowners who are meeting management plan objectives (generally, targeted fire intervals of 3 years or less, with some exceptions). Tracking these activities, and unmet needs, helps identify and prioritize lands where financial or technical assistance is required to improve habitat quality for tortoises.

- FWC will continue to maintain a vegetation monitoring database to track vegetation measurements on lands under its control (*i.e.,* objective-based vegetation management or OBVM) including fire, and other management activities on lands managed by FWC.

- FWC will partner with other Florida land-managing agencies and programs in the development of a common habitat management tracking system.

- The Nature Conservancy Resource Management Support Team (through a State Wildlife Action grant), can provide technical assistance and implement management actions on lands listed in the habitat management tracking system.

- As a member of the Acquisition and Restoration Council (ARC), FWC will contribute to the development of effective land management and monitoring plans that help protect, maintain, and recover gopher tortoises and their habitats.

- FWC will work with other land managing agencies to look at how they store land management data, and determine how to evaluate and/or prioritize land management for gopher tortoises.

Gopher Tortoise Relocation Activities

The FWC-permitted relocation of tortoises helps to minimize the loss of gopher tortoises (Objective 1). The FWC implemented a permit system in 2008 requiring that tortoises be relocated off development sites. The FWC will continue to track the number of tortoises relocated through the gopher tortoise online permitting system. Annual summaries of relocation data allow FWC to monitor the number of relocated tortoises, track relocation trends over time, recognize development hot spots, and identify recipient sites being utilized

most often. As more protected recipient areas become available, FWC will seek, wherever possible, to greatly reduce or eliminate rescue relocations, where tortoises are relocated to unprotected areas which only have short-term conservation value.

Recipient Sites

Monitoring the number of tortoises moved to protected sites is the first step in an ongoing process of long-term monitoring of recipient areas. Assessments and reports regarding the continuing use and activities on these lands help ensure that long-term management occurs as required on these protected lands. Landowners with recipient sites under conservation easement, and permitted public conservation lands, are required by FWC's Gopher Tortoise Permitting Guidelines to submit periodic reports. Reporting requirements include are outlined in Appendix 7 of the Gopher Tortoise Permitting Guidelines and include gopher tortoise surveys, information on habitat management activities which have occurred on the property, and estimates of habitat variables such as percent canopy cover and percent herbaceous ground cover. Future actions include the following:

- FWC will create and provide a form to the recipient site managers to standardize the data requested in these monitoring reports.

- FWC will create an electronic (online) mechanism for submission of recipient site reports. Electronic collection and storage of recipient site monitoring reports will help FWC determine whether management activities have met the sites' management plan requirements, and allows for summarization of recipient site activities on an annual basis.

- FWC will compile information on recipient sites to report on monitoring data that demonstrates quality of habitat on recipient sites and status of tortoise populations on those sites.

Gopher Tortoise Population Status and Habitat Loss

Technological innovations, such as GIS, can provide indirect estimates of tortoise habitat and will likely serve as a key tool when assessing the tortoise's listed species status. More direct population monitoring of important gopher tortoise preserves will help ensure that any declines are detected early and resources are focused on determining the root causes of such declines. The methods used to evaluate gopher tortoise populations have not been consistent across the range of the species. As a result, it is difficult to assess the status of gopher tortoise populations. The FWC and CCA partners are working towards a range-wide gopher tortoise monitoring protocol that, to the extent possible, will allow comparison among individual populations and allow a range-wide assessment of the status of the gopher tortoise. The goal of this range-wide monitoring effort is to establish a baseline on as many properties as possible. The method(s) used must be scientifically valid, *i.e.*, repeatable, verifiable, and statistically defensible. Working with state and federal partners in Florida, creation of a multi-agency cooperative monitoring team will be explored and grant funding will be sought to help initiate monitoring efforts. The protocol will then be implemented on all identified

priority conservation lands. Incentives for private landowners to monitor gopher tortoise populations are currently being explored and will be developed as is possible.

Periodic GIS assessments will be conducted to determine the acreages of potential tortoise habitat; these assessments will then be compared to the 2003 data to assess habitat losses due to urbanization or other permanently altered human landscapes. The FWC will conduct spatial analyses to determine the change in acreage of potential tortoise habitat by using a new land cover map that is scheduled for completion by 2014. The new land cover map will be used to build an updated gopher tortoise potential habitat map. The potential habitat identified in the 2003 and 2013-2014 maps will be compared to assess changes in the amount and configuration of potential gopher tortoise habitat. Changes in ownership (public vs. private) will also be re-assessed. The Florida Projected Population Growth – 2060 data set created by the University of Florida GeoPlan Center will be used to determine areas of gopher tortoise habitat with the potential for increased fragmentation and habitat loss due to projected urban growth. Using GIS, FWC will conduct spatial analyses to aid in prioritization of areas with gopher tortoise habitat. Potential habitat maps for commensal species will be used to indicate areas with the highest commensal species richness.

- FWC will conduct annual assessments to monitor the numbers of habitat acres acquired through public and private acquisition efforts.

- FWC will conduct patch size analyses of the existing gopher tortoise habitat map. A minimum of 250 acre patch size will be applied to the habitat map. This value is consistent with the minimum patch size used by the USFWS. The FWC will evaluate ownership of patches greater than 250 acres of contiguous gopher tortoise habitat.

- Once it is approved, FWC will use the monitoring protocol created by the CCA partners when assessing tortoise populations on protected lands.

- FWC will continue to prepare annual summaries of gopher tortoise habitat lost to development, as well as number of recorded gopher tortoise relocation permits, using data collected in the online permitting system. Included in this analysis, the number of acres added as a result of the gopher tortoise recipient site program will be factored as an off-set to habitat lost.

Gopher Tortoise Permits

The FWC will continue to maintain the gopher tortoise online permitting system which effectively meets all permitting application, review, issuance, and reporting needs. Permitting information will be accessible by local governments, other state agencies, and the public. Reports will be created that will allow FWC to summarize the number of permits issued by permit type.

Commensal Species

The gopher tortoise's status as a keystone species is predicated on the use of the gopher tortoise burrow by hundreds of other species. Gaining a better understanding of the conservation needs of commensal species will help us better understand and promote the role of the gopher tortoise as a keystone species (See Chapter 5).

Prior to creation of the online permitting system, FWC did not required encounters with or relocations of other species during tortoise relocation activities to be reported. The online permitting system now allows for the recording of these commensal species encounters and relocations. Future enhancements to the online system will allow permittees to select a different recipient site based on habitat suitability of relocated commensal species, indicate if a commensal was released on-site, and allow permittees to enter information about encounters with other species on the development sites. The FWC will continue to assess and summarize data collected regarding the relocation of commensal species when reported through research projects and during permitted gopher tortoise relocation activities.

Overall Success of the Gopher Tortoise Management Plan

The FWC will continue meeting annually with interested stakeholders to review progress made towards management plan goal and objectives. The FWC will receive input on all aspects of the plan and report back to stakeholders on changes to be implemented.

Table 11. Proposed timeline for implementing monitoring actions.

Proposed Monitoring Actions	**2013**	**2014**	**2016**	**2016**	**2017**
A) Habitat Protection					
Track the number of acres of gopher tortoise habitat acquired under the Florida Forever program.					
Use acquisition data to annually estimate the number of acres of gopher tortoise habitat permanently protected by NGO and local government acquisitions. Summarize data annually.					
Monitor the number of acres of private recipient sites protected through perpetual conservation easements.					
Create a conservation easement database allowing summarization of gopher tortoise habitat preserved by FWC efforts outside of the gopher tortoise permitting process.					

Coordinate with other agencies and organizations to assess and record the acreages of private lands protected under conservation easements or through other programs.					
B) Habitat Management					
Maintain FWC OBVM management treatment, and vegetation monitoring databases.					
Conduct a comprehensive qualitative assessment of gopher tortoise habitat and quantitative assessment of populations on select public conservation lands.					
Partner with other Florida land-managing agencies and programs in the development of a common habitat management tracking system.					
Fire strike teams will provide assistance and implement management actions on lands listed in the habitat management tracking system.					
As part of ARC, FWC will contribute to the development of land management and monitoring plans.					
C) Relocation					
Monitor the number of tortoises relocated to protected versus unprotected sites.					
D) Long-term Monitoring of Recipient Sites					
Conduct follow-up surveys of habitat management on recipient sites as required by the Gopher Tortoise Permitting Guidelines.					
Create a form to standardize monitoring data collected from recipient sites.					
Create an electronic submission mechanism as a component of the online permitting system for recipient site reporting.					
E) Population Status and Habitat Loss					
Conduct periodic GIS and permitting data assessments to monitor the rate of gopher tortoise habitat loss.					
Conduct a GIS analysis on patch sizes 250 acres or greater to include parcels, SHCAs, and Landowner Assistance Program focal areas.					
Once developed, FWC will implement the monitoring protocol adopted by the CCA partners when assessing tortoise populations on priority conservation lands, and work with partner agencies to develop a multi-agency					

cooperative team to implement the protocol in Florida.					
Summarize the number of gopher tortoises relocated annually.					
F) Commensal Species					
Enhancements to the online permitting system will be examined to allow more flexibility in site selection, and to promote more standardized recording of commensal species encounters and relocations.					
FWC will continue to assess and summarize commensal species relocation events.					
G) Monitor Overall Success of Plan					
Meet annually with stakeholders.					

Education and Outreach

An active and sustained conservation education and outreach program is necessary to keep the public informed about and engaged in conservation actions to benefit this high-profile and ecologically important species. Strategies for building knowledge and concern, and appropriate conservation actions, are most effective when specific audiences are targeted with strategies tailored to their needs. Educating landowners, developers, and other interest groups about the crucial link between wildlife and habitat is particularly challenging in a state with a substantial proportion of its population consisting of recent arrivals and thousands of new residents each year. Though slowed in recent years by economic conditions, urban development in Florida has fragmented gopher tortoise habitat, reduced available high-quality habitat, and displaced increasing numbers of gopher tortoises.

The FWC will continue its efforts to reduce and offset the decline in the Florida gopher tortoise population through targeted education and outreach to specific interest groups using the theme "Save Space for Wildlife". This theme focuses on the devastating impacts human population growth and related activities can have on wildlife and its habitat unless wildlife management planning is an inherent part of the growth and development process. Sub-themes will emphasize the gopher tortoise's role as a keystone species, the importance of its burrow to commensal species and biodiversity, and the need to watch out for gopher tortoises on Florida's roadways. Messages constructed using this theme and sub-themes will continue to be tailored to a variety of target audiences, including:

- Homeowners and landowners
- Land managers
- Developers
- State, county, and municipal permitting agencies and land-use planners
- Rehabilitators

- State's attorneys and law enforcement officers
- Teachers and students
- Motorists
- Transportation officials

To the extent that these education and outreach activities are successful, each of the target audiences will gain knowledge of the potential impacts of their activities on gopher tortoises, and will modify their activities when appropriate. For instance, home buyers will be able to recognize homes built more compatible with nature in upland habitats, and homeowners will adopt tortoise-friendly yard maintenance practices. Another example is that landowners, developers, permitting agencies, and land-use planners will understand the gopher tortoise's imperiled status and role as a keystone species, and will know that tortoises must be relocated before development can begin.

Table 12. Proposed timeline for implementing education and outreach actions.

Proposed Education and Outreach Actions	**2013**	**2014**	**2015**	**2016**	**2017**
A) Developers, Consultants, Land Clearing Companies, Permitting Agencies/Offices, and Land-Use Planners					
Distribute "Got Gophers, Get Permits" posters in local government workshops.					
Create fact sheet on the gopher tortoise's keystone species role and its associated commensal species.					
Host regional workshops on tortoise permitting, policies and regulations, conservation, and other topics as needed.					
B) State Attorneys and FWC Law Enforcement					
Create an internal FWC gopher tortoise notebook, including: complaint protocol; working with state's attorney's offices; rehabilitator's fact sheet; mitigation options; definitions.					
Conduct an internal workshop for FWC attorneys and law enforcement officers.					
Conduct a workshop for state attorneys offices.					
C) Homeowners					
Create a tortoise-wise community program. Program can include information on road mortality, role as a keystone species, laws and regulations, appropriate yard plantings, and impacts of pets.					

Establish 1 new tortoise-wise community project per year.					
Create a presentation and offer it to targeted communities; include distribution of the "Living with Gopher Tortoises" brochure.					
Create a gopher tortoise plant list for property owners.					
D) General Public					
Create web pages on the FWC gopher tortoise website, including a "Save Space for Wildlife" page, a commensals information page and Flickr photo set, and a road mortality issues page.					
Develop and implement a citizen science web portal and explore the option of creating a Smartphone application.					
Create videos and 30-second public service announcements on pertinent gopher tortoise topics.					
Develop news releases and utilize social media outlets to educate the public on the benefits of prescribed fire and habitat management.					
Investigate use of billboards for messaging.					
E) Educators and Students					
Using existing gopher tortoise educator's packet, offer an annual teacher training workshop at: 1) Project WILD's Call of the WILD workshop and, 2) the annual conference of the League of Environmental Educators in Florida.					
Enhance educator's packet as needed to incorporate new or revised materials.					
Train volunteers to offer the educator materials at appropriate venues.					
Evaluate educator's packet as the basis for an electronic field trip activity guide regarding gopher tortoise conservation.					
Distribute the Gopher Tortoise Activity booklet to appropriate elementary audiences.					
F) Rehabilitators					
Promote availability of fact sheet on proper housing, handling, record keeping, and release guidelines.					
G) Land Managers					

Create a fact sheet on gopher tortoise best management practices for agriculture and silviculture.					
H) Motorists and Transportation Officials					
Create a "safe roads for people and tortoises" card for use by law enforcement when stopping motorists.					
Create a fact sheet to address minimizing road mortality.					
I) Media					
Continue to create press releases, and media or public relations campaigns, addressing the above actions, as appropriate; and distribute to newspapers, radio, television, professional and trade publications, web sites, and other information outlets as identified.					
Use social media outlets as appropriate to advance gopher tortoise awareness (*e.g.*, Facebook, Twitter, YouTube, and Flickr).					

Research

Much information on gopher tortoises has been gleaned during the last 3 decades. Pioneering research by Walter Auffenberg and Richard Franz in the early 1970s and by J. Larry Landers and colleagues in the late 1970s laid the framework for research that followed (Berish 2001). Based on discussions at a range-wide gopher tortoise status workshop in 2003 (Smith *et al.* 2006), topics such as fecundity, adult sex ratios, seasonal activity, home range size, and known predators, have been well-documented in a general sense; nevertheless, there may be circumstances where additional site-specific studies are warranted. Other topics, such as growth rates and age/size at sexual maturity, have also been studied but will likely need further investigation due to variations among regions and sites.

Since the publication of the original Gopher Tortoise Management Plan in 2007, a number of the research needs outlined in the plan have been addressed, *e.g.,* tortoise population changes over time (Ennen *et al*. 2011, Diemer Berish *et al*. 2012), genetic comparisons of tortoise populations in the Panhandle and Peninsula (Sinclair-Winters *et al.*, in prep); insights regarding minimum preserve size (McCoy and Mushinsky 2007; Styrsky *et al*. 2010; Ennen *et al*. 2011; Guyer *et al.*, in press); effects of upper respiratory tract disease (McCoy *et al.* 2007; Ozgul *et al.* 2009; Diemer Berish *et al.* 2010; Wendland *et al.* 2010a,b; Perez-Heydrich *et al*. 2011); and tortoise response to prescribed fire (Yager *et al*. 2007, Ashton *et al.* 2008) and habitat restoration (FWC 2010, unpubl. report). Ongoing studies regarding tortoise relocation and site fidelity are also yielding valuable information.

Yet, despite the recent focus and numerous studies on this species by the FWC and other biologists, there are facets of gopher tortoise life history and ecology that remain poorly

understood. Patterns of population demographics and habitat use over time are not easily characterized in this long-lived, burrowing species. As a follow-up to the 2003 workshop, FWC staff coordinated a special research needs session at the 2011 Gopher Tortoise Council (GTC) meeting in Orlando. Informational gaps were identified in four key topic areas: long-term population dynamics and movements; minimum patch size and minimum viable population; juvenile needs and survival; and relocation. Active pursuit of research on these topics, and on others as they arise, is critical to our understanding of this species, and the results will help guide and refine recommended management actions. The overall research strategy is to gather the necessary information to effectively manage resident and relocated tortoise populations over the long-term.

The overall research strategy is to gather the necessary information to effectively manage resident and relocated tortoise populations over the long-term.

Long-term Population Dynamics, Habitat Use, and Movements

Specific research needs include determining immigration and emigration in resident populations (*e.g.,* what attracts tortoises to a specific area and what retains them; which tortoises emigrate and why?); changes in populations over time (*e.g.,* what recapture rates should we expect to see after a decade or more?); and forage and nutritional needs that affect movements (*e.g.,* why do tortoises select particular plants at a particular time?). Other related investigations include the most effective ways to mark juveniles for the long-term; improved methods to accurately determine age; impacts of predation and disease on tortoise populations; and the potential use of satellite telemetry for continuous monitoring of movements.

Minimum Patch Size and Population Size Needed to Maintain a Functional Population

Recommendations for minimum preserve size have varied in the literature (Cox *et al.* 1987, Eubanks *et al.* 2002, Mushinsky *et al.* 2006, McCoy and Mushinsky 2007, Styrsky *et al.* 2010) Overall, the trend over time has generally been that "bigger is better", with Cox *et al.* (1987) suggesting minimum preserves of 10-20 ha (25-50 acres) with at least 50 tortoises, and Styrsky *et al.* (2010) recommending preserves of 755 ha (1865 acres) for at least 240 tortoises. Both Styrsky *et al*. (2010) and McCoy and Mushinsky (2007) noted that conservation could be achieved on smaller preserves through an aggressive management commitment. But what type of intensive habitat and population management would these smaller preserves, especially those in extreme south Florida and those on islands, need to persist? Some insights were gleaned from a study of gopher tortoises left on 2 islands when a Georgia reservoir was created in 1963 (Ennen *et al*. 2011). Forty-five tortoises were captured in both 1984 and 2005 on the larger island (8.5 ha); however, the population on the smaller island (2 ha) declined precipitously from 27 tortoises (including juveniles) to only 2 adults. Habitat quality had declined on both islands over time, but canopy closure was more pronounced on the smaller island. Interestingly, none of the tortoises captured on the larger island in 2005 were marked, leaving questions regarding persistence of scute notches as well as immigration, emigration, and mortality in fragmented habitats.

Juvenile Tortoise Needs and Survival

Hatchling survival is the primary constriction in the gopher tortoise population pipeline (*e.g.*, population models by Miller 2001, Tuberville *et al*. 2009). Yet, despite numerous studies on juvenile tortoises (most of which did indicate relatively high predation rates on nests and/or young individuals), many questions remain regarding specific habitat and forage needs of juveniles, and what percentage of hatchlings survive their early, vulnerable years to eventually reach adulthood and reproduce. Because detection of burrows and other refugia used by hatchings and yearlings can be difficult, one alternative might be to focus on survival of 2-3 year-old tortoises or even intermediate size classes (older juveniles and subadults). Investigating the effectiveness of detecting burrows immediately post-burn or using dogs to detect burrows of the smallest size classes have also been suggested. Other recommended studies include investigating whether micro-habitat factors (*e.g.,* logs and other forest debris) enhance juvenile survival and determining how far juvenile tortoises disperse over time. Finally, preliminary research in Mississippi has indicated that winter burns may lead to reduced calcium levels in juveniles due to the lack of forage diversity (M. Hinderliter, pers. comm.); additional studies are needed to refute or substantiate this potential effect of non-growing season fire.

Relocation and Methods to Enhance Site Fidelity on Recipient Sites

Previous studies (Lohoefener and Lohmeier 1986, Tuberville *et al.* 2005) have indicated increased site fidelity by temporarily enclosing relocated tortoises. Studies in both the Panhandle and the Peninsula are investigating optimal size of enclosures, tortoise densities, and duration of confinement; preliminary results substantiate earlier findings that temporarily enclosing relocated tortoises facilitates site fidelity and helps reduce long-distance movements away from the designated recipient site (M. Aresco, A. Savage, pers. comm.). Another ongoing study involves the compatibility of cattle on recipient sites; initial indications are that cattle damage or destroy enclosure fencing (H. Mushinsky, pers. comm.). In the case of an augmentation in central Florida, both resident and relocated tortoises remained on-site and there was no adverse effect on either reproduction or body condition over several years post-relocation (Reidl *et al*. 2007).

A follow-up of a tortoise restoration in southern Florida 17 years after the tortoises were released revealed that the retention rate (*i.e.,* site fidelity) of relocated gopher tortoises changes over time, with relatively low retention during the first year post-relocation but nearly 100% retention in subsequent years (Ashton and Burke 2007). The researchers advocated relocating a large number of individuals ($\geq$ 100, if possible) to sites with high habitat quality and a firm management commitment. Additional follow-ups of previously relocated populations should be undertaken.

Despite previous and ongoing studies, lingering questions remain regarding the best methods to enhance tortoise relocation success (generally defined by site fidelity of relocated tortoises and establishment of a viable population, but see Reidl *et al*. 2007 for additional specific criteria). What effect, for example, do the following have on relocation success: source of relocated tortoises; distance between donor and recipient sites; number and size/sex of relocated tortoises; using individuals from multiple sites vs. colonies from single sites;

habitat types of donor and recipient sites; and season of relocation? Other questions involve optimal stocking densities, the fate of vulnerable relocated juveniles, and impacts on resident tortoises during augmentation efforts. As current studies are completed, some answers will be forthcoming, but additional relocation studies are warranted.

Impacts of Herbicides on Tortoises

Physiological studies would focus on toxicology and possible endocrine disruptions by herbicides. Field investigations should determine the effectiveness of herbicides in removing exotic species and producing suitable tortoise habitat.

Impacts of Exotic Wildlife on Tortoises

Although some insights have been gleaned regarding the impacts of species that have been introduced or have expanded their ranges into the Southeast (*e.g.*, armadillo, coyote, fire ant), little is known about the effects of exotic lizards, especially tegus and monitor lizards, on gopher tortoise populations. Predation by monitor lizards (Owens *et al.* 2005) has been documented, and tegus have been observed using gopher tortoise burrows (Enge *et al.* 2006b). Studies need to be undertaken to evaluate the effects of these lizards and other exotic reptiles and mammals on Florida's tortoise populations.

Long-term Effects of URTD on Tortoise Populations

Although two decades of clinical and field research on mycoplasmal URTD have greatly increased the knowledge base about this disease, many gaps remain regarding long-term effects of URTD on wild tortoise populations. Accordingly, as noted in the plan's disease section, it would be useful to conduct periodic follow-up assessments of tortoise populations known to have high incidence of disease to determine impacts over time.

Effectiveness of Retaining or Relocating Tortoises on Sites Undergoing Development

Although properly conducted off-site relocations likely offer a better long-term prognosis for displaced tortoises, there may be occasions where retaining the local tortoise resource warrants retention of individuals or populations on properties that are being developed. Follow-up surveys of tortoises inhabiting burrows where development stayed outside the 25-foot radius, tortoises moved aside out of harm's way, and tortoises moved into designated preserves (both those with and without passive recreational activities) should be conducted to determine effects of this mitigation option. Additionally, follow-up studies of tortoises moved under temporary exclusion permits (*e.g.,* power and gas line right-of-ways) should be undertaken to determine tortoise response to temporary displacement along linear, disturbed habitats.

Best Burn Regimes for Various Habitats and Best Alternative Management Methods Where Fire is Precluded

Because of changes in movements and burrow usage associated with habitat improvement (Moler and Berish 2001), burrow surveys alone will not suffice to refine optimal burn regimes for tortoises. Radio-instrumentation of tortoises will be necessary to understand initial and subsequent response of tortoises to various fire frequencies and seasons; additionally, differences in fecundity and other reproductive parameters under various burn regimes should be assessed. Similarly, best practices need to be identified for those urbanizing areas where fire will be limited or prohibited. A current FWC study is investigating tortoise response to experimental management (fire and mechanical treatment) of coastal scrub.

Habitat Use and Movements in Relatively Poorly-Drained Soils, especially in South Florida

Throughout much of their geographical range, gopher tortoises are found primarily in habitats with moderately well-drained to excessively drained soils. In Florida, and especially in southern portions of the peninsula, tortoises use areas that are classified as somewhat poorly to poorly-drained. There may be small "islands" of better-drained soils scattered in these vast flatwoods and dry prairies, but how tortoises use the poorly-drained areas, particularly during wetter years, is inadequately understood. Tortoises have been observed foraging in margins of wetlands and will use berms to gain higher ground for burrowing. Additional research is needed to refine our understanding of tortoise habitat use and movements in south Florida flatwoods.

Table 13. Proposed timeline for implementing research actions.

Proposed Research Actions	2013	2014	2015	2016	2017
Conduct follow-up studies of marked populations to determine dynamics, immigration, and emigration over one or more decades.					
Evaluate forage and nutritional needs that affect movements and habitat use.					
Identify and implement marking technique for juvenile tortoises that will persist over time.					
Find improved method to more accurately determine tortoise age.					
Evaluate usefulness of satellite telemetry for intensive monitoring of tortoise movements.					
Conduct baseline and follow-up studies of fragmented or insular populations to provide insights on minimum patch size/viable population.					
Evaluate survival of older juvenile and subadult size classes to help alleviate detection problem					

associated with hatchling tortoise burrows.					
Evaluate best methods to detect hatchling and juvenile burrows, *e.g.*, post-burn surveys; use of canines to locate burrows.					
Gather additional data on opportunistic sheltering, use of microhabitats, and dispersal by juvenile tortoises.					
Determine if winter burns contribute to calcium depletion in juvenile tortoises.					
Determine which factors enhance site fidelity and overall relocation success, *e.g.*, source, number, and size/sex of tortoises; habitat type; season of relocation.					
Evaluate the impacts of herbicides on tortoises.					
Identify impacts of exotic wildlife on tortoise populations.					
Conduct follow-up surveys of tortoises inhabiting burrows on sites undergoing development and of tortoises retained in on-site preserves.					
Conduct follow-up studies of tortoises moved under temporary exclusion permits to determine response to temporary displacement along linear, disturbed habitats.					
Investigate initial and subsequent response of tortoises to various fire frequencies and seasons.					
Identify best practices for areas where fire is prohibited or limited.					
Determine habitat use and movements of tortoises in relatively poorly-drained soils, especially in South Florida.					

CHAPTER 5: GOPHER TORTOISE COMMENSAL SPECIES

Introduction

The presence of gopher tortoises is important to many Florida species that benefit from the burrows gopher tortoises dig. For some species, survival is directly linked to their interactions with gopher tortoises, whereas other species have a less dependent relationship. By virtue of the burrow it constructs, the gopher tortoise is recognized as a keystone species that provides significant resources for a large set of other wildlife species in Florida. Jackson and Milstrey (1989) listed 60 vertebrate and 302 invertebrate species that have been observed in gopher tortoise burrows. A large proportion of those species are considered commensals, while others are infrequent visitors to gopher tortoise burrows.

Commensals are species strongly associated with gopher tortoise burrows because of the burrow's relatively constant microhabitat (temperature and moisture) and the protection it offers from fire and inclement weather. For populations of these commensals to persist in Florida, healthy gopher tortoise populations are needed. The conservation of the gopher tortoise conserves the biodiversity of commensals in Florida. As gopher tortoise populations declined, so did those of commensals. In the case of the eastern indigo snake, these declines were a factor in it being listed as a federally Threatened species under the Endangered Species Act (ESA).

For populations of these commensals to persist in Florida, healthy gopher tortoise populations are needed.

Dependence on burrows varies among commensal species; for some, burrows are essential. For these species, such as the Gopher Tortoise Acrolophus Moth (*Acrolophus pholeter*), the loss of active gopher tortoise burrows would probably cause extirpation or extinction. Some commensal species benefit from gopher tortoise burrows but use them infrequently. Although these species can live without gopher tortoise burrows, they benefit from them when they are present. In a few cases, commensals may benefit the gopher tortoise, such as the Little Gopher Tortoise Scarab Beetle (*Alloblackburneus troglodytes*) that feeds on gopher tortoise dung.

This chapter focuses on the conservation of *priority commensals.* Priority commensal species are believed to depend significantly on resources provided by the gopher tortoise burrow or its community of inhabitants. The priority commensals covered in this chapter include:

- Listed species that use gopher tortoise burrows
- Species that require the presence of gopher tortoises and their burrows to persist as viable populations in Florida
- Species whose presence provides some benefit to gopher tortoises

Biological review groups that included Florida Fish and Wildlife Conservation Commission (FWC) staff and external experts completed a biological status review (BSR) for several of these vertebrate species as part of FWC's new *Rules Related to Endangered and Threatened Species* (Chapter 68A-27 F.A.C.[29]). Recommendations from the BSRs included listing status changes for several of the commensal species included in this chapter. At the time this chapter was developed, the listing status changes had not yet occurred. Before a species can be removed from FWC's Threatened or Species of Special Concern lists, staff must develop a management plan, with input from stakeholders and the public, and the Commission must approve the plan. Staff has recommended that the gopher frog and Florida mouse not be included on Florida's Threatened Species list. For more detailed information on BSRs and listing recommendations, refer to the imperiled species section[30] of the MyFWC.com website.

This chapter of the Gopher Tortoise Management Plan includes information regarding priority commensal species as related to the gopher tortoise and Objective 4 of this plan: *Maintain the gopher tortoise's function as a keystone species*. The following information is not all inclusive of commensal species biology, threats, and conservation needs. The FWC is currently developing management plans for the gopher frog, Florida mouse, and Florida pine snake where a more comprehensive conservation plan and strategy will be included.

State and Federally Listed Priority Commensal Species

Gopher Frog *(Lithobates capito)*

Biology

Taxonomy: Until recently, two subspecies of gopher frog were recognized in Florida, the Florida gopher frog (*Rana capito aesopus*) and the dusky gopher frog (*R. c. sevosa*). However, Young and Crother (2001) showed no genetic divisions among populations of gopher frogs in Florida. Frost *et al.* (2006) removed New World frogs from the genus *Rana* and placed them in *Lithobates*, so the current name for the species occurring in Florida is the gopher frog (*Lithobates capito*).

Identification: The gopher frog is a stout-bodied frog measuring 6 – 11 cm (2.5 – 4.4 inches; adults) snout to vent with a large head and mouth, stocky body, stubby legs, and prominent eyes. The gopher frog color ranges from light tan to gray with black or brown irregular blotches on the back, sides, and legs. The skin is warty or wrinkled-looking. A raised ridge (dorsolateral fold) runs down each side of the back from head to groin. The hind feet are webbed. The breeding call of the males is a deep snoring sound.

Habitat: This species occurs in a variety of fire-maintained upland habitats, particularly sandhill, but can also be found in pastures and other open disturbed areas where gopher tortoises are found (Jensen and Richter 2005, Enge *et al.* 2011). Gopher frogs avoid fire-suppressed areas with a dense canopy cover or dense hardwood midstory, and data from radio telemetry studies suggest that juvenile frogs rarely move through these overgrown areas (Roznik *et al.* 2009).

Commensal Ecology: The presence of gopher frogs is closely linked to the presence of gopher tortoises, and this species relies extensively on gopher tortoise burrows for shelter and, to some degree, food (Godley 1992). These frogs will occasionally use mammal and crayfish burrows and other natural refugia (Carr 1940, Blihovde 2006, Roznik and Johnson 2009). The survival of newly metamorphosed gopher frogs is dependent on their ability to locate and use gopher tortoise burrows and other underground refugia (Roznik and Johnson 2009).

Geographic Distribution: The gopher frog occurs in the southeastern Coastal Plain from the Mobile River delta in Alabama east to North Carolina, with disjunct populations in central Alabama and the Cumberland Plateau in Tennessee (Jensen and Richter 2005). The gopher frog historically occurred throughout Florida except for the Everglades region (Enge *et al.* 2011). Refer to the species' distribution map in Appendix 5.

Regulation

The gopher frog is listed as a Species of Special Concern (68A-27.005, F.A.C.) by FWC. It is illegal to pursue, hunt, molest, capture, kill, attempt any of these acts, transport, or sell gopher frogs or their eggs without a permit issued by FWC. Information on applying for a permit for the collection or incidental take of gopher frogs is available on FWC's Protected Wildlife Permitting webpage.[31]

Considerations for Limited Relocation of Gopher Frogs

Limited relocation may be authorized by FWC in concert with permitted gopher tortoise relocation activities and specified on the gopher tortoise relocation permit. This is because gopher frogs are most commonly encountered during tortoise capture, either in bucket traps or during burrow excavation. They can also be trapped by placing a funnel trap in the mouth of the burrow or by using drift fences in combination with buckets or funnel traps to intercept their seasonal migrations to breeding ponds. Frogs may be secured in plastic containers (1 frog per container) with a wet paper towel soaked with non-chlorinated water (bottled water, filtered water, or well water). Containers with frogs should be of a length that is at least double the body length, with a width that is equal to the body length, and a height that will permit the animal to sit naturally with head clearance. Containers with frogs should have air holes in the lid and/or sides of the container that are sufficient for ventilation. In general, containers with frogs can be kept under the same conditions as gopher tortoises for transport, but frog containers must be cleaned and new wet paper towels replaced daily to prevent desiccation of the animals. Agents who undertake tortoise relocations in central and southern Florida should be aware of three nonnative amphibians (Cuban treefrog, greenhouse treefrog, and cane, giant, or marine toad) that may be confused with gopher frogs. These nonnative species should not be relocated but must be either euthanized or placed with a properly permitted individual or organization. Gopher frogs should be relocated to an area where active gopher tortoise burrows are within 2 km (1.2 mi) of fish-free, isolated wetlands that are not separated by any significant barriers to frog movement (*e.g.*, no major roads or rivers). The relocation site should be as close to the

capture site as possible and major river drainages should not be crossed. Frogs should be released directly into the mouth of the burrow at the recipient site, but avoid releasing more than 1 frog into a burrow.

Conservation and Research Actions

Determine the effects of relocation on the survivorship and behavior for both relocated individuals and resident gopher frogs in recipient populations.

Little is known about the effects of relocation on this species. Additional studies are needed to determine:

- Movements and behavior of relocated gopher frogs and individuals in recipient populations.
- Survivorship of relocated gopher frogs and any impacts of relocated individuals on survivorship in the recipient population.
- Success of relocated adults at finding wetland breeding sites and success of breeding of relocated individuals at recipient sites.
- Relationships between habitat variables and gopher tortoise density on survivorship of relocated frogs.

Develop effective relocation strategies for the gopher frog.

No relocation guidance has been developed for the gopher frog. Research is necessary to determine if relocation is appropriate for this species. If experimental relocations indicate that relocation is a viable option for this species, research should be conducted to determine the most effective relocation method for gopher frogs.

Assess disease transmission risk factors and disease mitigation strategies for gopher frog relocations.

Disease transmission within gopher frog populations is poorly understood. Factors associated with disease transmission should be studied and, if possible, effective strategies for decreasing disease transmission should be developed before relocating this species.

Florida Mouse *(Podomys floridanus)*

Biology

Taxonomy: Placement of the Florida mouse (*Podomys floridanus*) either within the genus *Peromyscus* or maintained in its own generic rank is contentious (as reviewed in Hafner *et al.* 1998). According to genetic evidence, *Podomys* shares what appear to be derived chromosomal inversions with members of the genus *Peromyscus* (Greenbaum and Baker 1978) and recent analyses embedded *Podomys* within the genus *Peromyscus* (Bradley *et al.* 2007, Miller and Engstrom 2008). Miller and Engstrom (2008) anticipated, however, that further data could lead to the conclusion that this concept of *Peromyscus* is inflated, and that

division of *Peromyscus* into multiple genera (including *Podomys*) might prove to be the most viable option.

Identification: The Florida mouse is distinguished from other rodents in Florida by a combination of characters. For its body size, the Florida mouse has relatively large ears, eyes, and hind feet compared to other mice. *Podomys* is also characterized by the presence of only five (sometimes four) plantar tubercles on the soles of the hind feet, instead of the six plantar tubercles typical of similar rodents. Adults typically have distinct orange-buff colored patches on the cheeks, shoulders, and lower sides. Adults also have a relatively large body size, weighing between 20 and 49 g (0.7 to 1.7 oz) (Whitaker and Hamilton 1998, Layne 1990).

Habitat: Across its range, the Florida mouse occupies fire-maintained, xeric upland habitats (Layne 1992) typically described as scrub, scrubby flatwoods, and sandhill (high pine) ecosystems (Layne 1990, Myers 1990), but other xeric upland habitats may be used. Scrub and scrubby flatwoods habitats generally support higher Florida mouse population densities than other xeric uplands (Layne 1990). According to Layne (1990) "...scrub-type vegetation is the primary and ancestral habitat of the Florida mouse ...".

Commensal Ecology: The ecology of the Florida mouse is closely tied to the gopher tortoise. Dependence by Florida mice on gopher tortoise burrows as sites for excavation of their burrows (Jones and Layne 1993) leaves this species vulnerable to loss or decline of gopher tortoises. The gopher tortoise burrow provides shelter and protection during dispersal and from fire and adverse weather conditions (Layne 1990). The Florida mouse can be sensitive to cold temperatures and begins to show signs of cold stress at 50°F (10°C; Jones 1990). Florida mice typically construct their burrows as small, U-shaped, tunnels off the sides of the main gopher tortoise burrow. Florida mouse burrows also serve as nesting sites, with expanded nesting chambers usually present (Layne and Jackson 1994).

Geographic Distribution: The Florida mouse is endemic to Florida and occurs only in a narrow range of dry habitats in the northern two-thirds of peninsular Florida (Fertig and Layne 1963; see range map, Appendix 5). Peripheral peninsular counties are St. Johns, Clay, Putnam, Alachua, Suwannee, and Taylor in the north; south to Sarasota County on the west coast (although not documented in Sarasota County in recent years); south to Highlands County in central Florida; and, at least formerly, south to Miami-Dade County on the east coast (now south to near Boynton Beach; Layne 1992; Jones and Layne 1993; Pergams *et al*. 2008). The Florida mouse occurs on Merritt Island, Brevard County (Stout 1979; I. J. Stout, UCF, pers. comm.). Historically, at least, an isolated Florida mouse population occurred near Carrabelle, Franklin County (Layne 1992, Jones and Layne 1993). A cursory survey for this Carrabelle population carried out by Florida Natural Areas Inventory (FNAI) in 2001 proved unsuccessful (D. Hipes, FNAI, pers. comm.). Although the species probably no longer occurs on the Pinellas coast, a single specimen was captured in 1984 near Clearwater (Layne 1992). The Florida mouse is apparently most continuously distributed in north-central peninsular Florida. In the southern peninsula, the Florida mouse is confined mainly to the Lake Wales Ridge in the central region and to a very narrow strip along the east coast (Layne 1992). Refer to the species' distribution map in Appendix 5.

Regulation

The Florida mouse is currently listed as a Species of Special Concern (68A-27.005, F.A.C.) by FWC. It is illegal to pursue, hunt, molest, capture, kill, attempt any of these acts, transport, or sell Florida mice or their nests without an FWC permit. Information on applying for a permit for the collection or incidental take of Florida mice is available on FWC's Protected Wildlife Permitting webpage[32].

Considerations for Limited Relocation of Florida Mice

Limited relocation may be authorized by FWC in concert with permitted gopher tortoise relocation activities and specified on the gopher tortoise relocation permit. This is because Florida mice can be opportunistically captured by hand during burrow excavation. Mice can be retained and transported in Sherman traps or small animal carriers for 24 hrs, as long as they are carefully protected from extremes of heat and cold; sunflower seeds should be provided. Mice should be released at the mouth of gopher tortoise burrows at the relocation site. To maximize relocation success, mice should be released into active burrows of adult gopher tortoises. Only 1 mouse should be released per burrow, unless mice were captured at the same burrow at the recipient site. Florida mice should not be released at any site with an existing population of Florida mice. Florida mice should be released only within their known geographic range and, more specifically, recipient sites (such as reclaimed quarries) should be within the same ridge system to avoid movement of mice across potential geographic boundaries for subpopulations. The maximum dispersal distance for Florida mice is not well known, so suitable patches of xeric upland habitat should not be separated by more than 1 km (0.6 mi) to maximize the probability that Florida mice would be able to move successfully among patches.

Conservation and Research Actions

Determine the genetic variation of the Florida mouse across its range to identify the potential presence of subpopulations.

The degree of genetic flow between the suspected subpopulations (*i.e.*, Ocala, Atlantic Coastal Ridge [ACR], Lake Wales Ridge [LWR], and Brooksville Ridge) is unknown. Understanding genetic variation is especially needed in areas where habitat is fragmented (ACR and LWR). Some understanding of genetic connectivity would be required before relocation could be used as a possible management tool.

Determine whether relocation is an effective conservation strategy for the Florida mouse.

No relocation guidance has been developed for the Florida mouse. Research is necessary to determine if relocation is appropriate for this species. If experimental relocations indicate that relocation is a viable strategy for this species, further research should be conducted to determine the most effective relocation method for Florida mice.

Monitor relocated Florida mice to assess the survivorship of those individuals and the effects of existing populations of Florida mice and habitat conditions on the success of relocation.

Little is known about the effects of relocation on Florida mice. Relocation of *Peromyscus polionotus ssp* indicates that juveniles may survive better than adults, and that movement of animals into existing populations reduces survival of resident individuals (J. Gore, FWC, pers. comm.; Van Zant and Wooten 2003). Research is needed to:

- Determine impacts to existing populations of Florida mice.
- Determine if presence of existing tortoise burrows and other habitat conditions affect survival of relocated mice.
- Determine a minimum number of individuals that should be relocated to generate a viable population and avoid founder effects.
- Determine whether age class effects survivorship of individuals that are relocated.

Evaluate the risk of disease transmission within Florida mouse populations.

Disease issues within Florida mouse populations are unknown and should be evaluated before relocating mice to sites with existing populations.

Florida Pine Snake (*Pituophis melanoleucus mugitus*)

Biology

Taxonomy: The Florida pine snake (*Pituophis melanoleucus mugitus* Barbour, 1921) is one of three currently recognized subspecies of the pine snake (Crother 2008). It intergrades with the black pine snake (*P. m. lodingi*) in Escambia County, Florida (Franz 1992).

Identification: The Florida pine snake is a large, nonvenomous snake with dark brown to reddish blotches on a gray to sandy-colored background. The scales on the upper part of the body are strongly keeled (ridged) and the anal scale is undivided. The head and snout are distinctly cone-shaped and adapted for burrowing (Franz 1992). Florida pine snakes range in length from 122 to 168 cm (48 to 66 inches), with a maximum recorded length of 228.6 cm (90 inches) (Conant and Collins 1998).

Habitat: Florida pine snakes occupy relatively large, unfragmented blocks of fire-maintained, open canopy, xeric habitats including sandhill, old fields, pastures, sand pine scrub, and scrubby flatwoods (Franz 1992, Hipes *et al.* 2001). Degraded habitats can be tolerated (to some degree), but Florida pine snakes may not use habitats where succession to closed canopy forests has taken place (Hipes *et al.* 2001). In addition to the habitat itself, stump holes, active and inactive gopher tortoise burrows, and pocket gopher mounds and burrows are necessary to ensure adequate underground refugia (areas for protection or feeding) for the Florida pine snake.

Commensal Ecology: Although Florida pine snakes are not known to prey on gopher tortoises, they will use tortoise burrows. Studies have shown that Florida pine snakes can spend up to 70 – 80% of their time underground (Franz 1992, Miller 2008) where they forage, nest, and escape adverse weather conditions or fire. In Florida, Georgia, and South Carolina, Florida pine snakes primarily use pocket gopher burrows as underground refugia, but also use stump holes, and gopher tortoise and other animal burrows (Franz 1992, Hipes *et al.* 2001.

Geographic Distribution: The Florida pine snake is restricted to the Atlantic and Gulf coastal plains, from southeastern South Carolina to South Florida, west to Mobile Bay, Alabama (Conant and Collins 1998). In Florida, its historic distribution included most of the state north of Lake Okeechobee and coastal ridges to the south (see species' distribution map in Appendix 5). Museum records indicate the distribution of this snake in South Florida is patchy, but future research may prove it to be more widely distributed (Franz 1992).

Regulation

The Florida pine snake is listed as a Species of Special Concern (68A-27.005, F.A.C.) by FWC. It is illegal to pursue, hunt, molest, capture, kill, attempt any of these acts, transport, or sell pine snakes or their eggs without an FWC permit; however, possession of 1 Florida pine snake without a permit is allowed (68A-25.002 [10] F.A.C.), although albino or amelanistic (lacking dark skin color) specimens may be possessed without limit. Information on applying for a permit for the collection or incidental take of Florida pine snakes is available on FWC's Protected Wildlife Permitting webpage.[33] The status of the Florida pine snake has recently been reviewed by a group of biologists and it was found to warrant protection as a state Threatened species. A management plan is being developed for this species to guide its conservation after the change in status.

Considerations for Limited Relocation of Pine Snakes

Limited relocation may be authorized by FWC in concert with permitted gopher tortoise relocation activities and specified on the gopher tortoise relocation permit. This is because Florida pine snakes may be encountered during site surveys, excavation of gopher tortoise burrows, or capture of tortoises. Snakes should be enclosed in a cloth bag (1 snake per container) such as a pillow case or similar 'snake bag' constructed for that purpose. Alternatively, snakes may be picked up with a rake or stick and dropped into a plastic garbage can with a secure lid. Snakes in bags can be placed in the same type container used for a gopher tortoise (without the gopher tortoise) and maintained under the same conditions as the tortoises until release. Snakes should be released with gopher tortoises and will make their own way to suitable cover.

Florida pine snakes have relatively large home ranges and use a variety of upland habitats, so they will require large, diverse recipient sites. Males have an average home range of 70.1 ha (173 acres) and females of 37.5 ha (93 acres; Miller 2008). Because of negative impacts from fragmentation (reduction in large, continuous natural areas by roads, cities, rivers, or other barriers), Florida pine snakes should be moved to sites with as little

fragmentation as possible. Florida pine snakes should not be relocated to reclaimed sites unless a sufficient onsite prey base can be verified.

Conservation and Research Actions

Determine and implement effective methods for surveying Florida pine snake populations on areas where gopher tortoises are found.

Due to the Florida pine snake's fossorial nature, actual numbers of the current population and the degree of genetic flow among subpopulations remain poorly known. Florida pine snakes occupy large home ranges; but as a result of habitat loss and fragmentation, populations or subpopulations in poor habitat could be in decline. Before relocation or population augmentation is used as a possible management tool, a better understanding of population numbers and genetics is needed.

Identify habitat characteristics that influence Florida pine snakes densities.

If relocation becomes a viable conservation strategy, identification of important habitat characteristics could be used to determine potential relocation sites able to support Florida pine snake populations.

Develop effective relocation strategies and guidelines for Florida pine snakes.

At this time, relocation guidance has not been developed for the Florida pine snake. Research is necessary to determine if relocation is appropriate. If experimental relocations indicate that relocation is a viable strategy for this species, further research should be conducted to determine the most effective relocation method for pine snakes.

Monitor relocated Florida pine snakes to assess their survivorship and behavior and also impacts on recipient populations.

Currently, there are no guidelines for relocating Florida pine snakes. Additionally, if Florida pine snakes are relocated, monitoring will be needed to assess the survivorship and behavior of relocated individuals to determine the success of the relocations. Information about impacts on recipient populations is also lacking.

Evaluate disease susceptibility, transmission risk factors, and disease mitigation strategies for relocating Florida pine snakes.

Assess the disease status of Florida pine snake populations in Florida to determine if relocation poses a disease transmission risk and, if necessary, develop a protocol for accommodating diseased snakes.

Eastern Indigo Snake (*Drymarchon couperi*)

Biology

Taxonomy: The eastern indigo snake was considered a subspecies, *D. corais couperi*, until Collins (1991) proposed full species status as *D. couperi*. This proposal has been substantiated by Wuster *et al*. (2001) based on morphological (structural) data and is now widely accepted. There are two genetically distinct lineages in Florida (Krysko *et al*. 2011).

Identification: The eastern indigo snake is the second longest snake native to the United States. Eastern indigo snakes reach 263 cm (103 inches) in length, although most adults are between 137 and 228 cm (54 to 90 inches) (D. Stevenson, pers. comm.). They are uniformly lustrous blue-black except for reddish to cream coloring on the chin and throat. Eastern indigo snakes in northern Florida are often completely blue-black with the exception of a white patch in the center of the throat. In Florida, the eastern indigo snake is most often confused with the black racer (*Coluber constrictor*), although the racer is a duller black color, has a divided anal plate (the indigo snake's anal plate is a single scale), and is smaller and thinner.

Habitat: In the northern part of its range, the eastern indigo snake prefers xeric habitats (longleaf pine, oak forest, palmetto flatwoods, pine flatwoods, scrubby flatwoods, dry prairies, agricultural fields, coastal dunes) near water, but in South Florida, they are also found in or along tropical hardwood hammocks, freshwater marshes, canals, streams, sugar cane plantations, wet fields and possibly mangrove thickets (USFWS 1982, Ernst and Ernst 2003). In northern Florida, indigo snakes are most often found in close association with gopher tortoise burrows, and as such, share similar habitat preferences (Breininger *et al.* 2011).

Commensal Ecology: In northern Florida and Georgia, eastern indigo snakes depend on gopher tortoise burrows as refugia from extreme temperatures and to prevent desiccation (Ernst and Ernst 2003, Hyslop *et al*. 2009, Breininger *et al*. 2011). There are some indications that indigo snakes are susceptible to rapid desiccation (Ernst and Ernst 2003). In the milder climates of central and southern Florida, especially in habitats without gopher tortoises, they use other shelters, including hollow tree root channels and logs, burrows of rodents and armadillos (*Dasypus novemcintus*), trash piles, crevices of rock-lined ditch or canal banks, land crab (*Cardisoma guanhumi*) holes, and limestone solution holes (USFWS 1982, Ernst and Ernst 2003). The home range of the eastern indigo snake varies by season and is smallest in winter, when it presumably stays close to or in thermal refuges such as gopher tortoise burrows (Ernst and Ernst 2003, Hyslop *et al.* 2009, Breininger *et al.* 2011). Eastern indigo snakes often prey on small gopher tortoises (Stevenson *et al.* 2010).

Geographic Distribution: The eastern indigo snake historically occurred from southeastern Georgia, throughout Florida, to southern Alabama and southeastern Mississippi, although some early authors indicate its presence in Louisiana (USFWS 1982, Ernst and Ernst 2003). The eastern indigo snake experienced dramatic declines and extirpations throughout its historic range. Its current range is most likely limited to Florida and areas in southern Georgia. The eastern indigo snake probably occurred in all counties in Florida, although no

sighting has been verified from Union County (see species' distribution map in Appendix 5). Eastern indigo snakes are rarely sighted in the Panhandle, where the last confirmed sighting was on Eglin Air Force Base in 1999 (Krysko *et al.* 2011).

Regulation

The eastern indigo snake is listed as a Threatened species by the USFWS in 50 C.F.R. 17.11 and listed as a Federally-designated Endangered and Threatened species (68A-27.003, F.A.C.) in recognition of its federal classification. For federally listed species like the eastern indigo snake, either a federal permit is required to capture, handle, or relocate individuals or an FWC permit issued under guidelines approved by the USFWS pursuant to Florida's Cooperative Agreement is required; as of the writing of this plan, there have not been any FWC guidelines proposed or approved for the eastern indigo snake. Therefore, authorized agents should coordinate with the USFWS if they plan to handle eastern indigo snakes. A programmatic effect determination key for the eastern indigo snake can be found on the USFWS website.[34]

Considerations for Limited Relocation of Eastern Indigo Snakes

Currently, relocation of eastern indigo snakes is not authorized by the USFWS or by FWC. The USFWS[35] suggests that when eastern indigo snakes are seen during land clearing, the land clearing activities cease and the eastern indigo snake be allowed to move away.

Conservation and Research Actions

Develop guidelines for conserving the eastern indigo snakes on development sites.

Depending on the disturbance on the development site and the surrounding habitat, relocation may not be the best option. Guidelines for conserving eastern indigo snakes encountered on development sites should be created and should consider relocation, mitigation, and avoidance. Standard protective measures for the eastern indigo snake can be found on the USFWS website.[36]

Identify quantitative or qualitative habitat characteristics that influence home range sizes and habitat use of eastern indigo snakes in northern Florida.

The eastern indigo snake requires large continuous tracts of land for its home range. If relocations are considered, the factors influencing home ranges should be assessed, focusing on areas in northern Florida where indigo snakes have a close association with gopher tortoise burrows. Such work should include an estimate of minimum habitat patch size, modifications to ongoing habitat management (if needed), and survey methods to determine habitat quality.

Develop effective methods for surveying eastern indigo snake populations.

Eastern indigo snakes are very difficult to survey. The USFWS[37] provides a visual encounter survey protocol for eastern indigo snakes to be conducted on development sites for determining indigo snake presence for federal permitting consideration. However, a more comprehensive method to survey indigos would be beneficial for determining the population status of the species.

Monitor relocated eastern indigo snakes to assess the survivorship and behavior of relocated snakes and also impacts on recipient populations.

Although some data exist on indigo snake relocation, there are data gaps that should be addressed before relocations proceed. An estimate of the number of eastern indigo snakes on each recipient site should be determined. Likewise, the appropriate site characteristics, habitat, effects of snake size and age, and timing of relocation should also be determined.

Evaluate disease susceptibility, transmission risk factors, and disease mitigation strategies for relocating eastern indigo snakes.

Assess the disease status of eastern indigo snake populations in Florida to determine if relocation poses a disease transmission risk, and, if necessary, develop a protocol for dealing with diseased snakes.

Develop monitoring protocols for indigo snakes that are relocated.

It is important to collect information about relocated indigo snakes to inform future relocation requirements and management actions.

Non-listed Priority Commensal Species

Eastern Diamondback Rattlesnake (*Crotalus adamanteus*)

Biology

Identification: The eastern diamondback rattlesnake (*Crotalus adamanteus*) is the largest venomous snake in North America (Timmerman and Martin 2003). This snake can be distinguished by its large size (maximum length, 244 cm [96 inches]; although most are 100-150 cm [39-59 inches]) and bulk (Ernst 1992). It is brown with a dorsal pattern of dark, yellow-bordered, diamond-shaped blotches; light stripes border a dark band, which extends downward and backward through the eye; and a brown and white ringed tail tipped with a rattle (Ernst 1992). The ventral surface is yellow to cream with brown mottling (Ernst 1992). Two other species of rattlesnakes in Florida occur within the distribution of the eastern diamondback rattlesnake. These species, the pygmy rattlesnake (*Sisturus miliarius*) and the timber or canebrake rattlesnake (*Crotalus horridus*) are generally smaller and have different coloration and pattern (Timmerman and Martin 2003). No other rattlesnake in Florida has

the combination of the dorsal diamond pattern, light facial stripes, and ringed tail (Ernst 1992).

Habitat: The eastern diamondback rattlesnake is found in longleaf pine habitats (Guyer and Bailey 1993), including sandhills, flatwoods, upland pine forests, and scrub; other habitats used include old fields, floodplains, hardwood hammocks, dry prairies, and coastal strands (Hipes *et al.* 2001). Its pre-settlement range was probably statewide in appropriate habitats, including the barrier islands and keys (Martin and Means 2000). Eastern diamondback rattlesnakes require large tracts of open-canopy habitats (Means 2006; Steen *et al*. 2007; Means, unpublished data). Open-canopy conditions with diverse, herbaceous ground cover provide structure and a food base for the rattlesnakes' primary prey species, rodents and rabbits (Means, unpublished data).

Commensal Ecology: In addition to stump holes and other underground shelter sites, eastern diamondback rattlesnakes use gopher tortoise burrows for microhabitat and seasonal refugia (Ernst 1992, Martin and Means 2000, Timmerman and Martin 2003).

Geographic Distribution: The eastern diamondback rattlesnake historically ranged in the Coastal Plain from North Carolina south throughout Florida and westward to the eastern most parishes of Louisiana (Dundee and Rossman 1989, Ernst 1992). Refer to the species' distribution map in Appendix 5.

Regulation

The eastern diamondback rattlesnake is not currently listed by either FWC or the USFWS. The USFWS has received a petition to list the eastern diamondback rattlesnake as Threatened under the Endangered Species Act. In May 2012, the USFWS announced the 90-day finding on that petition, noting that the petition presented substantial scientific or commercial information indicating that listing the eastern diamondback may be warranted. A status review is presently being undertaken, and if the 12-month finding deems that federal listing is warranted, individuals would be required to coordinate with the USFWS if they plan to handle or transport eastern diamondback rattlesnakes. Currently, a venomous reptile permit[38] issued by FWC is required to handle or transport live eastern diamondback rattlesnakes.

Considerations for Limited Relocation of Eastern Diamondback Rattlesnakes

If relocation of individual snakes is considered and authorized in the future, guidelines will be developed to ensure that relocation is undertaken when there is a conservation benefit to the overall population. Diamondback rattlesnakes are venomous and can strike a distance up to 2/3 of their body length. This species is best left alone when encountered.

Conservation and Research Actions

Develop effective relocation strategies for the eastern diamondback rattlesnake.

No relocation guidance has been developed for the eastern diamondback rattlesnake. Research is necessary to determine if relocation is appropriate. If experimental relocations indicate that relocation is a viable strategy for this species, further research should be conducted to determine the most effective and humane relocation method for eastern diamondback rattlesnakes.

Identify quantitative or qualitative habitat characteristics that influence home range sizes and habitat use of eastern diamondback rattlesnakes in Florida.

The eastern diamondback rattlesnake requires large continuous tracts of land for its home range. If relocations are to be considered, the factors that influence home ranges need to be assessed, focusing on areas in northern Florida where gopher tortoises are present. Such work should include an estimate of minimum habitat patch size, modifications to ongoing habitat management (if needed), and survey methods to determine habitat quality.

Develop effective methods for surveying eastern diamondback rattlesnake populations.

If sites are going to be developed or serve as recipient sites, the resident populations of eastern diamondback rattlesnakes need to be assessed.

Monitor relocated eastern diamondback rattlesnakes to assess the survivorship and behavior of relocated snakes and also impacts on recipient populations.

Although some data exists on eastern diamondback rattlesnakes relocation, data gaps should be filled before relocations proceed. An estimated number of rattlesnakes for each recipient site should be determined. Likewise, the appropriate site characteristics, habitat, effects of snake size and age, and timing of relocation should also be determined.

Assess disease susceptibility, transmission risk factors, and disease mitigation strategies for relocating eastern diamondback rattlesnakes.

Assess the disease status of eastern diamondback rattlesnake populations in Florida to determine if relocation poses a disease transmission risk, and, if necessary, develop a protocol for dealing with diseased snakes.

Develop monitoring protocols for rattlesnakes that are relocated.

It is important to collect information about relocated rattlesnakes to inform future relocation requirements and management actions.

Invertebrate Commensal Species

The following section includes details about the most important invertebrates associated with gopher tortoises, most of which are obligate commensals and some of which

may have a mutualistic relationship with the tortoise by virtue of their providing sanitation or pest control services to the tortoise while they benefit from food and shelter provided by the tortoise and its burrow. A comprehensive list of invertebrate taxa that have been recorded in association with gopher tortoises appears in Appendix 6. Distribution maps for the following invertebrate species are also included in Appendix 6.

Gopher Tortoise Acrolophus Moth (*Acrolophus pholeter*) is a small, approximately 15mm, moth with brownish gray wings (Davis and Milstrey 1988). It is only known from tortoise burrows at one locality in Putnam County and only from sandhill habitat, even though burrows in other habitats were sampled in a similar manner, and it subsists on tortoise dung and detritus within the burrows (Davis and Milstrey 1988). It appears to be an obligate commensal.

Little Gopher Tortoise Scarab Beetle (*Alloblackburneus troglodytes*) is a 3.5mm long elongate yellowish-brown scarab beetle that is difficult to distinguish from closely related species without close examination under a microscope (Woodruff 1973). This species is only known from association with gopher tortoise burrows and it is at least an obligate commensal and possibly a mutualist by providing dung removal services within the burrow, which could possibly lower tortoise parasite loads and pest fly populations (Jackson and Milstrey 1989). Hubbard (1894) stated that this was the most common burrow insect. Paul Lago (1991) found this species at only 1 site out of 48 sampled in Mississippi and commented that this may have been because of it being the most xeric and sandy site. Eric Milstrey (1987) found this to be the most abundant scarab at a xeric sandhill site, and Mark Deyrup (2011) found it to be relatively common in scrub habitat on the Lake Wales Ridge. It has been found in almost every month of the year. In Florida, it is known from approximately 25 localities within about 50,000 square kilometers from Walton County in the Panhandle to Miami-Dade County in the Peninsula. It is also known from Georgia, Mississippi, and South Carolina.

Gopher Tortoise Shell Moth (*Ceratophaga vicinella*) is an approximately 8mm long blackish brown moth with a small white spot on each forewing and fluffy tan hairs on its head (Deyrup *et al* 2005). The larvae subsist upon keratin from dead gopher tortoise shells. Mark Deyrup stated that this species "…is probably one of the most endangered of the gopher tortoise associates, as it relies on a population of tortoises large enough to provide at least one dead individual per year," and designated it as a species of conservation concern on the Lake Wales Ridge (Deyrup 2011). It has been found from February through October. It was known from Florida and Mississippi and expected to occur in Georgia and Alabama (Heppner 2003), but recent and specific records are only for three managed areas in Highlands and Polk counties (Deyrup 2011; Almquist, pers. comm.). This species is an obligate scavenger of gopher tortoise shells. Although it is not a burrow commensal, it was included in this section because of its obligate relationship with the tortoise and its rarity.

Camel or Gopher Crickets (*Ceuthophilus latibuli* and *C. walkeri*) are large brown gryllacridid crickets that are often found in tortoise burrows. They are not exclusively found where there are tortoise burrows, and so while they are commensals, they are not obligates (Young and Goff 1939). Eric Milstrey stated that gopher frogs preferred flies and camel

crickets over beetles when offered them in a laboratory setting, and so these crickets may benefit the frogs (Milstrey 1987). They are found throughout much of Florida.

Gopher Tortoise Hister Beetle (*Chelyoxenus xerobatis*) is a 3mm long black shiny beetle. Hubbard (1894) stated that this species was "very common, burrowing in the sand in all parts of the galleries." This species is only known from gopher tortoise burrows and it is at least an obligate commensal and possibly a mutualist by virtue of its being predatory on other arthropods, thereby possibly reducing pest species that would adversely affect the tortoise. Hubbard (1896) stated that he believed that it preys upon fly larvae within the burrows. There are records from March through November, although it may be active the rest of the year on warm days (Almquist, pers. comm.). It is known from approximately 20 localities from most of Florida, approximately 100,000 square kilometers, from Walton County in the Panhandle to Miami-Dade County in the southern Peninsula. It is also known from Georgia and Mississippi (Peck and Thomas 1998).

Gopher Tortoise Copris Beetle (*Copris gopheri*) is a 9mm long shiny black scarab beetle that is relatively easy for an expert to distinguish from congeners (Woodruff 1973). Although Milstrey (1987) raised the possibility that this species is not a commensal because of not finding it in his sampling efforts, this species is only known from association with gopher tortoise burrows and it appears to be at least an obligate commensal. It is possible that it is a mutualist by virtue of its providing dung removal services within the burrow, which could benefit tortoises by lowering parasite loads and pest fly populations (Jackson and Milstrey 1989). Hubbard (1894) stated that this species was in every burrow that he dug up and that it was frequently abundant. Mark Deyrup (pers. comm.) did not find this species when surveying in part for gopher tortoise commensals on the Lake Wales Ridge in 2009, although he did not excavate any burrows. This endemic beetle has only been found in approximately 10 localities within about 50,000 square kilometers of the Peninsula, and many of these records are at least 20 years old.

Tortoise Burrow Dance Fly (*Drapetis* n. sp.) is a slender, 1.75mm empidid fly with yellow legs (Deyrup and Franz 1994). It is only known from tortoise burrows in scrub habitat at four sites in Highlands County (see distribution map, Appendix 6), although this apparent rarity may be due in part to inadequate sampling methodology, as the fly appears to be most active in fall, winter and early spring (Deyrup 2011). It appears to be an obligate commensal.

Gopher Tortoise Burrow Fly (*Eutrichota gopheri*) is a gray and yellowish-brown 7mm long anthomyiid fly. Paul Lago (1991) reported that what was most likely *E. gopheri* was the most abundant commensal found during a study in Mississippi. This species is only known from association with gopher tortoise burrows and it is at least an obligate commensal and possibly a mutualist by providing dung removal services within the burrow, which could possibly lower tortoise parasite loads and pest fly populations (Jackson and Milstrey 1989). Mark Deyrup (2011) claimed that this species may be an important resource for gopher frogs, which corresponds with Eric Milstrey's (1987) observation that the frogs preferred flies and *Ceuthophilus* crickets in the laboratory. It has been collected January through October, but not as commonly in June and July (Deyrup 2011). It is known from slightly more than 10

localities in 50,000 square kilometers in Florida (FNAI 2012), as well as localities in Alabama, Georgia, and Mississippi.

Equal-clawed Gopher Tortoise Hister Beetle (*Geomysaprinus floridae*) is a 3mm long black shiny beetle with prominent mandibles. This species is only known from gopher tortoise burrows and it is at least an obligate commensal and possibly a mutualist by virtue of its being predatory on other arthropods, thereby possibly reducing pest species that would adversely affect the tortoise. Other than that it has been found in burrows in sandhill habitat (Almquist, pers. comm.), nearly nothing is known about its biology or requirements. This endemic species is known from approximately 5 localities within about 20,000 square kilometers (FNAI 2012).

Gopher Tortoise Noctuid Moth (*Idia gopheri*) is a relatively drab 35mm moth with wavy light lines across its forewings. It is known primarily from northern and central peninsular Florida, but a few specimen have been found in Georgia and Mississippi. This species is primarily known from association with gopher tortoise burrows and it appears to be an obligate commensal. During a comprehensive search for museum specimens of this species, Don Stillwaugh found that only 16 of 73 specimens had been collected more recently than 1980, and Mark Deyrup only found one specimen in a survey for rare insects on the Lake Wales Ridge, so it appears that this species may have declined (Deyrup 2011, Stillwaugh 2006, Schweitzer *et al.* 2011). It has been found year round, but appears to be active primarily in the spring and to a lesser extent in the fall (Stillwaugh 2006). It feeds upon dung and detritus in the burrows.

Gopher Tortoise Robber Fly (*Machimus polyphemi*) is a 15mm long fly that is mostly black with golden brown hairs and reddish yellow legs. All known specimens were collected in association with gopher tortoise burrows, so it appears to be an obligate commensal (Bullington and Beck 1991). There is some evidence that its primary prey may be other flies, so it is possible that it has a mutualistic relationship with the tortoise by virtue of reducing pest fly populations. Specimens have been found in May through July. In Florida, it is only known from two localities in Putnam and Santa Rosa counties, although it is also known from one locality in Georgia and approximately five localities in southeastern Mississippi (Bullington and Beck 1991).

Punctate Gopher Tortoise Onthophagus Beetle (*Onthophagus polyphemi polyphemi*) is a 6mm long brownish-black scarab beetle that is indistinguishable from *O. p. sparsisetosus* without close examination under a microscope (Howden and Cartwright 1963, Woodruff 1973). This subspecies is only known from association with gopher tortoise burrows and it is at least an obligate commensal and possibly a mutualist by providing dung removal services, which could possibly lower tortoise parasite loads and pest fly populations (Jackson and Milstrey 1989). It may be univoltine, with freshly-emerged specimens appearing in March (Howden and Cartwright 1963) and adults being active throughout the year, although less active in the coolest and hottest parts of the year (Milstrey 1987, pers. obs.). Hubbard (1894) reported that he did not find it in the winter, but it also wasn't uncommon in July where 21 specimens were found in one burrow. Relatively little is known of its biology other than that it occurs in the burrows and utilizes tortoise dung. Most localities have been scrub or

sandhill habitat (Deyrup 2011; Almquist, pers. comm.), but Milstrey (1987) reported that it was more common at a site with "moist dark soil". Elizabeth Knizley (1997) reported that this species was found on an undisturbed site and not on a disturbed site in Alachua County, so besides habitat type, habitat quality may be an important factor determining where it does and does not occur. It has been found at approximately 30 localities, within approximately 70,000 square kilometers, in Florida and is also known from Georgia and South Carolina (Woodruff 1973, Harpootlian 2001, FNAI 2012). Mark Deyrup (2011) found it at 15 sites on the Lake Wales Ridge during recent survey efforts.

Smooth Gopher Tortoise Onthophagus Beetle (*Onthophagus polyphemi sparsisetosus*) is a 6mm long brownish-black scarab beetle that is indistinguishable from *O. p. polyphemi* without close examination under a microscope (Howden and Cartwright 1963, Woodruff 1973). Relatively little is known of its biology other than that it uses tortoise dung within the burrows, although it is likely similar in habits to the nominate subspecies. This subspecies is only known from association with gopher tortoise burrows and it is at least an obligate commensal and possibly a mutualist by providing dung removal services within the burrow, which could possibly lower tortoise parasite loads and pest fly populations (Jackson and Milstrey 1989). Paul Lago (1991) reported that this species was the third most abundant burrow insect in a study in Mississippi. In Florida, this subspecies has only been recorded from three counties in the Panhandle within less than a 10,000 square kilometer area and these records are more than 40 years old (Woodruff 1973, FNAI 2012). It is also known from Alabama and Mississippi (Lago 1991).

Gopher Tortoise Rove Beetle (*Philonthus gopheri*) is a 5mm long yellow to reddish-yellow staphylinid beetle that is closely related to *P. testudo* and is indistinguishable from that species without examining male genitalia (Smetana 1995). This species is only known from gopher tortoise burrows and it is at least an obligate commensal and possibly a mutualist by virtue of its being predatory on other arthropods, thereby possibly reducing pest species that would adversely affect the tortoise. Smetana examined 32 specimens for his 1995 revision of subtribe Philonthina, with all of the definitively-dated specimens being from the 1890s. This species was found in sandhill habitat in Levy County in 2000 and most likely in Putnam County also around the same time, as well as in Sumter County in 2011 (also in a sandy xeric area), although the latter two sets of specimens have not been positively identified (Almquist, pers. comm.). Although it is certain that the lack of records during a century's time has something to do with lack of survey effort, it also may indicate a decline of this species concurrent with that of its host (Almquist, pers. comm.). Almost nothing is known of its biology other than that it occurs in the burrows, but it most likely preys upon the eggs and larvae of other burrow arthropods (Hubbard 1894). It does not occur in all burrows within its range, and its habitat and other requirements are unknown. It has only definitively been recorded from six localities in approximately 30,000 square kilometers in the northern half of peninsular Florida (Smetana 1995, FNAI 2012), although there is a questionable record for South Carolina (Peck and Thomas 1998) and it is quite possible that it occurs in other states.

Western Gopher Tortoise Rove Beetle (*Philonthus testudo*) is a 5mm long yellow to reddish-yellow staphylinid beetle that is closely related to *P. gopheri* and is indistinguishable from that species without examining male genitalia (Smetana 1995). This species is only

known from gopher tortoise burrows and it is at least an obligate commensal and possibly a mutualist by virtue of its being predatory on other arthropods, thereby possibly reducing pest species that would adversely affect the tortoise. Almost nothing is known of its biology other than it occurs in the burrows, but it most likely preys upon the eggs and larvae of other burrow arthropods. Paul Lago (1991) found it to be the second most abundant obligate commensal in a study in Mississippi in May and June, but it does not occur in all burrows within its range. As with *P. gopheri*, habitat and other requirements are unknown. This species was described in 1995 and has not been mentioned in most tortoise commensal related literature. In Florida, it has only been definitively recorded from Calhoun and Walton counties in the Panhandle, although there are specimens from Wakulla and Jefferson counties that are most likely this species (Almquist, pers. comm.). Its total range in Florida is less than 10,000 square kilometers (FNAI 2012). It is also known from one locality in southern Georgia and several localities in southeastern Mississippi (Smetana 1995).

Considerations for Limited Relocation of Invertebrates

Relocating invertebrate commensals with their hosts over relatively short distances within a contiguous habitat matrix might help them become established with the new tortoise populations and, in the case of suspected mutualists, might benefit the tortoises also. Research is needed to determine how to keep commensals alive, such as by refrigeration, rearing, or a combination of techniques, until tortoises have established burrows in their new locality.

Conservation and Research Actions

Very little is known about the biologies, distributions and, in some cases, systematics of obligate invertebrate commensals; and much more information is needed before making informed decisions regarding these taxa and other burrow commensals. Some obligate commensals do not occur in all tortoise-occupied areas within their known range, but their exact distributions are not known nor are their habitat and other biological requirements.

Information about some taxa is inadequate to decide whether they are obligate commensals or whether they have a more casual relationship with the gopher tortoise. Also, undescribed and poorly known taxa need to be described and researched before any meaningful work can be done, and it is likely that there are as yet undiscovered species that reside in gopher tortoise burrows.

Systematic questions remain even for described species that may have conservation implications. One example of this is that some specimens of the Gopher Tortoise Onthophagus Beetle (*Onthophagus polyphemi)* from the Panhandle appear to be intermediate between the two subspecies, which calls into question the validity of the subspecific designations. A small carrion beetle, *Ptomaphagus texanus*, is known only from gopher tortoise burrows in Florida, but only from ant nests in Texas (Peck 1973). Because of the different hosts in different geographical locations, it is possible that there are actually two reproductively isolated species presently designated by one name.

The most logical starting point for gathering the necessary data to answer these questions would be surveys for invertebrates that inhabit gopher tortoise burrows throughout the range of the tortoise to attempt to ascertain distributions, habitat, and other requirements, as well as to gather other necessary information and sort out their systematic relationships and enable descriptions of undescribed species. Having entomologists on-site during gopher tortoise relocation activities to collect specimens would be ideal for these sorts of surveys, although various trapping and active surveying techniques can be effectively employed at sites where no gopher tortoise relocations are planned.

Nonnative Species that use Gopher Tortoise Burrows

Nonnative species and infrequent visitors to gopher tortoise burrows are not considered commensals for the purpose of this plan, but may be addressed herein as needed, particularly when providing guidance when encountered during gopher tortoise relocation efforts. Nonnative species removed from gopher tortoise burrows during relocations should either be euthanized or placed with a properly permitted individual or organization. The Argentine giant tegu (*Tupinambis merianae*), recently established in Florida, is known to occupy gopher tortoise burrows. Please report this and any other nonnative species through the toll-free number 888-IVEGOT1 (888-483-4681), or online at www.EDDMaps.org. For more information on nonnative species in Florida, visit the nonnative section[39] on MyFWC.com.

Interim FWC Policy on the Relocation of Priority Commensals

The FWC has permitted the humane relocation of gopher tortoises since the mid-1980s. Along with the gopher tortoise, a "suite of species," or commensals, was also permitted for relocation. Specifically, state-listed species were authorized for relocation with the gopher tortoises when captured incidentally during authorized gopher tortoise capture methods. These state-listed species included the Florida mouse, gopher frog, and pine snake; and prior to 2009, also included the eastern indigo snake. Although the relocation of these animals has occurred, no follow-up monitoring was required. Therefore, little to nothing is known about the survival of these relocated animals and their impact on resident individuals or populations.

Furthermore, little is known how commensal species respond to relocation, in particular the Florida mouse, gopher frog, and pine snake, and little research has been conducted on the best methods for relocating these species. Concerns exist about the potential impacts to resident populations, genetic boundaries, and minimizing the potential spread of disease, because these factors are poorly understood. For these reasons, interim guidelines for limited relocation are provided until the individual species management plans are developed and approved by FWC's Commission. Once the species plans are approved, this interim guidance will be re-evaluated to ensure that all aspects of commensal conservation are considered, and changes to this policy will be amended in the future as needed. The FWC will work with stakeholders from the Gopher Tortoise Technical

Assistance Group (GTTAG) and species experts from the scientific/academic communities to develop guidance that is best for species conservation while ensuring its practicability for the regulated community.

Until more permanent guidance is developed and approved by FWC's Commission, the priority commensals that do not require a separate permit from FWC or the USFWS will be authorized for limited relocation under FWC-issued gopher tortoise relocation permits. The FWC gopher tortoise permits do not authorize release of any animal onto properties not specified in the issued permit. One type of gopher tortoise relocation permit for temporary exclusion, does allow gopher tortoises to be temporarily relocated to adjacent sites only with written permission from the landowner. This written permission must be included with the permit application in order to obtain FWC authorizations needed for relocation on adjacent habitat. Species that will be authorized include the Florida mouse, gopher frog, and pine snake. No other species will be authorized for limited relocation under gopher tortoise permits, and a separate permit may be needed in order to perform relocation (see specific species information above under "Regulation"). Upon approval of the Gopher Tortoise Management Plan at the scheduled 5 September 2012 FWC Commission meeting, this *Interim FWC Policy on the Relocation of Priority Commensals* will supersede the guidelines for commensals provided in Appendix 9, *Handling of Commensal Species during Relocations* of the Gopher Tortoise Permitting Guidelines (April 2008, revised November 2011).

Limited Relocation Guidance

Limited relocation helps remove captured commensals from harms' way while minimizing the threats to individuals and populations, *e.g.,* by lessening potential impacts of competition with resident populations, crossing genetic boundaries, and possible spread of disease. Different permit options are available for the relocation of gopher tortoises depending on the type and extent of impact to the gopher tortoise and habitat on which it depends. Gopher tortoise relocation permits are described in the Gopher Tortoise Permitting Guidelines (April 2008, as amended) available at MyFWC.com/GopherTortoise.[40] The following interim guidance only applies to listed and non-listed commensals that are incidentally captured during permitted gopher tortoise relocation activities. Trapping or capturing these species associated with any other activity requires a separate permit from FWC's Protected Species Permitting section.[41]

To accommodate various project types and permit scenarios, FWC has developed interim guidance (see Table 14) for limited relocation of commensals based on post-development site characteristics and species identity. Additional species-specific considerations for relocations are included above in the sections for priority commensal species. Species-specific guidelines for permitting relocations and research are forthcoming and will be developed as management plans are finalized for listed commensal species. For the interim, the following guidance is provided so that animals encountered during gopher tortoise trapping and relocation efforts are appropriately handled and released.

Table 14. Interim guidance for limited relocation of commensals based on post-development site characteristics and species identity.

Post-development site characteristics	*If a gopher tortoise burrow will be impacted from development activities and* ***some habitat will remain on-site***	*If a gopher tortoise burrow will be impacted from development activities and* ***adjacent habitat is available***	*If a gopher tortoise burrow will be impacted/destroyed from development activities and* ***no habitat will remain***
Florida Mouse	Any incidentally captured Florida mouse should be released on-site or allowed to escape unharmed if some habitat will remain post-development activities.	Any incidentally captured Florida mouse should be released on-site as close to original habitat as possible.	Any incidentally captured Florida mouse should be allowed to escape unharmed, relocated offsite to newly created (*i.e.*, reclaimed) habitat that is not currently occupied by Florida mice, or donated to a facility for educational or research purposes (permit required for receiving facility).
Gopher frog	Any incidentally captured gopher frog should be released on-site or allowed to escape unharmed if some habitat will remain post-development activities.	Any incidentally captured gopher frog should be released on-site or allowed to escape unharmed if some habitat will remain post-development activities, within 2 km of capture site.	Any incidentally captured gopher frog should be allowed to escape unharmed or donated to a facility for educational or research purposes (permit required for receiving facility).
Pine snake	Any incidentally captured pine snake should be released on-site or allowed to escape unharmed if some habitat will remain post-development activities.	Any incidentally captured pine snake should be released on-site or allowed to escape unharmed if some habitat will remain post-development activities.	Any incidentally captured pine snake should be allowed to escape unharmed or donated to a facility for educational or research purposes (permit required for receiving facility).
Non-listed commensals, invertebrates, and other common animals encountered	All animals should be released on-site or allowed to escape unharmed.	All animals should be released on-site or allowed to escape unharmed.	All animals should be released on-site or allowed to escape unharmed. Captured invertebrates can also be donated to a facility for educational or research purposes.
Exotic species	Nonnative species removed from gopher tortoise burrows during relocations should either be euthanized or placed with a properly permitted individual or organization.	Nonnative species removed from gopher tortoise burrows during relocations should either be euthanized or placed with a properly permitted individual or organization.	Nonnative species removed from gopher tortoise burrows during relocations shall either be euthanized or placed with a properly permitted individual or organization.

Table 15. Proposed timeline for implementing commensal conservation actions.

Proposed Commensal Conservation Actions	species	2013	2014	2015	2016	2017
Create series of maps that include potential habitat maps for commensal species (species richness maps) to aid in identification of areas with highest priority.	gofr; flms; pisn; eis; edr; invt					
Develop effective relocation strategies and guidelines for each species as appropriate.	gofr; flms; pisn; eis; edr; invt					
Conduct surveys of genetic variation to determine subpopulations and the level of gene flow among subpopulations.	gofr; flms; pisn					
Identify habitat characteristics that influence home range sizes, habitat use, and species densities in scrub and sandhill habitats.	flms; pisn; eis; edr					
Determine and implement effective methods for surveying priority commensal populations in areas where gopher tortoises are found.	gofr; flms; pisn; eis; edr;					
Develop monitoring protocols for relocated priority commensals to collect information to inform future management.	flms; gofr; eis					
Monitor relocated priority commensals to assess the survivorship and behavior of those individuals and impacts on recipient populations.	flms; gofr; eis					
Identify and prioritize appropriate potential recipient sites for commensal species if future research indicates relocation can be effective.	gofr; flms; pisn; eis; edr; invt					
Assess disease susceptibility, transmission risk, and disease mitigation strategies for relocating priority commensals.	flms; gofr; eis					
Conduct surveys for invertebrate commensals to determine distributions and habitat.	invt					
Determine best protocols for releasing commensals that increase their chance for survival.	gofr; flms; pisn; eis; edr; invt					

Abbreviations: Gopher frog- gofr; Florida mouse- flms; Florida pine snake- pisn; Eastern indigo snake- eis; Eastern diamondback rattlesnake- edr; Invertebrates- invt

CHAPTER 6: IMPLEMENTATION STRATEGY

Conservation and recovery of the gopher tortoise through the implementation of this plan requires the ongoing cooperation of local governments; regional, state, and federal agencies; non-governmental organizations (NGOs); business interests; and the public. Within government, the Florida Fish and Wildlife Conservation Commission (FWC) recognizes that a number of agencies have important roles in gopher tortoise conservation. Although this plan was developed by FWC, in collaboration with the stakeholders, it cannot be successfully implemented without significant direct involvement of these agencies and NGOs. Close coordination with the Florida Department of Environmental Protection, the Florida Forest Service, and local governments will be required to address the significant problems associated with habitat loss and management.

Complex natural resource problems cannot be solved by government alone. Collaboration and cooperation with the private sector and support from the public will be necessary for the long-term successful implementation of this management plan in Florida. Significant progress has been made in the first 5 years since implementation of the Gopher Tortoise Management Plan in 2007. During this time, FWC has enjoyed close cooperation with private sector business interests and NGOs, and those entities will continue to play a significant leadership role in helping achieve habitat protection and conservation outreach and education objectives as laid out in this revised plan for future activities.

Much of what has been accomplished in the original plan since its implementation has been removed as "action" items from this plan. Table 16, below, presents these items to help preserve the record of what has been done to date. The table also includes significant achievements, not specifically included in the first draft of the Gopher Tortoise Management Plan, by FWC staff, partners, and stakeholders for gopher tortoise conservation. These items were identified as a need during implementation, and were undertaken accordingly. This is an adaptive plan, and FWC has been able to adapt to the ever-changing circumstances, resources, and challenges confronting the gopher tortoise. Significant conservation has been achieved for the gopher tortoise through accomplishments from the first 5 years of operation under this plan as summarized below.

The FWC will continue to work with the Gopher Tortoise Technical Assistance Group (GTTAG) as long as the group feels this interaction is productive and valued by the membership. The Gopher Tortoise Stakeholder Group members (Appendix 8) have provided input on the content of the Gopher Tortoise Management Plan throughout its development. The FWC recognizes this valuable contribution and will continue to solicit input and support as this revised plan is approved and implemented.

The FWC's Species Conservation Planning Section within the Division of Habitat and Species Conservation will be responsible for overseeing implementation of this plan including scheduled 5-year revisions and updates. The FWC recognizes there are many opportunities within the agency for the divisions and offices to continue working together to assist in the recovery of the gopher tortoise. Some areas within FWC where staff will work to improve those efforts are listed below:

- Continue providing input into the Florida Forever land purchases, putting the focus on lands important to listed species' recovery.

- As a member of the Acquisition and Restoration Council, continue contributions to the drafting of land management plans that will help protect, maintain, and recover species, particularly listed ones.

- Develop an FWC strategy on state and federal conservation-based incentives for private landowners in Florida.

- Work with FWC's Law Enforcement Division to increase their knowledge and build the capacity of officers and field personnel when receiving and responding to gopher tortoise complaints.

- Continue working with FWC Legislative Affairs Office to review relevant proposed bills during legislative sessions to ensure gopher tortoise protection is maintained. Meet with Legislative Affairs staff after each session to determine and understand the final outcome and intent of any tortoise-related legislation.

Timeframe for Completing Actions

For ease of understanding, Chapters 4 and 5 present a series of tables that contain proposed management actions and associated timelines for sequencing work during the second 5-year action cycle of this plan. For example, Table 12 (Chapter 4, Education and Outreach) presents a listing of education and outreach actions and sequencing timelines. Where funding or staffing is limited, the timeframe for beginning and completing work will be adjusted to accomplish the greatest conservation benefit for the species.

Significant Gopher Tortoise Management Plan Achievements to Date

Table 16. Completed and Ongoing Conservation Activities

Completed (✓) and Ongoing (*)	**Years 1-5**
Overall Management	
Establish Gopher Tortoise 3 Team (GT3)	✓
Meet at least annually with stakeholders	*
Coordinate as needed with GTTAG	*
Hire and train new staff for management plan implementation	✓
Create new internship opportunities for college students to assist with management plan implementation	*
Report annually to the FWC Commission on plan implementation progress	*
Permitting	
Develop and distribute permitting guidelines	✓

Create online permitting system	✓
Create permit applications for recipient site, authorized agent, and relocation permits	✓
Develop a curriculum outline for authorized agent training and approve privately-operated training programs	✓
Improve and revise permitting guidelines as needed	*
Develop an e-Learning curriculum for 10 or Fewer Burrows applicants	✓
Coordinate with stakeholders on the development of the initial permitting guidelines and revisions to improve the guidelines as needed	*
Coordinate with GTTAG sub-team on development of the online permit system	✓
Develop and implement an online survey to obtain feedback on the website and permit system	*
Create and maintain reports from the online permitting system	✓
Conduct a "Rapid Process Improvement" analysis to improve FWC's permit process and timeframe for gopher tortoise recipient sites	✓
Local Government Coordination	
Coordinate with counties on establishing waif tortoise recipient sites	*
Coordinate with counties on establishing long-term recipient sites	*
Assist counties with creating local ordinances, inter-local agreements, and reviewing comprehensive plan elements	*
Plan and conduct regional workshops for local government representatives	*
Develop and implement a local government habitat management assistance program	*
Law Enforcement	
Create training manual and materials for recruits and officers	✓
Implement training materials at FWC's Law Enforcement Training Academy for new recruits	✓
Conduct training for regional LE officers and personnel	*
Coordinate with county offices regarding permit compliance and enforcement issues	*
Habitat Management	
Implement appropriate habitat management practices on FWC managed lands	✓
Implement fire management actions through expanded partnerships through the State Wildlife Grant program, TNC's Fire Strike Teams, and state-owned lands	✓
Determine fire management actions	✓
Develop a habitat management treatment database for FWC managed lands	✓
Establish monitoring protocol for gopher tortoises on Wildlife Management Areas	✓
Develop a vegetation monitoring database	✓

Population Management	
Coordinate with other public land agencies regarding restocking	*
Coordinate with other states to explore options for restocking waif tortoises to public lands	*
Disease Management	
Provide guidelines regarding disposition of diseased or potentially infectious tortoises captured during relocation efforts	✓
Create a health screening protocol for field use	✓
Incentives	
Draft and distribute criteria (in permitting guidelines) for higher gopher tortoise stocking densities	✓
Coordinate with staff to increase acres of protected and managed habitat on private lands	*
Coordinate with FWC on Greenbelt Amendment 2008, providing guidance on tax incentives for lands placed under conservation easements	✓
Explore use of Candidate Conservation Agreements with Assurances with landowners to provide incentives for conserving gopher tortoises	*
Monitoring	
Conduct follow-up survey of habitat management on recipient sites	✓
Track number of acres of gopher tortoise habitat acquired under the Florida Forever Program	✓
Coordinate with GTTAG sub-team to improve the monitoring requirements for recipient sites	*
Estimate the number of acres of gopher tortoise habitat protected by local governments, non-governmental organizations, and private landowners	*
Monitor the number of gopher tortoises relocated to protected and unprotected recipient sites	*
Education, Outreach, Media Relations	
Create gopher tortoise fact sheets: Permitting, Laws, Horses and Safety, Recipient Sites, Waif Tortoises, Wildlife Rehabilitation	✓
Create gopher tortoise brochures: *A guide to living with gopher tortoises* (English and Spanish), *Before you build*	✓
Re-print and distribute the "Gopher Tortoise Activity Book" by Zander Srodes	*
Complete a statewide distribution of the "Gopher Tortoise Activity Book" to all nature centers in Florida with educational programming or related interests	✓
Redesign "Got Gophers, Get Permits" poster	✓
Create a "Featured Critter" page formatted for newspaper publications	✓
Create implementation plan for publication distribution	✓
Coordinate with GTTAG sub-team on outreach materials	*
Assist the American Forest Foundation with the development of *The Pine Ecosystem Conservation Handbook for the Gopher Tortoise in Florida*	✓

Develop facilitator's curriculum for training environmental educators and curriculum and activities for use by educators in Florida	✓
Create a gopher tortoise conservation session and implement the facilitator's curriculum at the Annual Educator's Conference	*
Create a gopher tortoise "treasure box" of artifacts to enhance outreach programs and festivals	✓
Develop standard outreach programs specific to audience type	*
Participate in outreach opportunities including school presentations, summer camps, festivals, community groups, environmental professionals, and general adult groups	*
Provide assistance and input on the development of education programs by community groups such as Master Naturalists and local Audubon groups	*
Provide outreach materials to local governments to improve communication and coordination	*
Initiate Save Space for Wildlife Campaign	✓
Create press releases as needed	*
Create global annual calendar of outreach opportunities and events (gtevents@myfwc.com)	*
Contact each licensed wildlife rehabber in Florida in order to develop a sub-list of those who treat gopher tortoises	✓
Develop a landowner incentive handout for programs compatible with gopher tortoise conservation actions	✓
Coordinate with Florida Youth Conservation Center Network (FYCCN) on programming	*
Research	
Complete a follow-up study of long-term population dynamics on gopher tortoises at the Plum Creek/Lochloosa study site in Alachua County (FWC)	✓
Conduct study of Panhandle gopher tortoise genetics and compare with Peninsular populations (FWC and Towson University)	✓
Evaluate effects of URTD in wild gopher tortoise populations (FWC and UF)	✓
Study the effects of cattle grazing on gopher tortoise stocking densities (USF)	*
Evaluate gopher tortoise and vegetation response to mechanical treatment in coastal scrub (FWC)	*
Evaluate effectiveness of restocking peninsular tortoises to Panhandle (Nokuse)	*
Evaluate the response of relocated gopher tortoises to stocking density and enclosure size on the Apalachicola National Forest (St. Joe)	*
Conduct follow-up study on relocated tortoises (Disney)	*
Waif Tortoises	
Establish a simple and organized method for handling waifs	✓
Create a tracking system for recipient sites for waif tortoises	✓
Coordinate with public and private landowners to establish waif tortoise recipient sites	*

This record of actions and accomplishments has helped to inform and guide the current revision of the Gopher Tortoise Management Plan, and maintaining the record will continue to guide future efforts. As revisions to the plan occur in the future, this list of accomplishments will be continuously updated to reflect the significant progress made toward achieving the goal and objectives of the management plan.

CHAPTER 7: ECONOMIC, SOCIAL, AND ECOLOGICAL IMPACTS

Potentially Affected Parties

Gopher tortoises affect people primarily due to their shared occupancy of well-drained, upland habitats. Areas with deep, well-drained soil are preferred both for gopher tortoise burrows and people's homes and associated development, bringing them into contact and conflict. In earlier times, tortoises were relished as food by some rural people, and depletion of tortoise populations in some areas is due to this cause. Currently, human consumption of tortoises is thought to be sporadic and localized, and the primary interactions result from habitat competition. Tortoises are also charismatic creatures that many people find attractive and appealing or vulnerable. People affected by tortoises, therefore, fall into 3 broad classes: those who are charged with conserving and managing tortoises and their habitat; those who find their economic activities constrained by the presence of tortoises; and those who wish to preserve, conserve, or cherish them in different ways. Table 17 lists broad categories of 'interest groups' that were identified by the Florida Fish and Wildlife Conservation Commission (FWC) and stakeholders as the major affected parties which formed the basis for a representative stakeholder group that assisted FWC on gopher tortoise conservation and the management plan. A full list of stakeholders is given in Appendix 8.

Table 17. Categories of stakeholders' interest in gopher tortoise management and conservation.

Primary Industry	Forestry production, mining (*e.g.,* phosphate), agriculture, (*e.g.,* Florida Farm Bureau, Florida Cattlemen's Assoc.)
Conservation Organizations	Defenders of Wildlife, Gopher Tortoise Council, The Nature Conservancy
Land Development	Florida Chamber of Commerce, Florida Homebuilders Assoc.
Local Government Agencies	County, municipal
Research and Academic	University and private researchers
Commercial Service	Consultants providing gopher management and relocation services
Private Landowners	Lykes Ranch, Deseret Ranches of Florida, St. Joe Co., Nokuse Plantation
Military, Federal, or State Land Managers	U.S. Forest Service, FL DEP - Parks, Florida National Guard, water management districts
General Public	Individuals, neighborhood associations, educators
Animal Welfare	Humane Society, ASPCA, licensed wildlife rehabilitators

Social Impacts

Conflicts among interested stakeholder groups have generated substantial passion and controversy and required active mediation. Public outrage at some elements of gopher tortoise mitigation, such as habitat loss and incidental take permitting, and concerns about undue or even unconstitutional interference with private land use and development rights have resulted in extensive media coverage, and required much effort by FWC. Recognizing the need to manage these conflicts, the preparation of this plan served as an impetus to develop structures for improved communication among FWC and various stakeholder groups. Beginning in July 2005, FWC used its contracted facilitation leadership initiative to assist stakeholders in forming their own forum for discussions, adopting effective governance to facilitate communication and equity among stakeholders, and transmitting stakeholder views and recommendations to FWC. This stakeholder group, the Gopher Tortoise Technical Assistance Group (GTTAG), continues to operate effectively to discuss issues, review FWC proposals, and recommend alternative or additional possibilities. The management plan proposes to extend this group to serve as a citizen oversight body as FWC and other partners continue to implement the plan. A public SharePoint site[42] is maintained by FWC and is used by the GTTAG for communications and maintaining group meeting records.

Humane and animal welfare considerations have emerged as a significant component of the social impact of gopher tortoise regulation. The public, organized animal advocacy groups and media have expressed deep concern over the entombment of tortoises during development. Recently, this concern has been effectively mobilized to 'rescue' tortoises from selected sites and relocate them, with the approval of FWC and the voluntary participation of landowners and developers. One of the highest priority implementation items of the original plan was to provide permit mechanisms to continue this process. The new permitting options were fully developed in the Gopher Tortoise Permitting Guidelines and implemented in April 2009.

Economic Effects

The economic analysis (Appendix 9) for the Gopher Tortoise Management Plan closely follows the standards established for the Statement of Estimated Regulatory Costs as described in Chapter 120, F.S., Florida Administrative Procedures Act. Cost estimates included in the analysis (based on the best available data) are provided for FWC and the regulated community for implementation of the proposed gopher tortoise management plan.

The estimated costs to FWC (excluding expenditures for grants) are as follows:

> When the plan was approved in 2007, the startup costs for the first year of the plan were estimated to be $3,675,049.
>
> Ongoing, recurring/annual costs for plan implementation are estimated to be $2,091,842.

Implementation of the Gopher Tortoise Management Plan will affect landowners; commercial, industrial, residential, and other land development entities; local governments; the general public; and all other entities who qualify for a permit. Historically, permit records from FWC indicate that approximately 1,500 to 1,600 permits were issued on an annual basis across all categories (effecting approximately 14,800 tortoises). However, since plan implementation, the economy of Florida has suffered from a significant downturn and the number of gopher tortoise permits issued as such has also changed. Since the new permitting framework outlined in the 2007 plan was implemented, approximately 150-500 permits have been issued across all permit categories (effecting approximately 3,800 tortoises). The majority of regulated entities (approximately 63%) are issued the 10 or fewer burrows permit with a mitigation contribution of $200. However, there are several different options for permits, and costs are determined by the permit issued and the number of tortoises.

The total estimated five year direct cost to the regulated community is estimated at $35 million. Looking at the net of mitigation contributions and private third-party vendor revenues, there is a transfer of $7.4 million over the five year period from the public sector to the private sector. This will result in a net increase of 1.7 new private sector jobs annually and a shift of 15.9 public sector jobs to the private sector per year for a total of 8.5 new private sector jobs in five years. On the revenue side, FWC will see $5.6 million in total revenue ($3.2 million from the private sector and $2.4 million from government agencies). In terms of economic growth, the Gopher Tortoise Management Plan will result in a net annual growth of $437,784 or $2.8 million in five years. See Appendix 9 of this plan for the full economic analysis of this plan.

Ecological Impacts

Potentially Positive Impacts

The gopher tortoise's ecological role as a keystone species has been well-documented (Cox *et al.* 1987, Jackson and Milstrey 1989, Witz *et al.* 1991, Kent *et al.* 1997); therefore, in most cases, management actions that enhance tortoise populations will prove beneficial to numerous other vertebrate and invertebrate species. Imperiled species, such as the eastern indigo snake, gopher frog, and Florida mouse, regularly use gopher tortoise burrows. These underground retreats serve as both resting and foraging habitat and allow many species to escape from temperature extremes, predators, or fires. Some invertebrate species are found only in gopher tortoise burrows.

Restoring gopher tortoise populations enhances biodiversity by providing additional refuges for other wildlife and by influencing patterns of plant colonization and community structure (Kaczor and Harnett 1990). This grazing reptile also serves as a seed dispersal agent for native grasses and forbs (Auffenburg 1969, Landers 1980). The importance of this single species to the ecological welfare of many upland habitats in Florida should not be underestimated.

Potentially Negative Impacts

Although management for gopher tortoises meshes well with that of many other species, particularly traditional game species, there may be circumstances where creating optimal conditions for gopher tortoises could negatively affect other wildlife. For example, when using fire to manage scrub jay *(Aphelocoma coerulescens)* habitat to benefit tortoises, burning an entire site on a frequent basis may be detrimental to scrub jays. However, this can be offset by burning small areas and leaving a mosaic of unburned habitat. Mowing or roller-chopping in areas where fire is prohibited may benefit gopher tortoises but could adversely affect "sand swimmers" such as sand skinks (*Neoseps reynoldsi*) and blue-tailed mole skinks (*Eumeces egregious lividus*). In cases where another threatened species may be adversely affected by manipulation of habitat for tortoises, decisions will need to be made on a site-specific basis. Whenever more seriously imperiled species (especially those that are restricted by geography or habitat) co-exist with gopher tortoises, land managers should defer to the needs of those rare species.

Use of some types of temporary enclosures around gopher tortoise recipient sites could affect movements of amphibians to and from breeding ponds. Consideration of enclosure sizes, types, and locations, in addition to other site-specific management recommendations, should help reduce these short-term effects.

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APPENDICES

APPENDIX 1. History of Gopher Tortoise Regulations in Florida

1972 Ban on sale and export
1973 Possession limit of 10
1975 Listed as threatened species
1976 Possession limit of 5
1978 Ban on introduction of toxic substances into burrows
1979 Listing revised: Listed as Species of Special Concern
1980 Closed season from April 1 to June 30
1982 Ban on export revoked
1984 Closed season from January 2 to June 30
Ban on bucket traps and snares
Relocation policy statement issued
1985 Closed season from January 2 to September 30
Possession limit of 2
Harvest prohibited south of line designated by SR 72 and 70
Interim relocation protocol issued
Gopher tortoise race guidelines issued
1986 Harvest prohibited in 3 national forests
Use of paint to mark turtle shells prohibited
Revised relocation protocol issued
1987 Habitat protection guidelines for large-scale developments issued
1988 Harvest prohibited statewide
Revised relocation guidelines issued
1989 Gopher tortoise races prohibited
1991 Relocation on property, incidental take permit process, URTD monitoring
1992 Clarification issued regarding taking of tortoises on development sites
2001 Major revision modifying guidelines
2006 Rule protecting tortoise burrows passed
Modification of upper respiratory tract disease and incidental take policies
2007 Interim incidental take policy implemented
2007 Listing revised: Listed as Threatened; Gopher Tortoise Management Plan approved
2008 Gopher Tortoise Permitting Guidelines approved
2009 Issuance of Standard Relocation and Incidental Take permits ends;
Permitting Guidelines approved in 2008 are fully implemented (April 2009)

APPENDIX 2. Gopher Tortoise Enforcement Policy

Florida Fish and Wildlife Conservation Commission
620 South Meridian Street, Tallahassee, FL 32399

POLICY☒; POSITION☐; GUIDELINE☐.

TITLE: **Gopher Tortoise enforcement**

APPROVAL AUTHORITY: OFFICE OF EXECUTIVE DIRECTOR

DATE:

GENERAL POLICY STATEMENT

Agricultural, Silvicultrual, and Wildlife management activities

This policy is for the purpose of enforcement of Chapter 68A-27 relating to Gopher tortoises with respect to agricultural and silvicultural activities or activities intended to improve native wildlife habitat. The adoption of the Gopher Tortoise Burrow rule does not expand pre-existing gopher tortoise regulatory prohibitions or change existing policy or practice with respect to agricultural and silvicultural activities.

An illegal take of a gopher tortoise burrow includes, but is not limited to, damaging, collapsing or covering a gopher tortoise burrow from land clearing, bulldozing, grading, paving, or building construction associated with land development, without a permit issued under Chapter 68A, Florida Administrative Code.

Gopher tortoise or gopher tortoise burrow permits are not required to conduct agricultural activities, silvicultural activities, or activities intended to improve native wildlife habitat. Such activities include, but are not limited to, tilling, planting, mowing, harvesting, prescribed burning, mowing, disking, roller-chopping, and tree-cutting.

Burrow prohibition

The prohibitions related to gopher tortoise burrows will not be applied when a landowner can demonstrate that those burrows are no longer used by gopher tortoises by conducting a gopher tortoise survey in accordance with FWC guidelines.

As stated in Chapter 68A-27 "gopher tortoise burrow" is defined as a tunnel in the ground with a cross-section that closely approximates the shape of a gopher tortoise.

Solely for the purpose of this policy, the presence of one or more of the following characteristics indicates that gopher tortoises or gopher tortoise burrows may be present:

(a) Ground surrounding a burrow entrance shows evidence of gopher tortoise activity including but not limited to presence of a gopher tortoise; gopher tortoise eggs or egg shell fragments; impressions from the bottom shell of the tortoise;

3/6/2008 1 of 2

foot-prints or tracks left by tortoises; scat; obvious feeding trails radiating out and extending into surrounding vegetation);
(b) Sand mound from the burrow excavation apparent at the burrow entrance;
(c) Located in well-drained to moderately well-drained, sandy soils;
(d) Located in sandhill, scrub, coastal dunes, flatwoods, dry prairie, dry hammock communities, or any disturbed version of these plant communities (such as, but not limited to, pastures, old fields, yards, power line corridors, roadsides);
(e) Other burrows with the shape defined above, and with one or more of the characteristics described in (a)-(d) above, located on the site or in proximity on adjacent property.

This policy will remain in effect until replaced with policy or rule.

Kenneth Haddad, Executive Director — 3/6/08 date

APPENDIX 3. FWC Regional Map and Contact Information

Florida Fish and Wildlife Conservation Commission
DIVISION OF HABITAT AND SPECIES CONSERVATION
GOPHER TORTOISE CONTACT INFORMATION

For inquiries related to the Gopher Tortoise Management Plan, please contact:

Gopher Tortoise Management Plan Coordinator
Division of Habitat and Species Conservation
Species Conservation Planning Section
Florida Fish and Wildlife Conservation Commission
620 South Meridian Street (Mail Station 2A)
Tallahassee, Florida 32399-1600
(850)921-1019; Fax: (850)921-1847

For specific inquiries related to gopher tortoise permitting requirements and status, please contact:

Gopher Tortoise Permit Coordinator
Division of Habitat and Species Conservation
Species Conservation Planning Section
Florida Fish and Wildlife Conservation Commission
620 South Meridian Street (Mail Station 2A)
Tallahassee, Florida 32399-1600
(850)921-1031; Fax: (850)488-5297
MyFWC.com/GopherTortoise

APPENDIX 4. Gopher Tortoise Priority Habitat by FWC Region

The regional priority habitat maps identify public and privately owned property that has suitable gopher tortoise habitat. The criteria for identifying primary and secondary gopher tortoise habitats are consistent with the habitat criteria used to evaluate gopher tortoise recipient sites (*acceptable* and *desirable*) as outlined in the Gopher Tortoise Permitting Guidelines. The variables considered include: vegetation, canopy cover, and soils with a water table depth greater than 1.5 ft. Larger, contiguous habitat patches can provide the highest conservation value for gopher tortoises, therefore; the FWC identified all gopher tortoise habitat patches greater than 200 acres. The habitat patches that contain the specified habitat characteristics were then separated into primary (desirable) and secondary (acceptable) gopher tortoise habitat.

The Gopher Tortoise Priority Habitat maps were created to identify geographic areas in Florida that may have the highest conservation benefit potential for gopher tortoises. The maps will be utilized to guide FWC's implementation of conservation-based incentives to public and private landowners who can manage and conserve high quality gopher tortoise habitat. Landowners who possess land located within identified *primary* and *secondary* gopher tortoise habitat may be eligible for increased incentives to assist in managing and conserving gopher tortoises and associated commensal species.

Potential Primary and Secondary Habitat
Florida Fish and Wildlife Conservation Commission

The original Regional Gopher Tortoise Habitat Model (RGTHM) was created by Tom Hoctor and Suzanne Beyeler of the Center for Landscape and Conservation Planning, University of Florida. The RGTHM contained select vegetation, canopy data and soils with water table depth greater than 6.5 ft. The FWC modified the original RGTHM using all original vegetation habitat with additional beach and dune habitat. The vegetation habitat was then combined with the selected canopy grids and further selected for soils with a water table depth greater than 1.5 ft:

- **Class 1 –** Primary habitat and soils with water table depth greater than 6.5ft
- **Class 2 –** Primary habitat and soils with water table depth 1.5 to 6.5ft
- **Class 3 –** Secondary habitat and soils with water table depth greater than 6.5ft
- **Class 4 –** Secondary habitat and soils with water table depth 1.5 to 6.5ft
- **Class 5 –** Other potential primary habitat**:** Florida sandhill, scrub, dry prairie (FNAI data) and beach/dune and other beach communities (Southeast Gap Analysis Project – SEGAP)
- **Class 6 –** Pasture secondary habitat and soils with water table depth greater than 6.5f**t**
- **Class 7 –** Pasture secondary habitat and soils with water table depth 1.5 to 6.5ft

Description of additional files created or used

Primary Gopher Tortoise Habitat
This spatial data set contains the Modified Regional Gopher Tortoise Habitat, Group 4 = (1, 5 classes) with patches greater than 200 acres.

- ***Primary Habitat*** was defined as areas that contain appropriate habitat types that have a canopy closure of < 65% and are located on non-hydric soils are at least moderately well drained, flood occasionally or less, and have a water table depth greater than 6.5 ft deep or have a water table depth between 1.5 ft and 6.5ft.

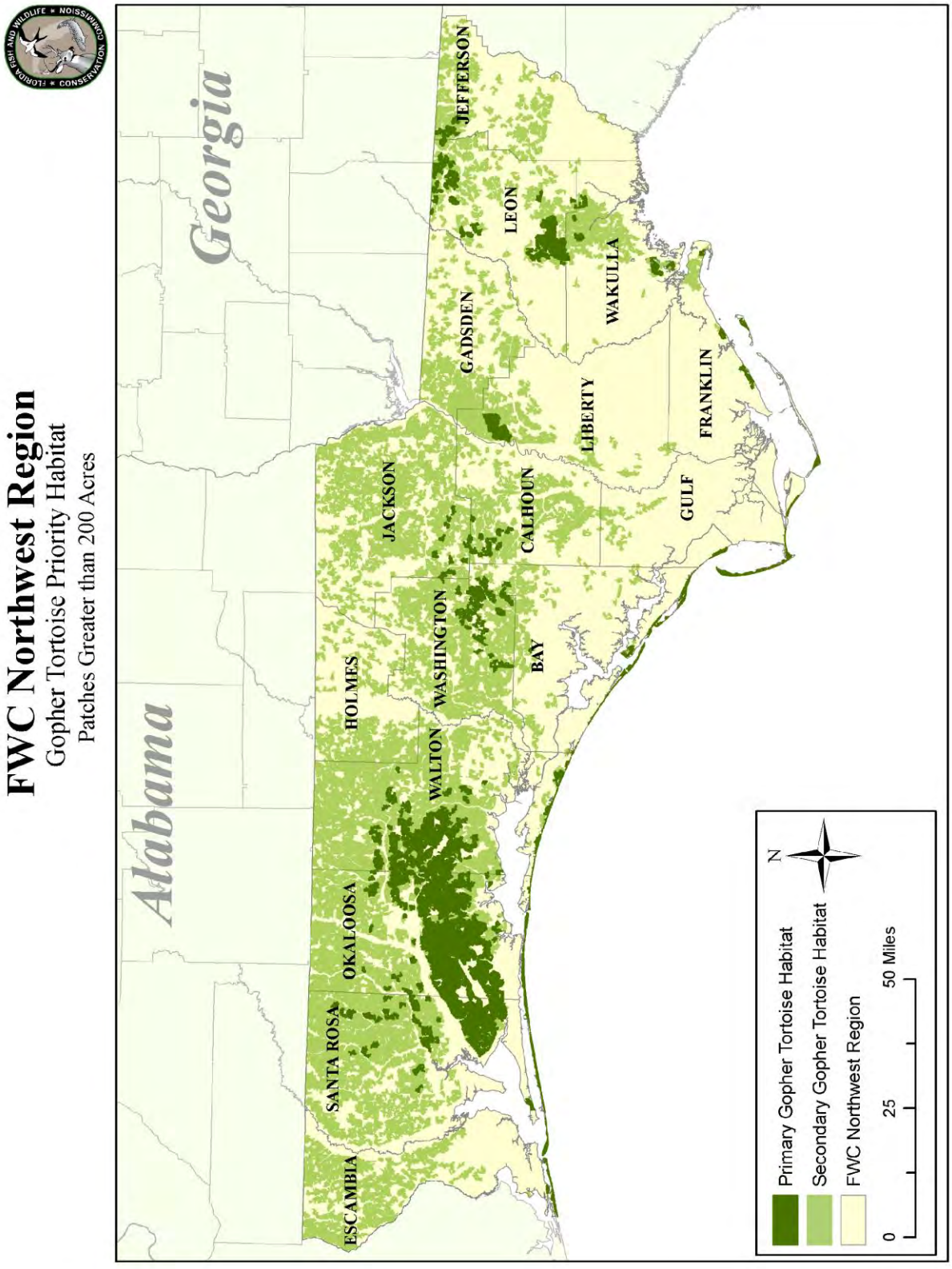
Secondary Gopher Tortoise Habitat
This spatial data contains the Modified Regional Gopher Tortoise Habitat, Group 1 = all habitat (1, 2, 3, 4, 5, 6, 7 classes) with patches greater than 200 acres.

- ***Secondary Habitat*** was defined as areas that contain appropriate habitat types that have canopy closure ≥ 65% and are located on non-hydric soils, are at least moderately well drained, flood occasionally or less, and have a water table depth greater than 6.5ft deep or have a water table depth between 1.5ft and 6.5ft.

FWC Regions
The shape file contains Florida Fish and Wildlife Conservation Commission regional boundaries.

Project data used

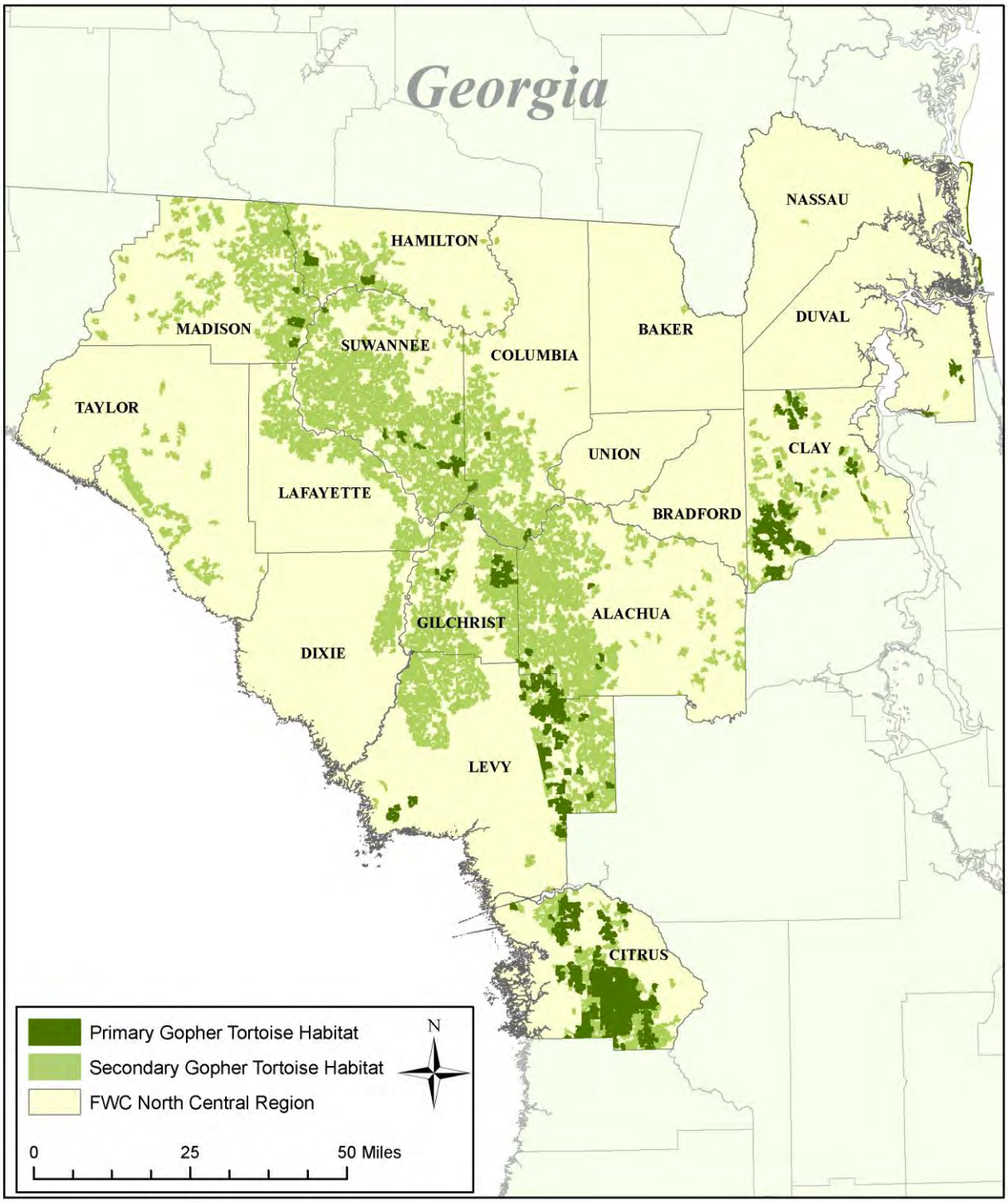
- SSURGO and STATSGO - soils data from USDA - NRCS
- National Wetlands Inventory dataset – used to eliminate all wetlands - USFWS
- National Land Cover Database - 2001 Tree Canopy data from USGS
- Southeastern Gap Analysis Program (SEGAP) land cover data (vegetation) - Biodiversity and Spatial Information Center, USGS North Carolina Cooperative Fish and Wildlife Research Unit, NC State University
- Florida Natural Areas Inventory habitat data (Florida sandhill, scrub, dry prairie)
- Parcel (2009, 2010) data used to locate Potential habitat on large landowners property


FWC Northwest Region
Gopher Tortoise Priority Habitat
Patches Greater than 200 Acres
Alabama
Georgia
ESCAMBIA
SANTA ROSA
OKALOOSA
WALTON
HOLMES
WASHINGTON
JACKSON
BAY
CALHOUN
GULF
LIBERTY
FRANKLIN
GADSDEN
LEON
WAKULLA
JEFFERSON
N
Primary Gopher Tortoise Habitat
Secondary Gopher Tortoise Habitat
FWC Northwest Region
0
25
50 Miles

FWC North Central Region

Gopher Tortoise Priority Habitat

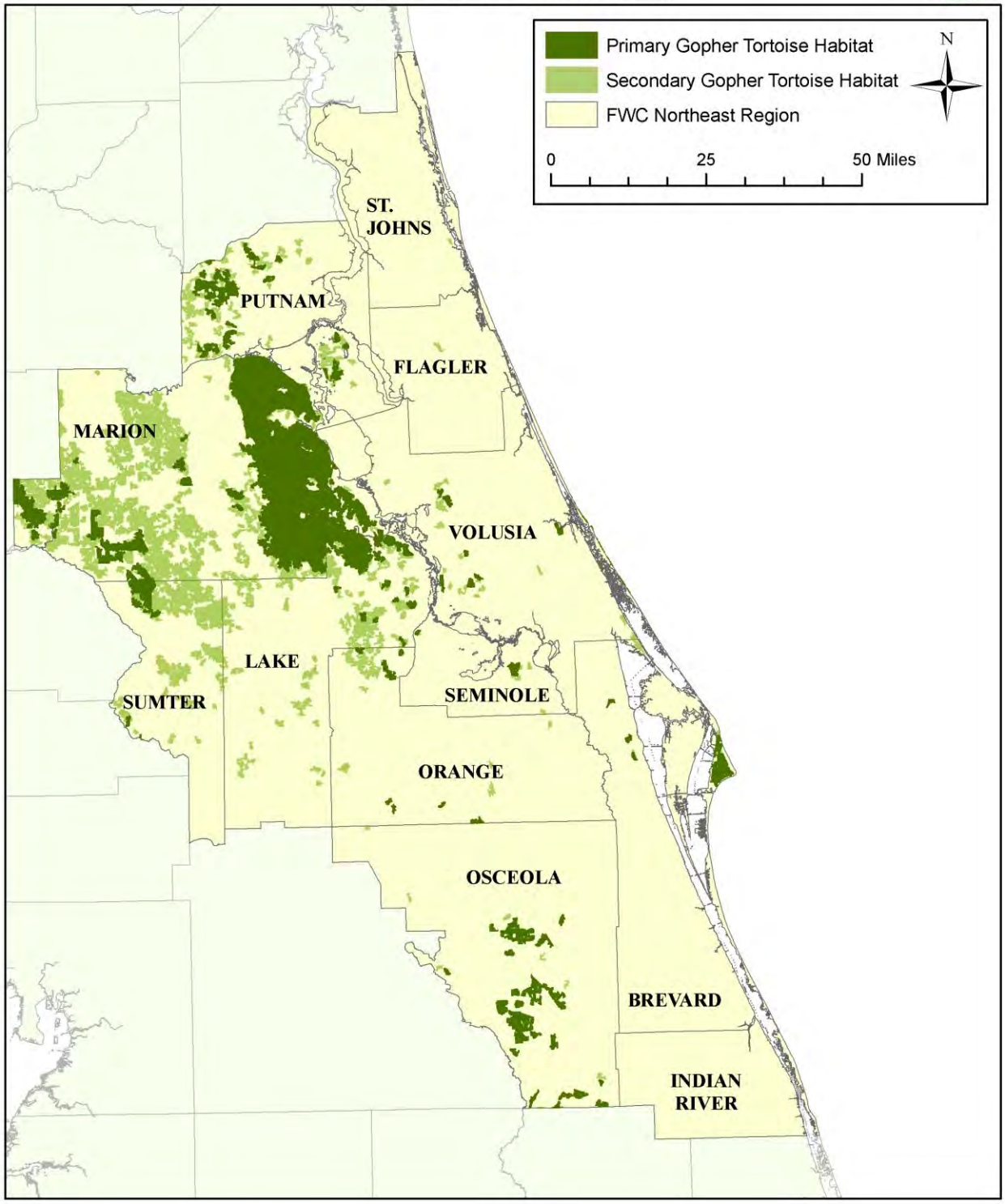
Patches Greater than 200 Acres



FWC Northeast Region

Gopher Tortoise Priority Habitat

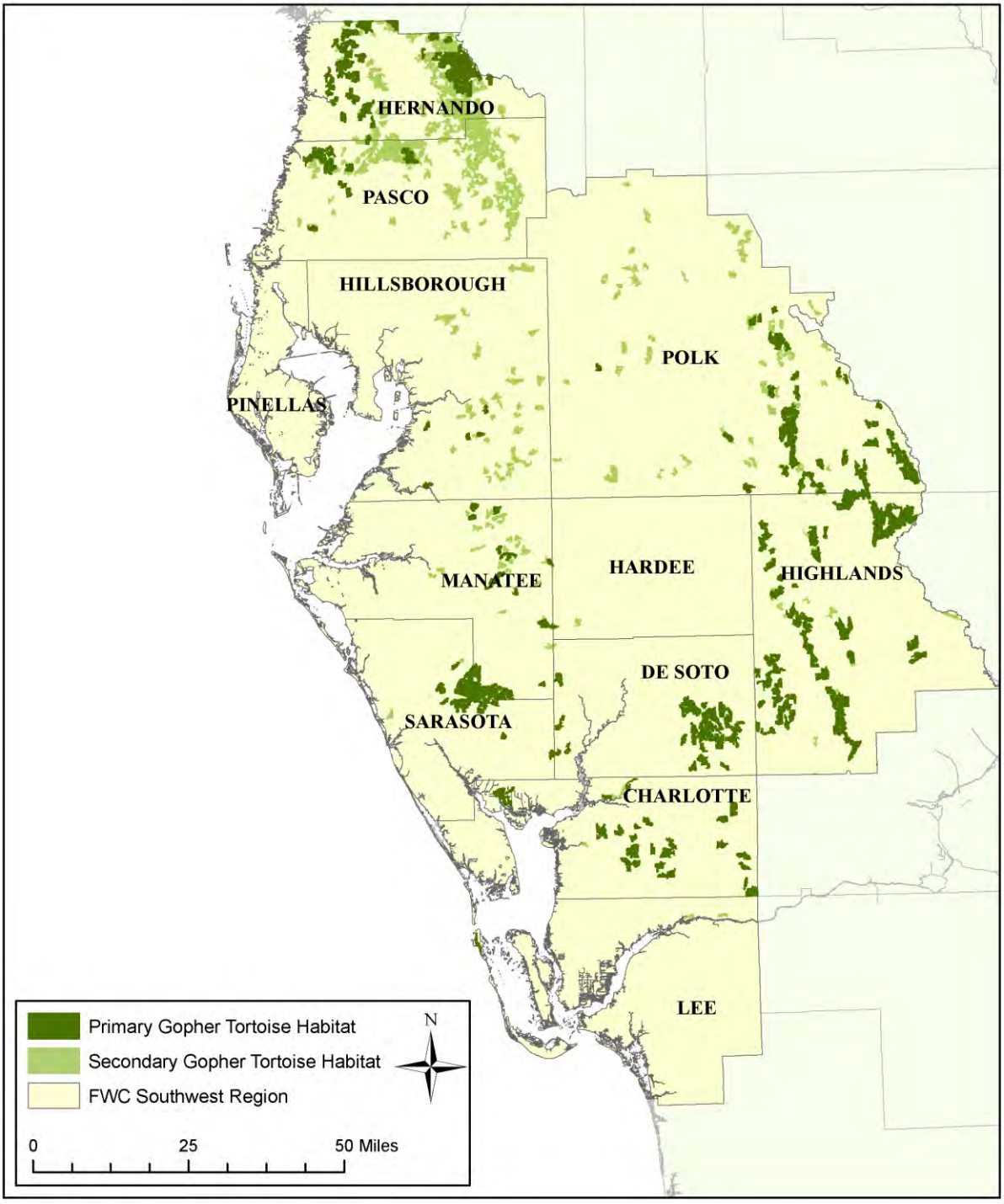
Patches Greater than 200 Acres



FWC Southwest Region

Gopher Tortoise Priority Habitat

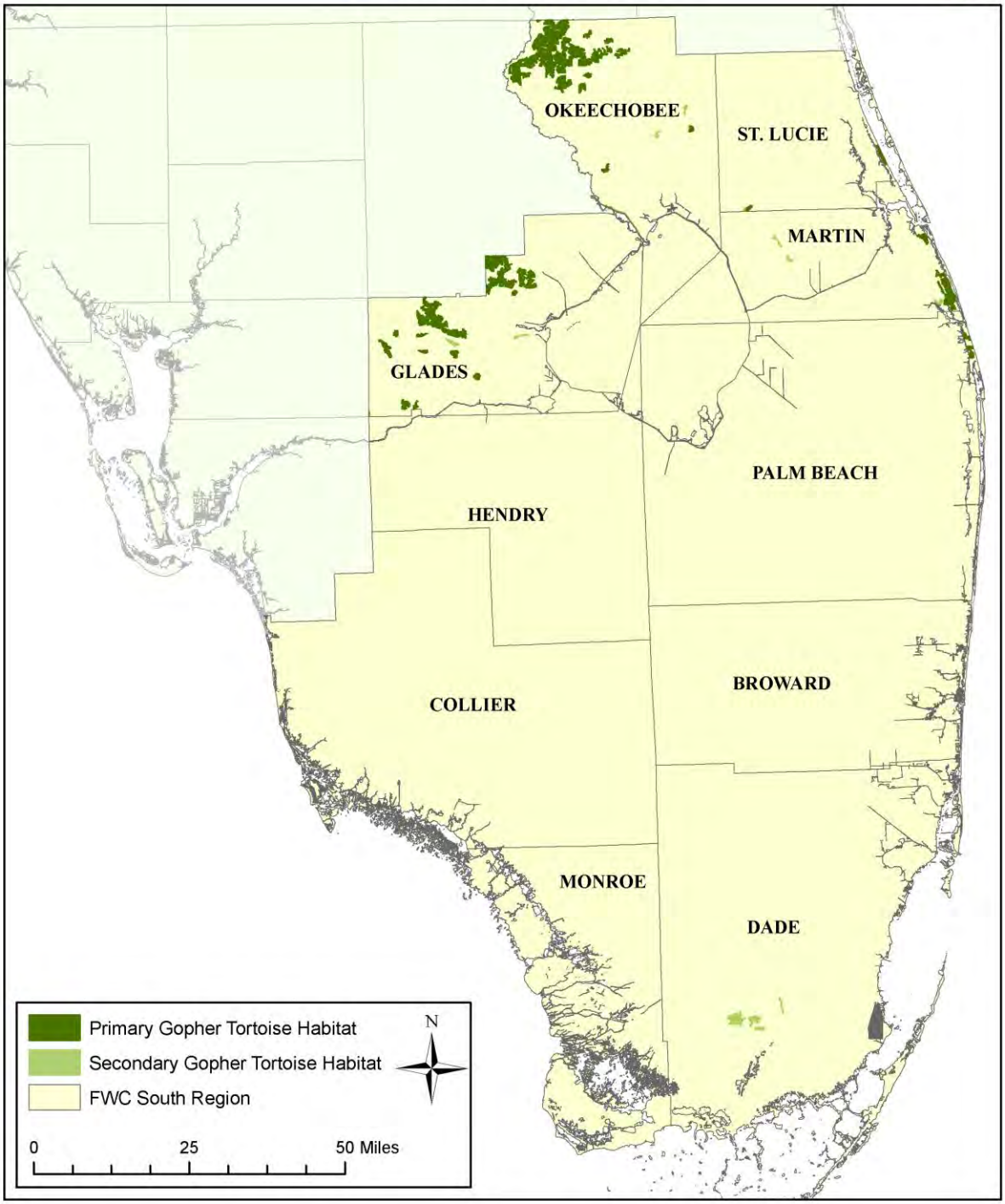
Patches Greater than 200 Acres



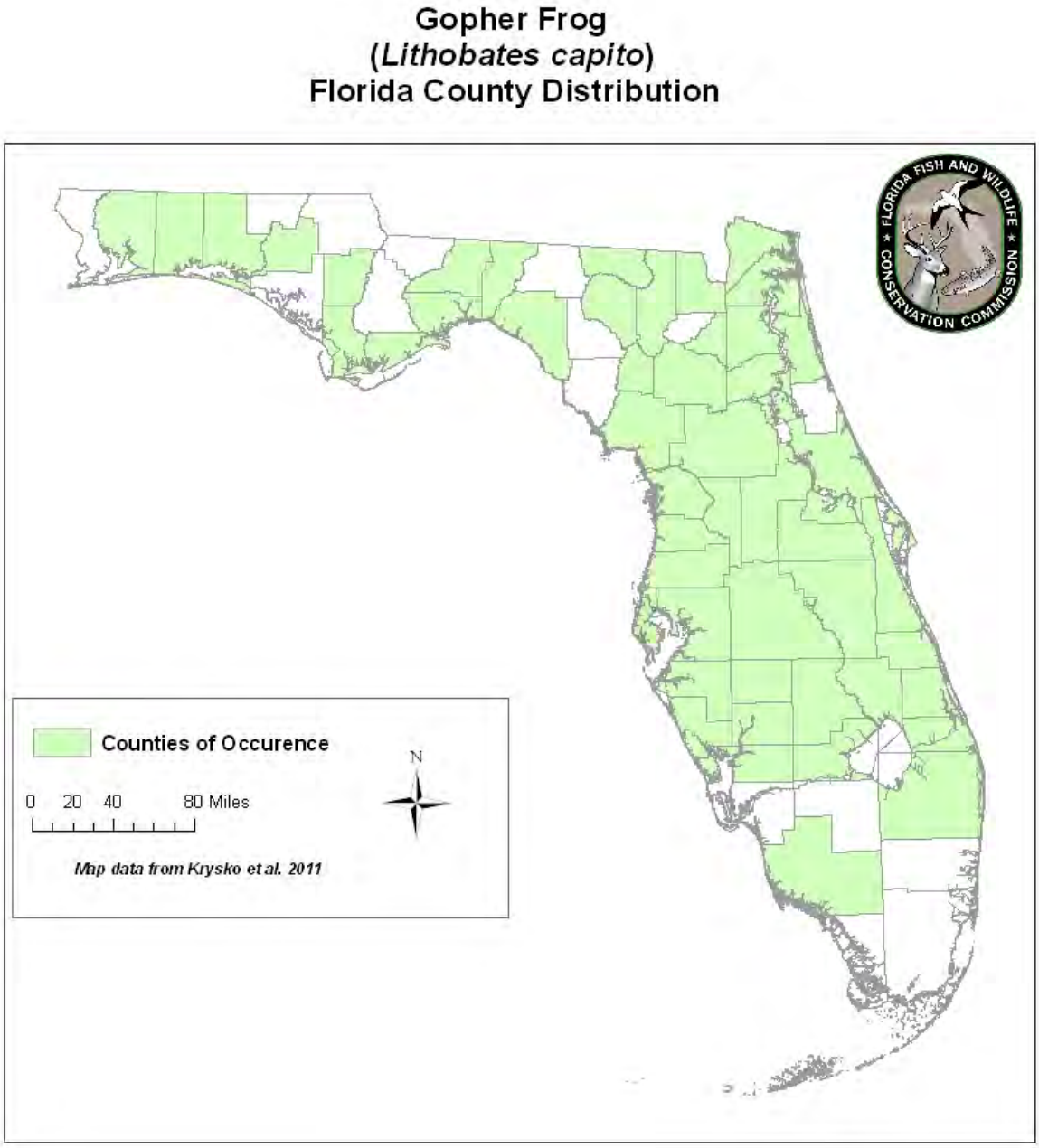
FWC South Region

Gopher Tortoise Priority Habitat

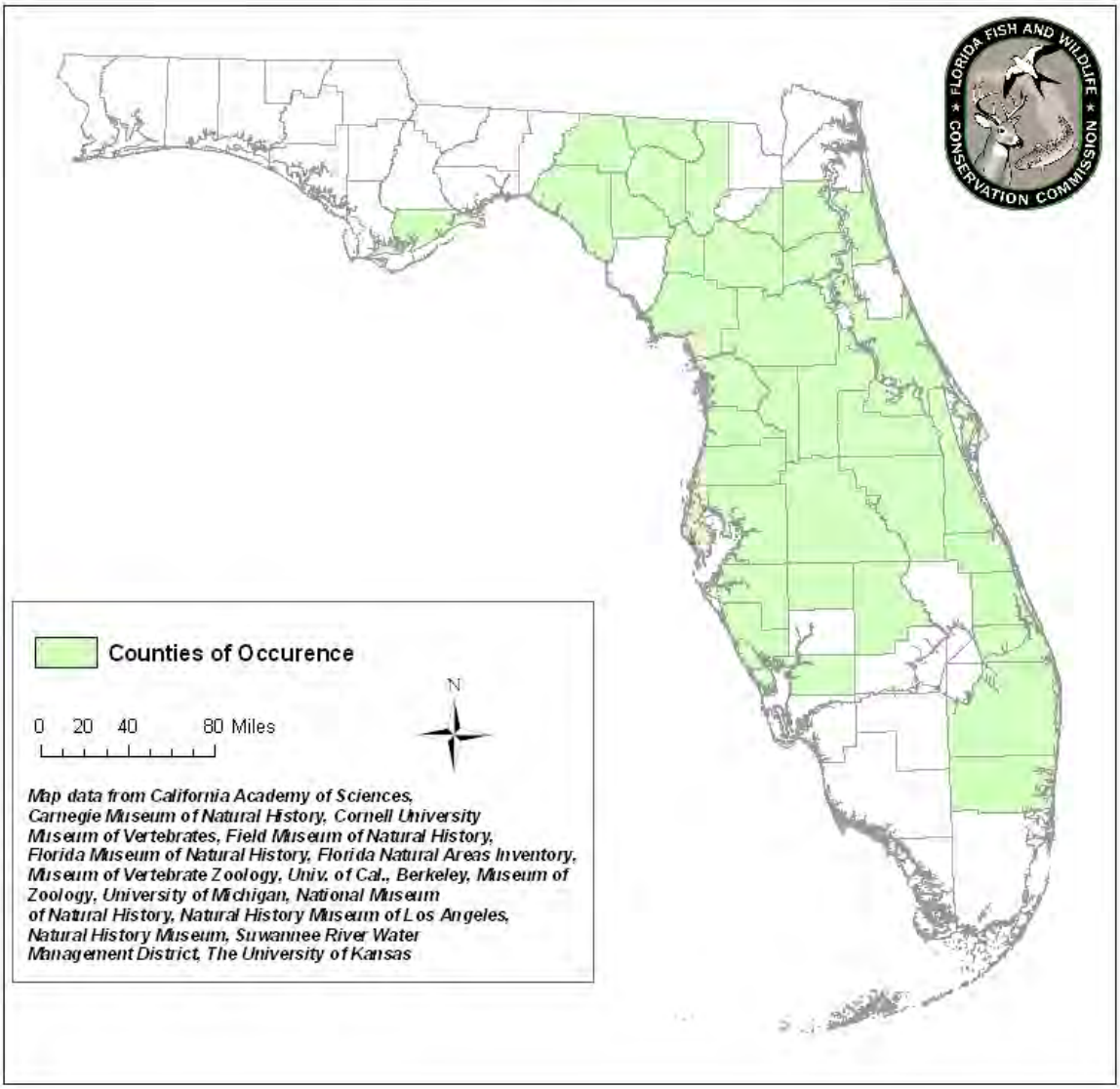
Patches Greater than 200 Acres



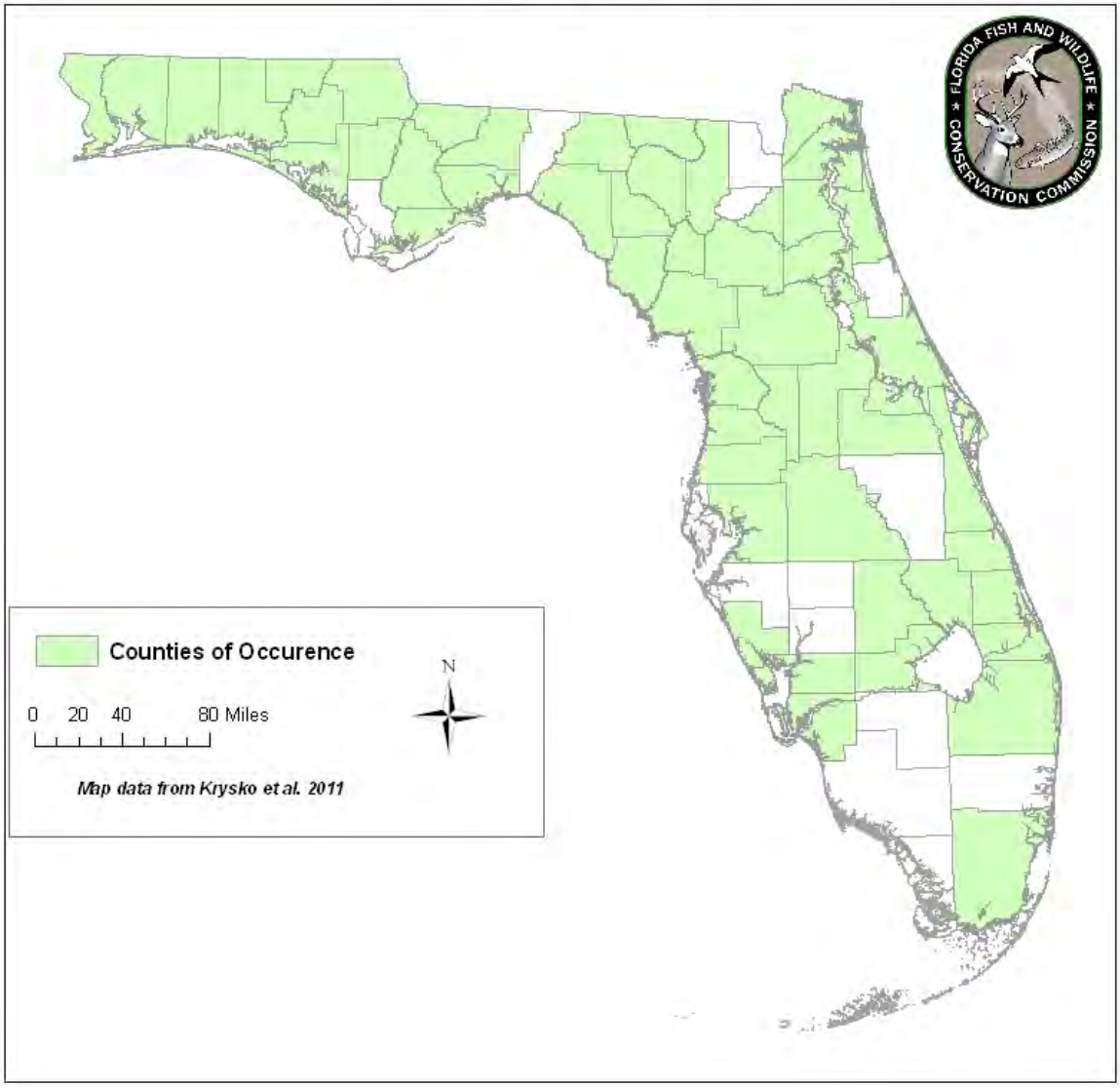
APPENDIX 5. Gopher Tortoise Priority Commensal Species County Distribution Maps



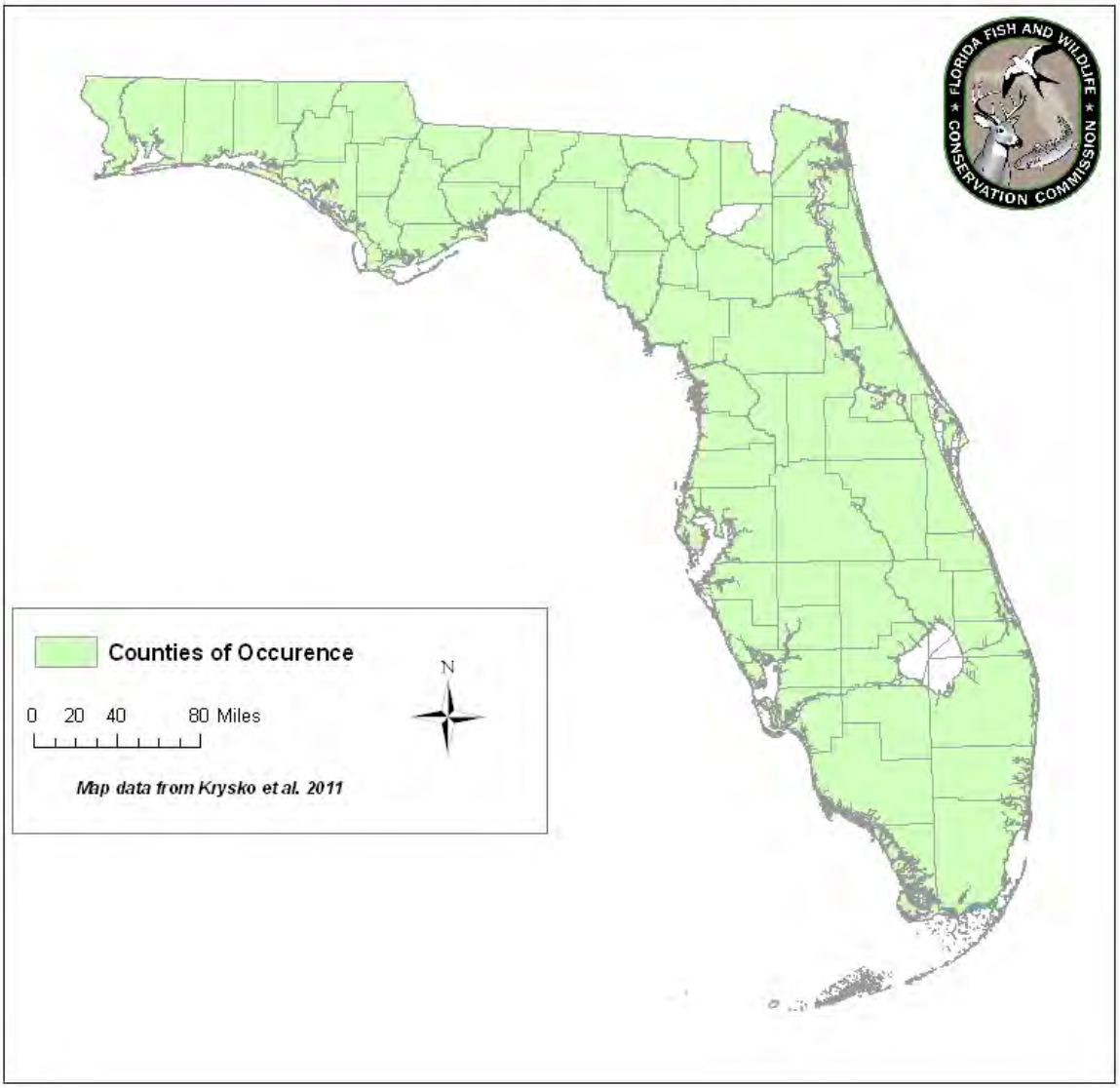
Florida Mouse
(*Podomys floridanus*)
Florida County Distribution



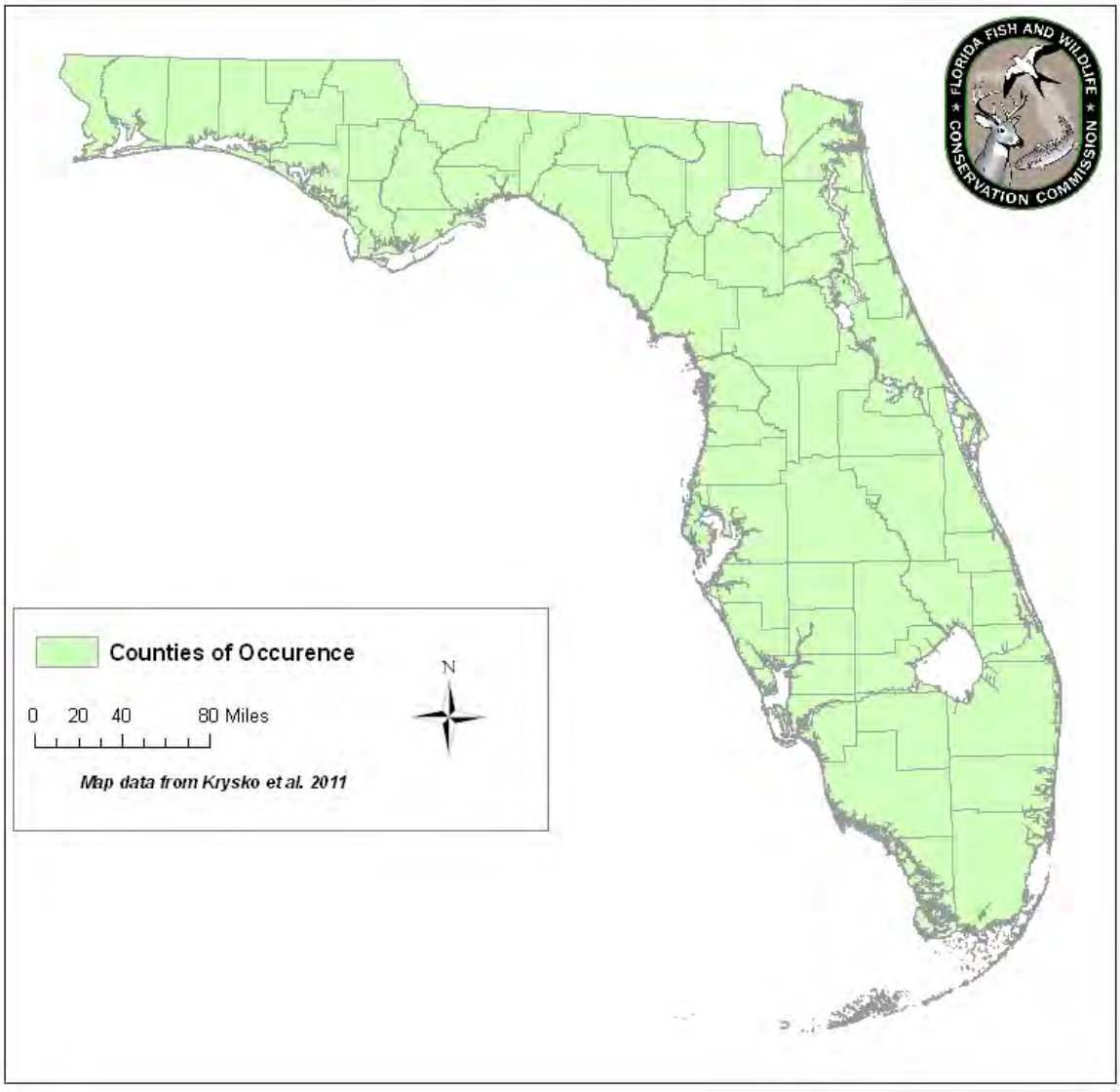
Florida Pine Snake
(*Pituophis melanoleucus*)
Florida County Distribution



Eastern Indigo Snake
(*Drymarchon couperi*)
Florida County Distribution



Eastern Diamondback Rattlesnake
(*Crotalus adamanteus*)
Florida County Distribution



APPENDIX 6. Invertebrates Associated with Gopher Tortoises

This list of invertebrates that have been recorded in association with gopher tortoises is primarily based upon the following references, although with supplementation from various other sources: Jackson and Milstrey 1989, Knizley 1997, and Lago 1991.Categories of the relationship to the tortoise are as follows: A=accidental or casual, C=facultative commensal, F=frequently associated, O=obligate commensal, P=parasitic on tortoises, S=obligate scavenger; not a burrow commensal.

Group	Taxon	Common Name	Category
Snails and Slugs--Gastropoda	*Glyphyalinia dalliana*	A Land Snail	A
Snails and Slugs--Gastropoda	*Glyphyalinia indentata*	A Land Snail	A
Snails and Slugs--Gastropoda	*Hawaiia minuscula*	A Land Snail	A
Snails and Slugs--Gastropoda	*Praticolella bakeri*	Ridge Scrubsnail	A
Snails and Slugs--Gastropoda	*Ventridens cerinoideus*	Wax Dome Snail	F
Snails and Slugs--Gastropoda	*Zonitoides arboreus*	A Land Snail	A
Isopods--Isopoda	*Armadillium vulgare*	A Pillbug	A
Isopods--Isopoda	*Porcellio virgatus*	A Woodlouse	A
Decapoda--Crayfish and Kin	*Procambarus* cf. *P. alleni*	A Crayfish	A
Snails and Slugs--Gastropoda	*Leidyula floridana*	Florida Leatherleaf Slug	A
Centipedes--Chilopoda	Lithobiomorpha sp.	A Stone Centipede	F
Centipedes--Chilopoda	Scolopendromorpha sp.	A Centipede	F
Millipedes--Diplopoda	*Abacion* sp.	A Millipede	F
Millipedes--Diplopoda	*Chicobolus spingerus*	Florida Ivory Millipede	F
Millipedes--Diplopoda	*Narceus* sp.	A Millipede	F
Spiders--Araneae	*Achaearenea porteri*	A Cobweb Weaver Spider	A
Spiders--Araneae	*Agelenopsis* sp.	A Grass Spider	A
Spiders--Araneae	*Anasaitis canosa*	A Jumping Spider	A
Spiders--Araneae	*Callilepis* sp.	A Gnaphosid Spider	A
Spiders--Araneae	*Castianeira gertschi*	Gertsch Ant Mimic Spider	A

Spiders--Araneae	*Castianeira trilineata*	An Ant Mimic Spider	A
Spiders--Araneae	*Ceratielus* cf. *C. paludigera*	A Sheetweb Spider	A
Spiders--Araneae	*Ceratinops crenata*	A Sheetweb Spider	A
Spiders--Araneae	*Corinna* sp.	A Spider	A
Spiders--Araneae	*Dictyna* sp.	A Dictynid Spider	A
Spiders--Araneae	*Eperingone* sp.	A Sheetweb Spider	A
Spiders--Araneae	*Florinda coccinea*	A Sheetweb Spider	A
Spiders--Araneae	*Gnaphosa sericata*	A Gnaphosid Spider	A
Spiders--Araneae	*Habronattus* n. sp.	A Jumping Spider	A
Spiders--Araneae	*Habronattus* sp.	A Jumping Spider	A
Spiders--Araneae	*Hibana* sp.	An Anyphaenid Spider	A
Spiders--Araneae	*Hogna carolinensis*	A Wolf Spider	F
Spiders--Araneae	*Hypsosinga rubens*	An Orb Weaver Spider	A
Spiders--Araneae	*Isohogna timuqua*	A Wolf Spider	F
Spiders--Araneae	*Latrodectus mactans*	Southern Black Widow	F
Spiders--Araneae	*Lepthyphantes* sp.	A Sheetweb Spider	A
Spiders--Araneae	*Lycosa* sp.	A Wolf Spider	A
Spiders--Araneae	*Metaltella simoni*	A Spider	A
Spiders--Araneae	*Naphrys bufoides*	A Jumping Spider	A
Spiders--Araneae	*Naphrys* sp.	A Jumping Spider	A
Spiders--Araneae	*Naphrys xerophilum*	A Jumping Spider	A
Spiders--Araneae	*Neoantistea alachua*	A Funnel Weaver Spider	A
Spiders--Araneae	*Neoantistea magna*	A Funnel Weaver Spider	A
Spiders--Araneae	*Neoantistea* sp.	A Funnel Weaver Spider	A
Spiders--Araneae	*Neospintharus* cf. *A. trigonum*?	A Dewdrop Spider	A
Spiders--Araneae	*Ozyptila* sp.	A Leaf Litter Crab Spider	A
Spiders--Araneae	*Parasteatoda tepidariorum*	Common House Spider	A

Spiders--Araneae	*Philodromus* sp.	A Crab Spider	A
Spiders--Araneae	*Phrurotimpus* sp.	A Sac Spider	A
Spiders--Araneae	*Pirata* sp.	A Pirate Wolf Spider	A
Spiders--Araneae	*Pirata spiniger*	A Pirate Wolf Spider	F
Spiders--Araneae	*Rabidosa rabida*	A Wolf Spider	A
Spiders--Araneae	*Scotinella* sp.	A Sac Spider	A
Spiders--Araneae	*Sosippus janus*	A Wolf Spider	F
Spiders--Araneae	*Sosippus* sp.	A Wolf Spider	A
Spiders--Araneae	*Steatoda* sp.	A Cobweb Weaver Spider	A
Spiders--Araneae	*Thioclina* sp.	A Jumping Spider	A
Spiders--Araneae	*Trachelas* sp.	A Sac Spider	A
Spiders--Araneae	*Uloborus* sp.	A Cribellate Orb Weaver Spider	A
Spiders--Araneae	*Ummidia* sp.	A Trapdoor Spider	A
Spiders--Araneae	*Xysticus* sp.	A Ground Crab Spider	A
Spiders--Araneae	*Zelotes limnophilus*	A Gnaphosid Spider	A
Harvestmen--Opiliones	*Crosbyella* sp.	A Harvestman	C/F
Harvestmen--Opiliones	*Leiobunum bimaculatum*	A Harvestman	A
Harvestmen--Opiliones	*Vonones ornata*	A Harvestman	A
Pseudoscorpions--Pseudoscorpionida	*Chelanops afinis*	A Pseudoscorpion	C
Whip Scorpions and Kin--Thelyphonida	*Mastigoproctus giganteus*	A Giant Whip Scorpion	A
Mites and Ticks--Acari	*Aeroppia floridana*	A Soil Mite	A
Mites and Ticks--Acari	*Alliphis* sp.	A Predaceous Mite	C?
Mites and Ticks--Acari	*Allodamaeus* sp.	A Soil Mite	A
Mites and Ticks--Acari	*Amblyomma maculatum*	Gulf Coast Tick	A
Mites and Ticks--Acari	*Amblyomma tuberculatum*	Gopher Tortoise Tick	P
Mites and Ticks--Acari	*Androlaelaps fahrenholzi*	A Parasitic Mite	C

Mites and Ticks--Acari	*Brachysternurn* sp.	A Phoretic Mite	C
Mites and Ticks--Acari	*Eremgeozetes* sp.	A Soil Mite	A
Mites and Ticks--Acari	*Eucheyletia bishoppi Baker*	A Predaceous Mite	C
Mites and Ticks--Acari	*Eutrombicula cinnabaris*	A Chigger Mite	A
Mites and Ticks--Acari	*Haemolaelaps glascowi*	A Parasitic Mite	C
Mites and Ticks--Acari	*Hypoaspis (Gaeolaelaps)* sp.	A Parasitic Mite	C
Mites and Ticks--Acari	*Ixodes scapularis*	Black-legged Tick	A
Mites and Ticks--Acari	*Lanibelba pini*	A Soil Mite	A
Mites and Ticks--Acari	*Liodes floridensis*	A Soil Mite	A
Mites and Ticks--Acari	*Macrocheles dimidiatus* s. lat.	A Predaceous Mite	C
Mites and Ticks--Acari	*Macrocheles* sp. 1	A Predaceous Mite	C
Mites and Ticks--Acari	*Macrocheles* sp. 2	A Predaceous Mite	C
Mites and Ticks--Acari	*Macrocheles* sp. 3	A Predaceous Mite	C
Mites and Ticks--Acari	*Microcaeculus* n. sp.	A Rake-legged Mite	F
Mites and Ticks--Acari	*Nothrus carolinae*	A Soil Mite	A
Mites and Ticks--Acari	*Ornithodoros turicata americanus*	Relapsing Fever Tick	P
Mites and Ticks--Acari	*Ornithonyssus bacoti*	Tropical Rat Mite	C
Mites and Ticks--Acari	*Parasecia gurneyi*	A Chigger Mite	A
Mites and Ticks--Acari	*Pilogalumna* aff. *P. tenuiclava*	A Soil Mite	A
Mites and Ticks--Acari	*Prolistophorus sparsilineatus*	A Fur Mite	C
Mites and Ticks--Acari	*Rhysotrita ardua*	A Soil Mite	A
Mites and Ticks--Acari	*Scheloribates* sp.	A Soil Mite	A
Mites and Ticks--Acari	*Tectocepheus* sp.	A Soil Mite	A
Mites and Ticks--Acari	trombidid sp. 1	A Parasitic Insect Mite	A
Mites and Ticks--Acari	trombidid sp. 2	A Parasitic Insect Mite	A
Mites and Ticks--Acari	*Walchia americana*	A Chigger Mite	A
Mites and Ticks--Acari	*Xylobates* sp.	A Soil Mite	A

Grasshoppers, Crickets, and Kin--Orthoptera	*Ceuthophilus divergens*	A Camel Cricket	F
Grasshoppers, Crickets, and Kin--Orthoptera	*Ceuthophilus latibuli*	A Camel Cricket	F
Grasshoppers, Crickets, and Kin--Orthoptera	*Ceuthophilus walkeri*	A Camel Cricket	C/F
Grasshoppers, Crickets, and Kin--Orthoptera	tetrigid sp.	A Pygmy Grasshopper	A
Walking Sticks--Phasmatodea	*Anisomorpha buprestoides*	Southern Two-Striped Walkingstick	A
Cockroaches--Blattodea	*Parcoblatta* sp.	A Wood Cockroach	F
True Bugs--Heteroptera	*Cydnoides* sp.	An Ebony Bug	A
True Bugs--Heteroptera	*Phytocoris* sp.	A Plant Bug	A
True Bugs--Heteroptera	*Ploiaria carolina*	A Thread-legged Bug	A
True Bugs--Heteroptera	*Tominotus communis*	A Burrowing Bug	F
Ant Lions, Lacewings and Kin--Neuroptera	*Glenurus gratis*	An Antlion	C/F
Ant Lions, Lacewings and Kin--Neuroptera	*Myrmeleon carolinus*	An Antlion	A
Ant Lions, Lacewings and Kin--Neuroptera	*Myrmeleon mobilus*	An Antlion	A
Beetles--Coleoptera	*Acrorona* sp.	A Rove Beetle	A
Beetles--Coleoptera	*Acrostilicus hospes*	A Rove Beetle	C
Beetles--Coleoptera	*Acrotona picescens*	A Rove Beetle	A
Beetles--Coleoptera	*Acrotrichis*sp.	A Feather-winged Beetle	C?
Beetles--Coleoptera	***Alloblackburneus troglodytes***	**Little Gopher Tortoise Scarab Beetle**	**O**
Beetles--Coleoptera	alticine sp.	A Flea Beetle	A
Beetles--Coleoptera	*Anthicus ictericus*	An Antlike Flower Beetle	A
Beetles--Coleoptera	*Astenus linearis*	A Rove Beetle	A

Beetles--Coleoptera	*Ataenius cylindrus*	A Scarab Beetle	F
Beetles--Coleoptera	*Ataenius exiguus*	A Scarab Beetle	A
Beetles--Coleoptera	*Ataenius miamii*	A Scarab Beetle	F
Beetles--Coleoptera	*Ataenius ovatulus*	A Scarab Beetle	F
Beetles--Coleoptera	*Ataenius platensis*	A Scarab Beetle	A
Beetles--Coleoptera	*Ateuchus lecontei*	A Scarab Beetle	A
Beetles--Coleoptera	*Atheta macrops*	A Rove Beetle	A
Beetles--Coleoptera	*Atheta* sp.	A Rove Beetle	A
Beetles--Coleoptera	Blaptini sp.	A Darkling Beetle	A
Beetles--Coleoptera	*Bledius wudus*	A Rove Beetle	F
Beetles--Coleoptera	carabid sp. 1	A Ground Beetle	A
Beetles--Coleoptera	carabid sp. 2	A Ground Beetle	A
Beetles--Coleoptera	cardiophorine sp.	A Click Beetle	A
Beetles--Coleoptera	cf. *Mycetochara* sp.	A Comb-clawed Beetle	F
Beetles--Coleoptera	***Chelyoxenus xerobatis***	**Gopher Tortoise Hister Beetle**	**O**
Beetles--Coleoptera	ciid sp.	A Minute Tree Fungus Beetle	A
Beetles--Coleoptera	*Conoderus* sp.	A Click Beetle	A
Beetles--Coleoptera	***Copris gopheri***	**Gopher Tortoise Copris Beetle**	**O**
Beetles--Coleoptera	*Cryptocephalus* sp. 1	A Case-bearing Leaf Beetle	F
Beetles--Coleoptera	*Cryptocephalus* sp. 2	A Case-bearing Leaf Beetle	F
Beetles--Coleoptera	cucujid sp. 1	A Flat Bark Beetle	A
Beetles--Coleoptera	cucujid sp. 2	A Flat Bark Beetle	A
Beetles--Coleoptera	curculionid sp. 1	A Weevil	A
Beetles--Coleoptera	curculionid sp. 2	A Weevil	A
Beetles--Coleoptera	*Diplotaxis bidentata*	A Scarab Beetle	A
Beetles--Coleoptera	Elaterini sp.	A Click Beetle	A
Beetles--Coleoptera	*Gabronthus mgogoricus*	A Rove Beetle	A

Beetles--Coleoptera	***Geomysaprinus floridae***	**Equal-clawed Gopher Tortoise Hister Beetle**	**O**
Beetles--Coleoptera	*Haroldiataenius saramari*	A Scarab Beetle	F
Beetles--Coleoptera	histerid sp. 1	A Clown Beetle	F
Beetles--Coleoptera	histerid sp. 2	A Clown Beetle	F
Beetles--Coleoptera	histerid sp. 3	A Clown Beetle	F
Beetles--Coleoptera	histerid sp. 4	A Clown Beetle	F
Beetles--Coleoptera	*Hypocaccus ferrugineus*	A Clown Beetle	C/F
Beetles--Coleoptera	*Ips avulsus*	Small Southern Pine Engraver	A
Beetles--Coleoptera	lathridiid sp.	A Minute Brown Scavenger Beetle	A
Beetles--Coleoptera	*Lathrobium dimidiata*	A Rove Beetle	A
Beetles--Coleoptera	*Megalopinus rufipes*	A Rove Beetle	A
Beetles--Coleoptera	*Neohypnus melanops*	A Rove Beetle	A
Beetles--Coleoptera	*Nossidium* sp.	A Feather-winged Beetle	A
Beetles--Coleoptera	***Onthophagus polyphemi polyphemi***	**Punctate Gopher Tortoise Onthophagus Beetle**	**O**
Beetles--Coleoptera	***Onthophagus polyphemi sparsisetosus***	**Smooth Gopher Tortoise Onthophagus Beetle**	**O**
Beetles--Coleoptera	*Onthophagus tuberculifrons*	A Scarab Beetle	A
Beetles--Coleoptera	*Paederus littoreus*	A Rove Beetle	A
Beetles--Coleoptera	*Parataenius simulator*	A Scarab Beetle	F
Beetles--Coleoptera	*Pasimachus subsulcatus*	A Ground Beetle	A
Beetles--Coleoptera	phalacrid sp.	A Shining Flower Beetle	A
Beetles--Coleoptera	*Phanaeus igneus*	A Rainbow Scarab Beetle	A
Beetles--Coleoptera	*Phanerota carinata or P. fasciata*	A Rove Beetle	A
Beetles--Coleoptera	*Phelister rouzeti*	A Clown Beetle	A
Beetles--Coleoptera	*Philonthus cautus*	A Rove Beetle	A
Beetles--Coleoptera	***Philonthus gopheri***	**Gopher Tortoise Rove Beetle**	**O**

Beetles--Coleoptera	***Philonthus testudo***	**Western Gopher Tortoise Rove Beetle**	**O**
Beetles--Coleoptera	*Pinophilus confusus*	A Rove Beetle	A
Beetles--Coleoptera	pselaphine sp.	An Ant-loving Rove Beetle	F
Beetles--Coleoptera	ptiliid sp.	A Feather-winged Beetle	A
Beetles--Coleoptera	*Ptomaphagus consobrinus*	A Small Carrion Beetle	A
Beetles--Coleoptera	*Ptomaphagus texana*	A Small Carrion Beetle	C
Beetles--Coleoptera	*Ptomaphagus ulkei*?	A Small Carrion Beetle	A
Beetles--Coleoptera	rhyzophagid sp.	A Root-eating Beetle	A
Beetles--Coleoptera	*Sepedophilus basalis*	A Rove Beetle	F
Beetles--Coleoptera	*Sepedophilus kiteleyi*	A Rove Beetle	F
Beetles--Coleoptera	tenebrionid sp. 1	A Darkling Beetle	A
Beetles--Coleoptera	tenebrionid sp. 2	A Darkling Beetle	A
Beetles--Coleoptera	tenebrionid sp. 3	A Darkling Beetle	A
Beetles--Coleoptera	tenebrionid sp. 4	A Darkling Beetle	A
Beetles--Coleoptera	Thinobius sp.	A Rove Beetle	A
Beetles--Coleoptera	throscid sp. 1	A False Metallic Wood-boring Beetle	A
Beetles--Coleoptera	throscid sp. 2	A False Metallic Wood-boring Beetle	A
Beetles--Coleoptera	*Cercyon pygameus*	A Water Scavenger Beetle	A
Beetles--Coleoptera	*Aphodius rubeolus*	A Scarab Beetle	A
Beetles--Coleoptera	*Aphodius stercorosus*	A Scarab Beetle	A
Beetles--Coleoptera	*Ataenius fattigi*	A Scarab Beetle	A
Beetles--Coleoptera	*Alenochora notula*	A Rove Beetle	A
Beetles--Coleoptera	*Anotylus* sp.	A Spiny-legged Rove Beetle	A
Beetles--Coleoptera	Falgaria dissecta	A Rove Beetle	A
Beetles--Coleoptera	*Lithocaris* sp.	A Rove Beetle	A
Beetles--Coleoptera	*Mycetoporus* sp.	A Rove Beetle	A

Moths and Butterflies--Lepidoptera	***Acrolophus pholeter***	**Gopher Tortoise Acrolophus Moth**	**O**
Moths and Butterflies--Lepidoptera	*Acrolophus* sp.	A Tubeworm Moth	F
Moths and Butterflies--Lepidoptera	***Ceratophaga vicinella***	**Gopher Tortoise Shell Moth**	**S**
Moths and Butterflies--Lepidoptera	*Euclea delphinii (pupa)*	Spiny Oak-slug Moth	A
Moths and Butterflies--Lepidoptera	***Idia gopheri***	**Gopher Tortoise Noctuid Moth**	**O**
Flies--Diptera	*Apocephalus* n. sp.	An Ant-decapitating Fly	A
Flies--Diptera	*Apocephalus tenuipes*	An Ant-decapitating Fly	A
Flies--Diptera	*Arareta* sp.	A Gall Gnat	A
Flies--Diptera	*Arenagena* n. sp.	A Stilleto Fly	C
Flies--Diptera	*Asilus* n. sp.	A Robber Fly	C
Flies--Diptera	*Bitheca agarica*	A Lesser Dung Fly	A
Flies--Diptera	*Brachyneura* sp.	A Dark-winged Fungus Gnat	A
Flies--Diptera	*Bradysia* sp.	A Dark-winged Fungus Gnat	A
Flies--Diptera	*Bradysia* sp. aff. *B. coprophila*	A Dark-winged Fungus Gnat	A
Flies--Diptera	*Bromeloecia winnemardi*	A Lesser Dung Fly	A
Flies--Diptera	*Cecidomyia* sp.	A Gall Gnat	A
Flies--Diptera	cecidomyiid new genus n. sp.	A Gall Gnat	A
Flies--Diptera	Cecidomyiidi sp. 1	A Gall Gnat	A
Flies--Diptera	Cecidomyiidi sp. 2	A Gall Gnat	A
Flies--Diptera	Cecidomyiidi sp. 3	A Gall Gnat	A
Flies--Diptera	Cecidomyiidi sp. 4	A Gall Gnat	A
Flies--Diptera	Cecidomyiidi sp. 5	A Gall Gnat	A
Flies--Diptera	Cecidomyiidi sp. 6	A Gall Gnat	A
Flies--Diptera	Cecidomyiidi sp. 7	A Gall Gnat	A
Flies--Diptera	Cecidomyiidi sp. 8	A Gall Gnat	A
Flies--Diptera	Cecidomyiine sp.	A Gall Gnat	A
Flies--Diptera	*Chrysorus* sp.	A Long-legged Fly	A

Flies--Diptera	*Claspettomyia* sp.	A Gall Gnat	A
Flies--Diptera	*Clinodiplosis* sp. 1	A Gall Gnat	A
Flies--Diptera	*Clinodiplosis* sp. 2	A Gall Gnat	A
Flies--Diptera	*Condylostylus* sp.	A Long-legged Fly	A
Flies--Diptera	*Conioscinella triorbiculata*	A Frit Fly	A
Flies--Diptera	*Contarinia* sp.	A Gall Gnat	A
Flies--Diptera	*Coproica* n. sp. aff. *C. ferruginata*	A Lesser Dung Fly	C
Flies--Diptera	*Corynoptera* sp.	A Dark-winged Fungus Gnat	A
Flies--Diptera	*Cycloptelus pictipennis*	A Stilleto Fly	A
Flies--Diptera	*Dilophus sayi*	A March Fly	A
Flies--Diptera	*Dohrniphora* aff. *D. perplexa*	A Hump-backed or Scuttle Fly	A
Flies--Diptera	*Dohrniphora perplexa*	A Hump-backed or Scuttle Fly	A
Flies--Diptera	***Drapetis* sp. 1**	**Tortoise Burrow Dance Fly**	**O**
Flies--Diptera	*Drapetis* sp. 2	A Dance Fly	C
Flies--Diptera	*Drosophilia guttifera*	A Vinegar Fly	A
Flies--Diptera	*Epidapus* sp.	A Dark-winged Fungus Gnat	A
Flies--Diptera	***Eutrichota gopheri***	**Gopher Tortoise Burrow Fly**	**O**
Flies--Diptera	Gymnopternus sp.	A Long-legged Fly	A
Flies--Diptera	*Liohippelates pusio*	A Frit Fly	A
Flies--Diptera	*Ledomyia* sp.	A Gall Gnat	A
Flies--Diptera	*Lesterminae*	A Gall Gnat	A
Flies--Diptera	*Litolinga tergisa*	A Stilleto Fly	A
Flies--Diptera	*Lobodiplosis* sp.	A Gall Gnat	A
Flies--Diptera	***Machimus polyphemi***	**Gopher Tortoise Robber Fly**	**O**
Flies--Diptera	*Megaselia miniara*	A Hump-backed or Scuttle Fly	A
Flies--Diptera	*Megaselia* sp. 1	A Hump-backed or Scuttle Fly	F
Flies--Diptera	*Megaselia* sp. 2	A Hump-backed or Scuttle Fly	F

Flies--Diptera	*Megaselia* sp. 3	A Hump-backed or Scuttle Fly	F
Flies--Diptera	*Millichiella* n. sp. aff. *M. arcuata*	A Freeloader Fly	C
Flies--Diptera	*Muscidae unident.* sp. 1	A Fly	F?
Flies--Diptera	*Nephrotoma* sp. *(larvae)*	A Tiger Crane Fly	F
Flies--Diptera	*Ozodiceromyia notata*	A Stilleto Fly	F
Flies--Diptera	*Ozodiceromyia* sp.	A Stilleto Fly	A
Flies--Diptera	*Phronia* sp.	A Fungus Gnat	A
Flies--Diptera	*Porricondyla* sp.	A Gall Gnat	A
Flies--Diptera	porricondyline new genus n. sp.	A Gall Gnat	A
Flies--Diptera	porricondyline sp.	A Gall Gnat	A
Flies--Diptera	*Pterogramma* sp. 1	A Lesser Dung Fly	A
Flies--Diptera	*Pterogramma* sp. 2	A Lesser Dung Fly	A
Flies--Diptera	*Resseliella* sp. 1	A Gall Gnat	A
Flies--Diptera	*Resseliella* sp. 2	A Gall Gnat	A
Flies--Diptera	*Rhegmoclemia (Neorhegmoclemina) bisaccatum*	A Minute Black Scavenger Fly	C
Flies--Diptera	*Rymosia* sp.	A Fungus Gnat	A
Flies--Diptera	*Sarcophaga cistudinis*	A Flesh Fly	A
Flies--Diptera	*Schizomyia* sp.	A Gall Gnat	A
Flies--Diptera	*Spelobia* sp.	A Lesser Dung Fly	C
Flies--Diptera	*Tricimba melanchiolica*	A Frit Fly	A
Flies--Diptera	Rachispoda sp.	A Lesser Dung Fly	A
Fleas--Siphonoptera	*Polygenus floridanus*	A Flea	C
Ants, Wasps, and Kin--Hymenoptera	alysiine sp. 1	A Parasitic Wasp	C
Ants, Wasps, and Kin--Hymenoptera	alysiine sp. 2	A Parasitic Wasp	C
Ants, Wasps, and Kin--Hymenoptera	Anoplius atrox	A Spider Wasp	F?
Ants, Wasps, and Kin--Hymenoptera	*Aphaenogaster ashmeadi*	Ashmead's Long-legged Ant	A

Ants, Wasps, and Kin--Hymenoptera	*Aphaenogaster carolinensis*	Carolina Long-legged Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Aphaenogaster fulva*	Ridge-backed Long-legged Ant	F
Ants, Wasps, and Kin--Hymenoptera	*Aphaenogaster rudis*	A Long-legged Ant	A
Ants, Wasps, and Kin--Hymenoptera	bethylid sp.	A Parasitic Wasp	C
Ants, Wasps, and Kin--Hymenoptera	braconine sp. 1	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	braconine sp. 2	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	*Calopompilus* sp.	A Spider Wasp	A
Ants, Wasps, and Kin--Hymenoptera	*Camponotus castaneus*	Chesnut Colored Carpenter Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Crematogaster ashmeadi*	An Acrobat Ant	F
Ants, Wasps, and Kin--Hymenoptera	*Cyphomyrmex rimosus*	Larger Little Fungus Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Dasymutilla* sp.	A Velvet Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Dialictus* sp.	A Sweat Bee	A
Ants, Wasps, and Kin--Hymenoptera	diapriid sp.	A Parasitic Wasp	C?
Ants, Wasps, and Kin--Hymenoptera	*Dorymyrmex* sp.	A Pyramid Ant	F
Ants, Wasps, and Kin--Hymenoptera	dryinid sp.	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	encyrtid sp. 1	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	encyrtid sp. 2	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	encyrtid sp. 3	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	encyrtid sp. 4	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	eucoilid sp. 1	A Parasitic Wasp	C?
Ants, Wasps, and Kin--Hymenoptera	eucoilid sp. 2	A Parasitic Wasp	C?
Ants, Wasps, and Kin--Hymenoptera	eulophid sp. 1	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	eulophid sp. 2	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	eulophid sp. 3	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	eulophid sp. 4	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	eulophid sp. 5	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	eupelmid sp. 1	A Parasitic Wasp	A

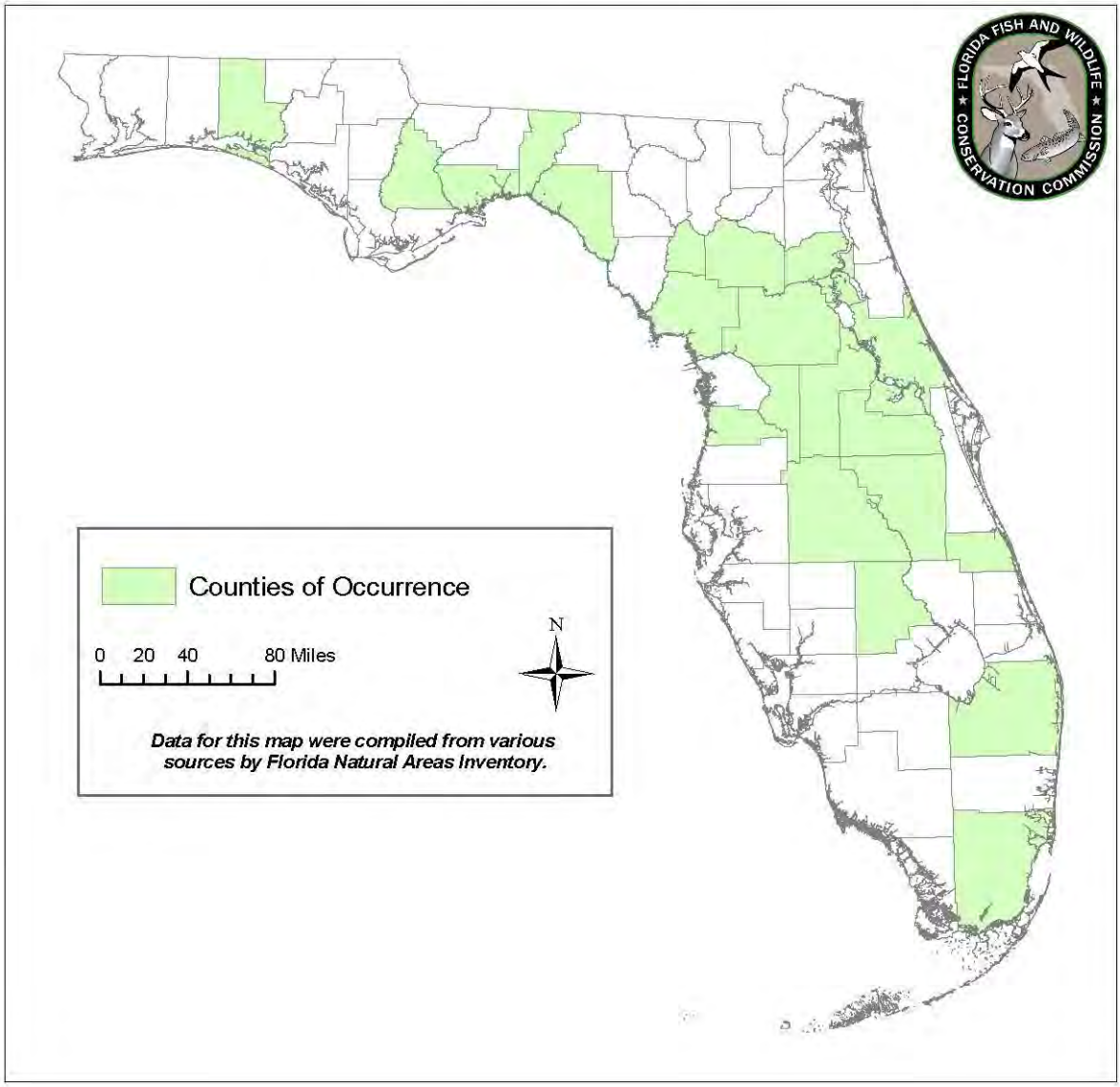
Ants, Wasps, and Kin--Hymenoptera	eupelmid sp. 2	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	*Forelius pruinosus*	Frosty Odorous Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Formica pallidefulva*	Variable Fleet Formica	A
Ants, Wasps, and Kin--Hymenoptera	*Habropoda laboriosa*	Southeastern Blueberry Bee	A
Ants, Wasps, and Kin--Hymenoptera	*Hypoponera opacior*	Comman Mini-ponerine	F
Ants, Wasps, and Kin--Hymenoptera	*Hypoponera punctatissima*	Pantropical Mini-ponerine	A
Ants, Wasps, and Kin--Hymenoptera	*Liris sp.*	A Square-headed Wasp	A
Ants, Wasps, and Kin--Hymenoptera	microgastrine sp. 1	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	*Nylanderia arenivaga*	Sand-loving Crazy Ant	F
Ants, Wasps, and Kin--Hymenoptera	*Nylanderia faisonensis*	Woodland Crazy Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Nylanderia parvula*	Northern Crazy Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Odontomachus brunneus*	Southeastern Snapping Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Pheidole adrianoi*	Adrian's Big-headed Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Pheidole anastasii*	A Big-headed Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Pheidole diversipilosa*	A Big-headed Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Pheidole metallescens*	Metallic Big-headed Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Pheidole morrisi*	Morris's Big-headed Ant	A
Ants, Wasps, and Kin--Hymenoptera	platygastrid sp. 1	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	platygastrid sp. 2	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	platygastrid sp. 3	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	platygastrid sp. 4	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	platygastrid sp. 5	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	*Pogonomyrmex badius*	Florida Harvester Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Prenolepis imparis*	False Honey Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Proceratium pergandei*	Pergande's Egg-eating Ant	A
Ants, Wasps, and Kin--Hymenoptera	pteromalid sp. 1	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	pteromalid sp. 2	A Parasitic Wasp	A

Ants, Wasps, and Kin--Hymenoptera	pteromalid sp. 3	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	pteromalid sp. 4	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	scelionid sp. 1	A Parasitic Wasp	C?
Ants, Wasps, and Kin--Hymenoptera	scelionid sp. 2	A Parasitic Wasp	C?
Ants, Wasps, and Kin--Hymenoptera	*Solenopsis invicta*	Red Imported Fire Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Solenopsis nickersoni*	Nickerson's Thief Ant	A
Ants, Wasps, and Kin--Hymenoptera	*Solenopsis pergandei*	Pergande's Thief Ant	F
Ants, Wasps, and Kin--Hymenoptera	sphecid sp.	A Parasitic Wasp	A
Ants, Wasps, and Kin--Hymenoptera	*Strumigenys louisianae*	Louisiana Pygmy Snapping Ant	A

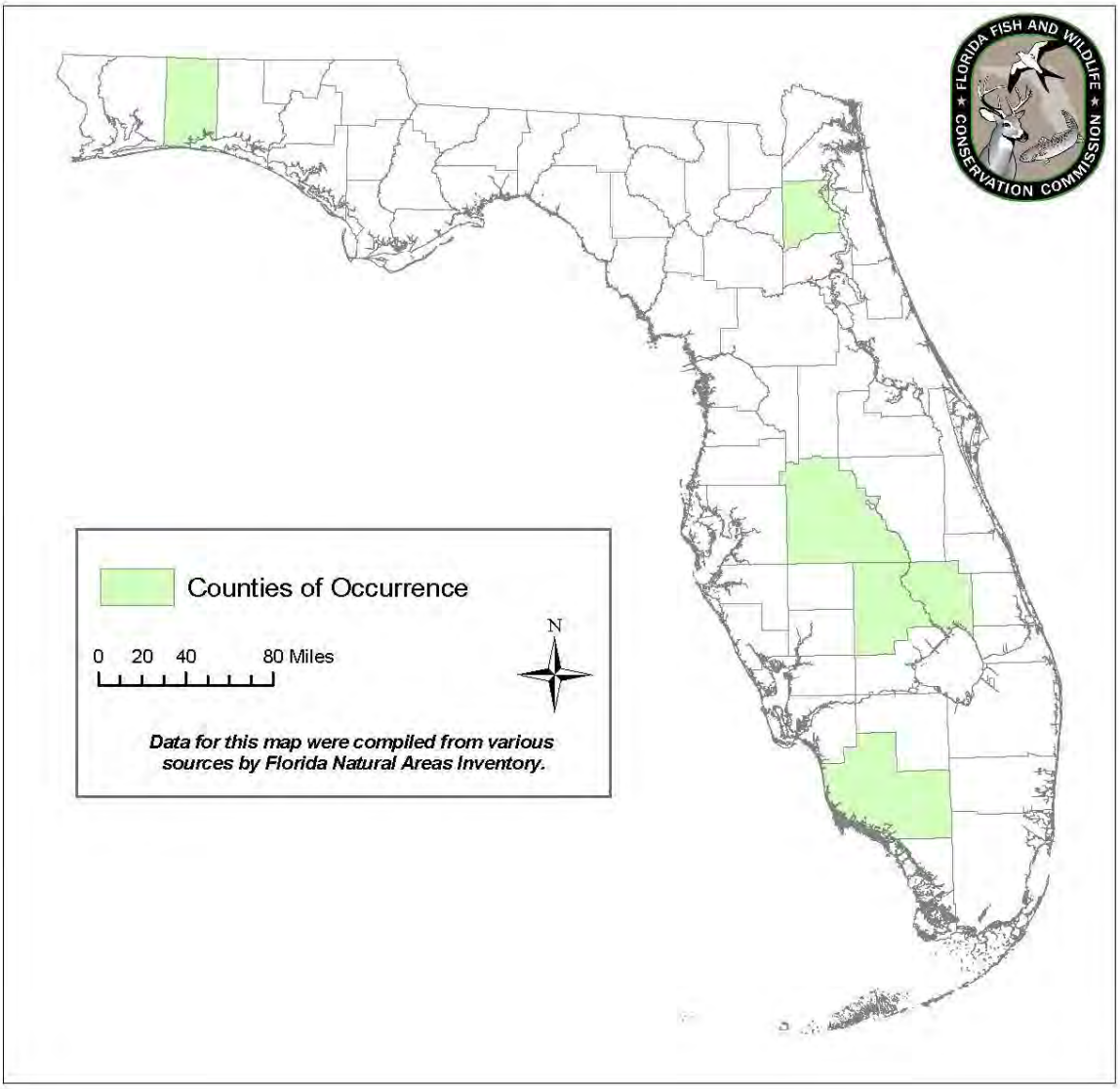
Select Invertebrate Distribution Maps

Gopher Tortoise Acrolophus Moth
(*Acrolophus pholeter*)
Florida County Distribution

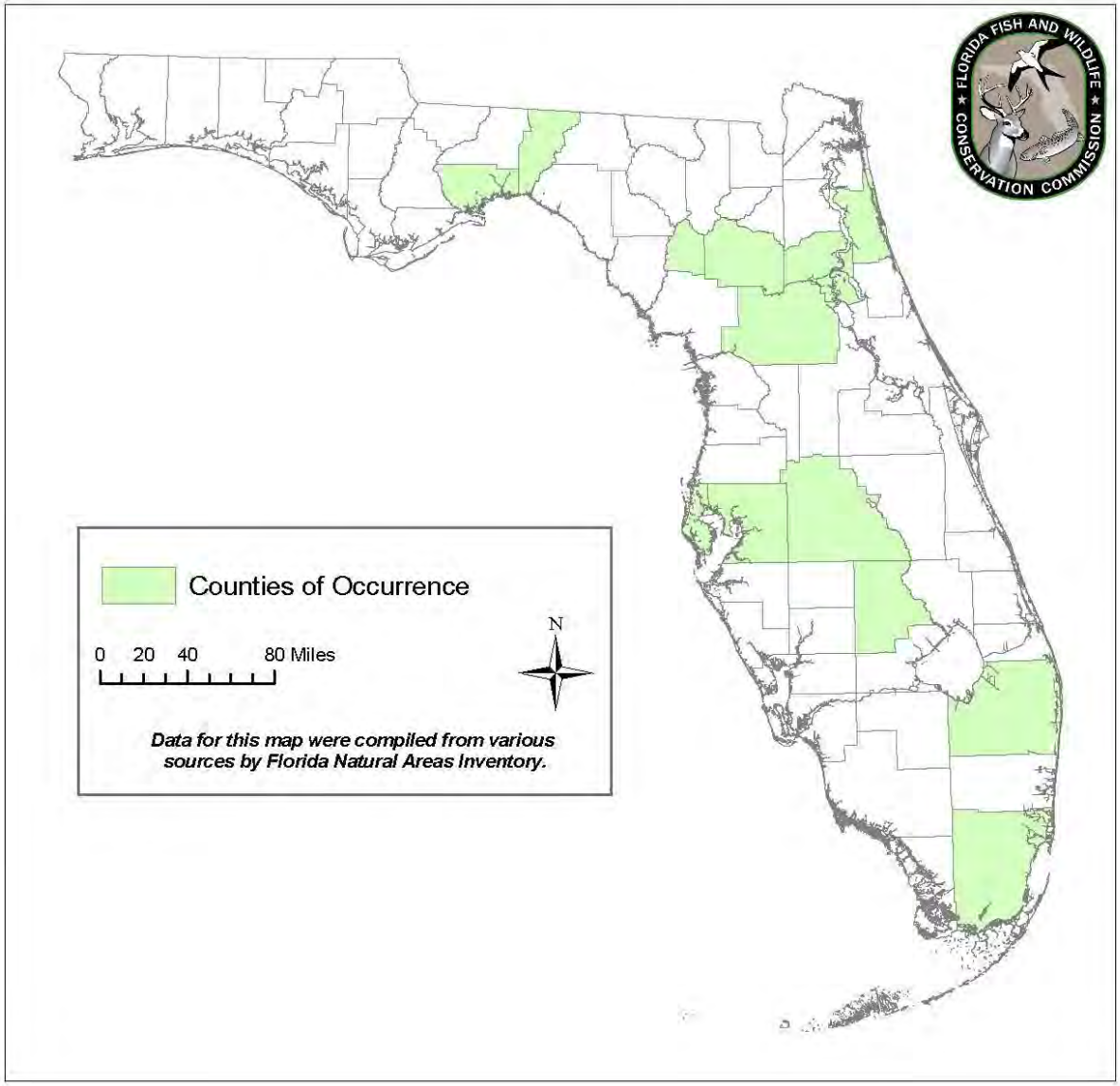
Little Gopher Tortoise Scarab Beetle (*Alloblackburneus troglodytes*) Florida County Distribution



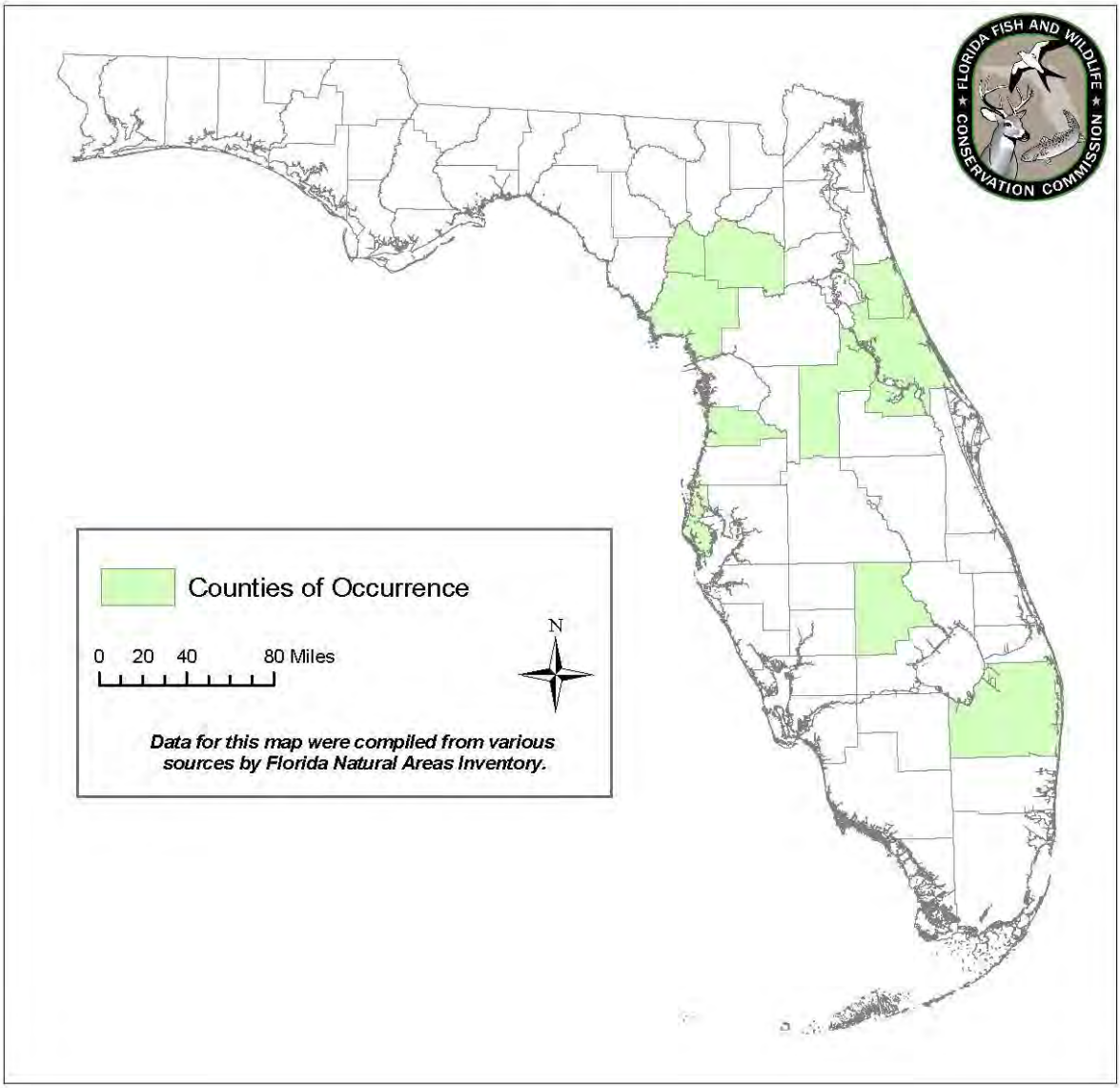
Gopher Tortoise Shell Moth
(*Ceratophaga vicinella*)
Florida County Distribution



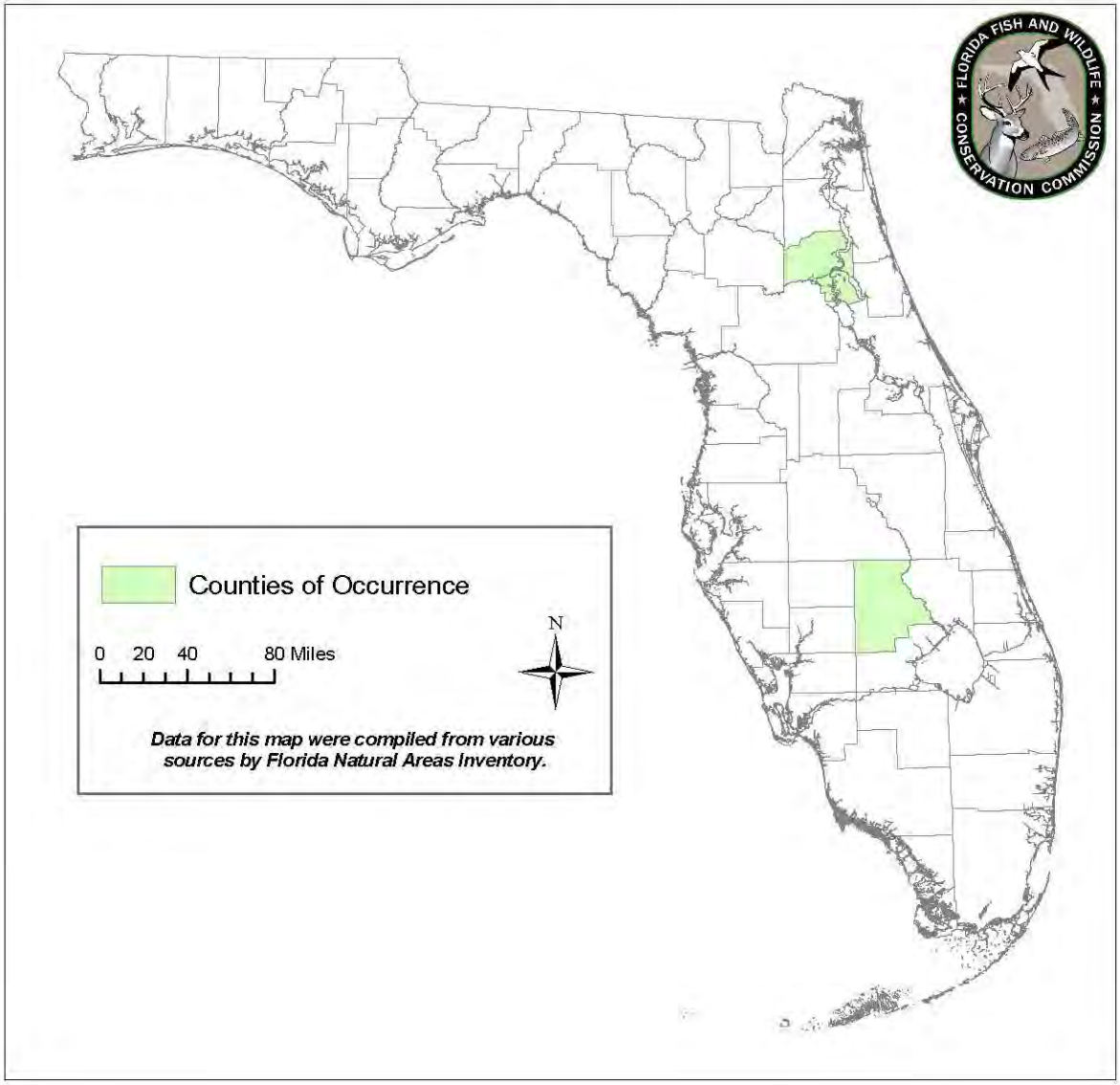
Gopher Tortoise Hister Beetle (*Chelyoxenus xerobatis*) Florida County Distribution



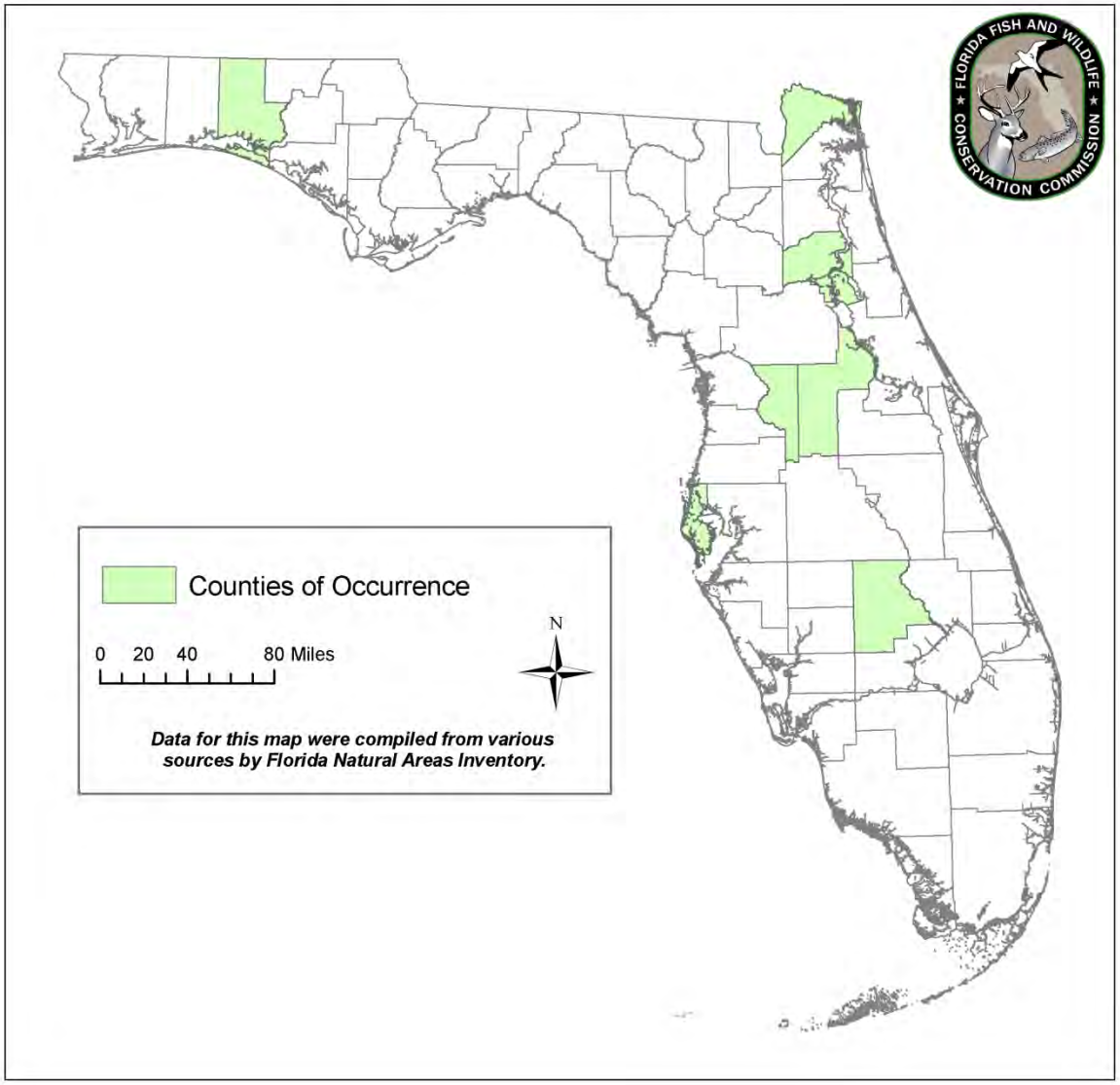
Gopher Tortoise Copris Beetle (*Copris gopheri*) Florida County Distribution



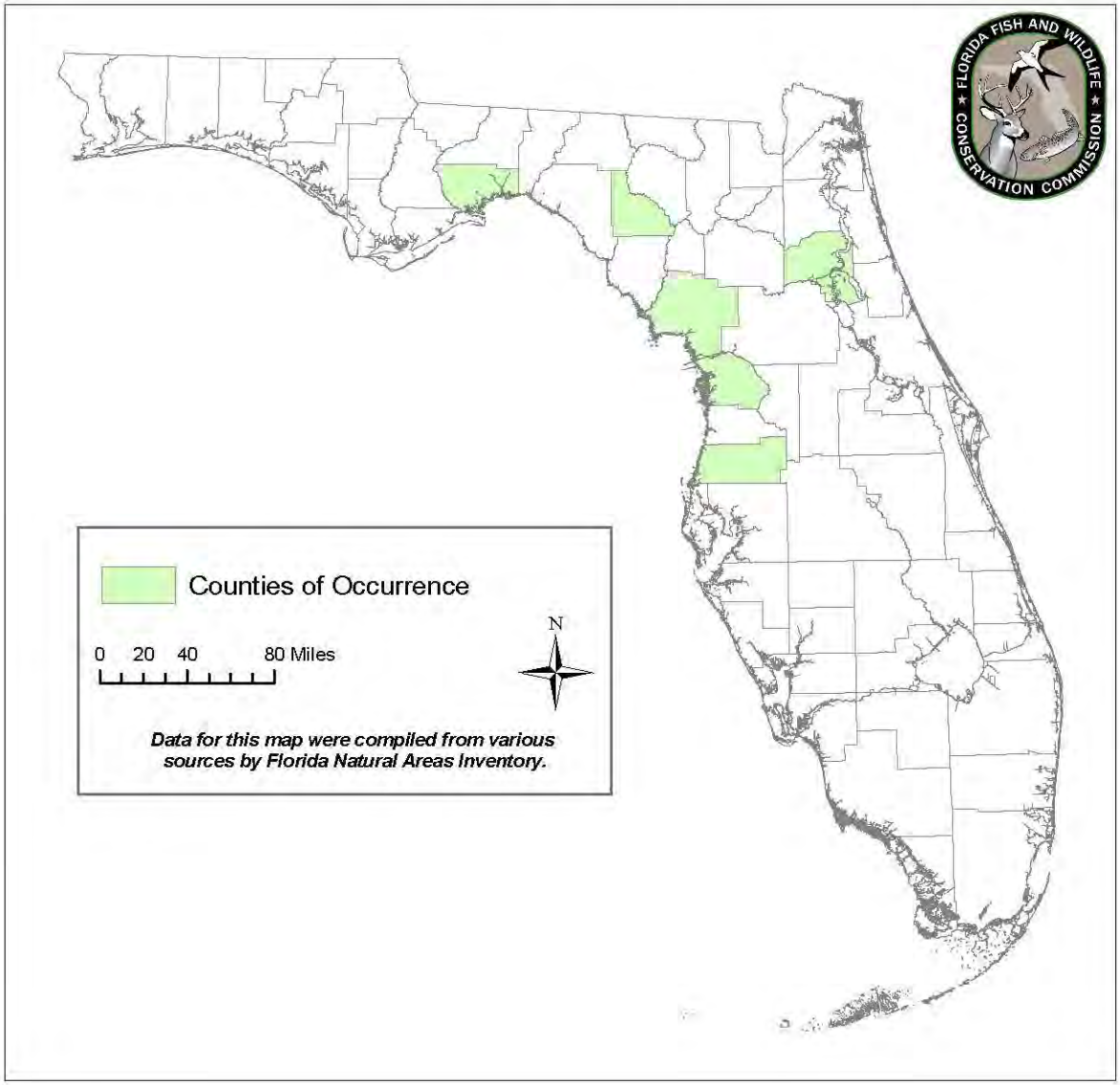
Tortoise Burrow Dance Fly (*Drapetis n. sp.*) Florida County Distribution



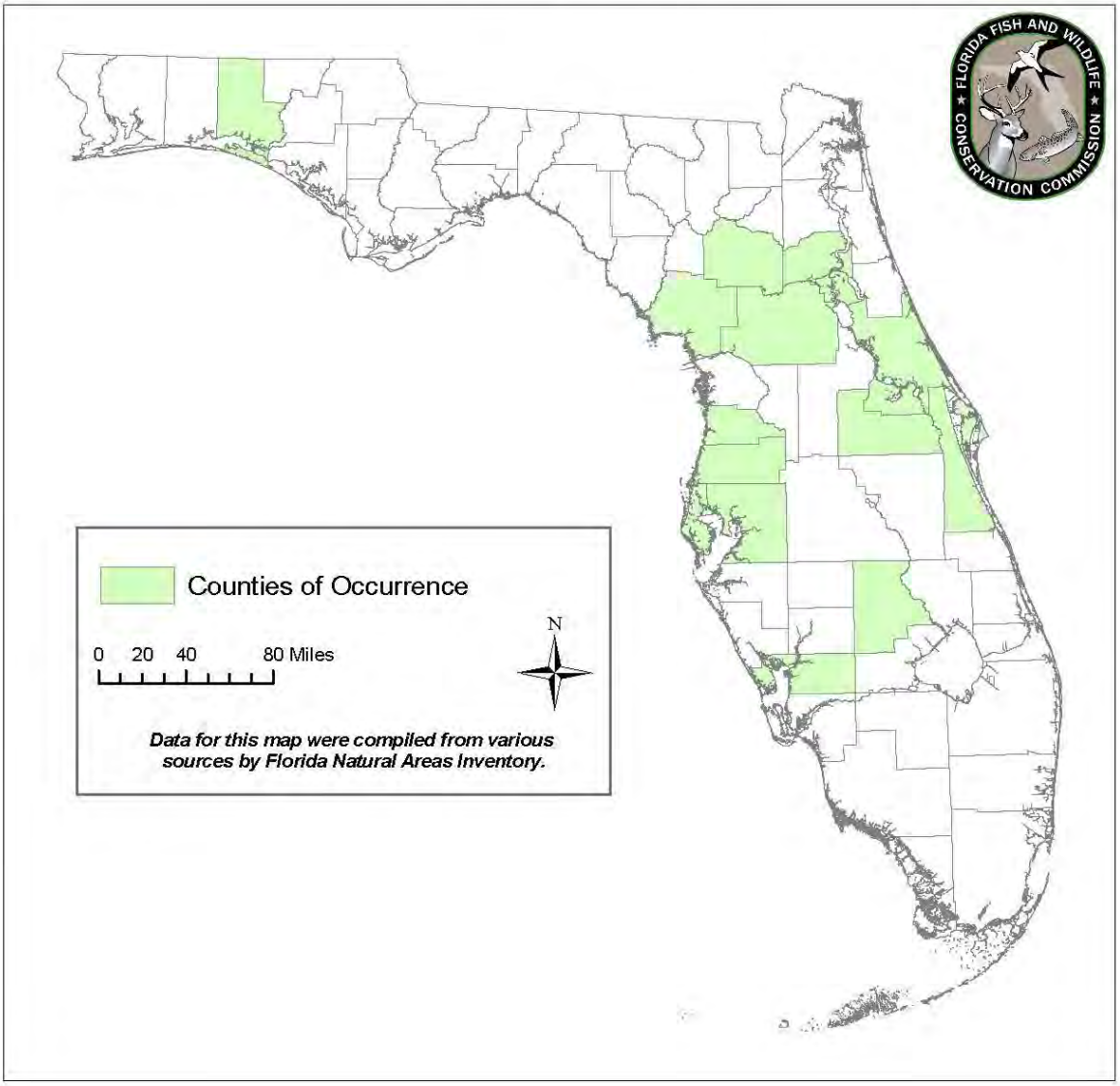
Gopher Tortoise Burrow Fly (*Eutrichota gopheri*) Florida County Distribution



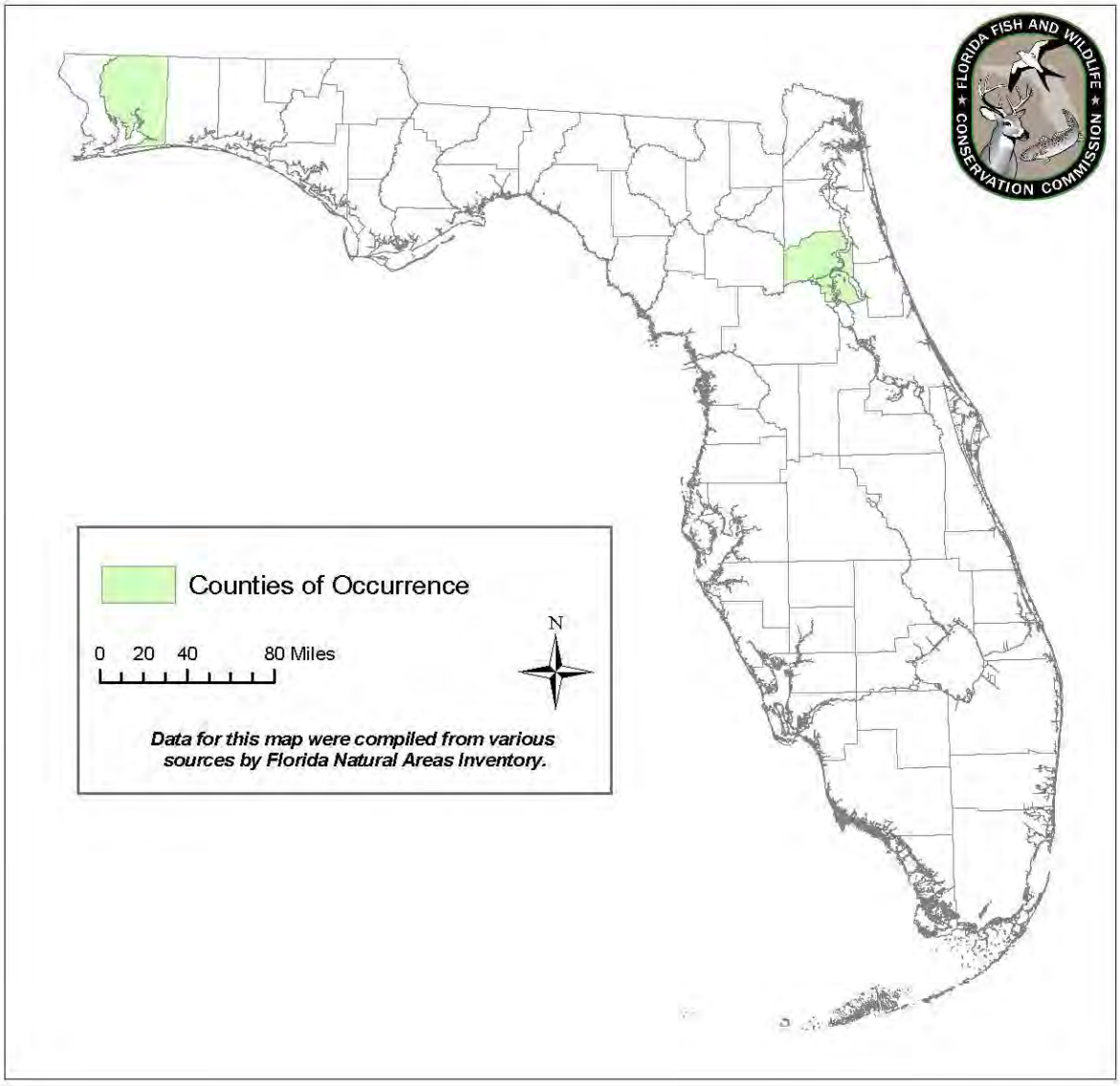
Equal-clawed Gopher Tortoise Hister Beetle (*Geomysaprinus floridae*) Florida County Distribution



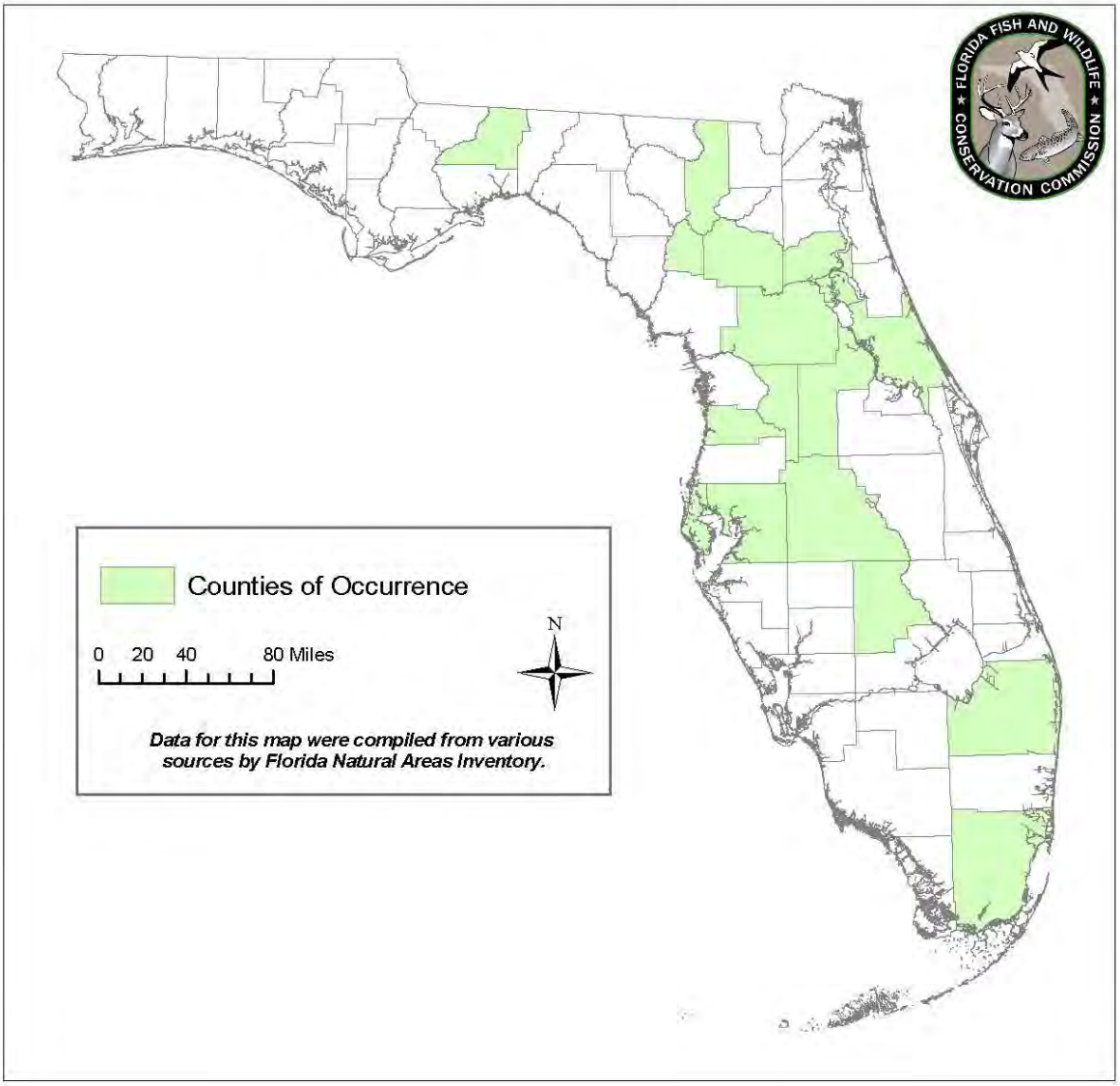
Gopher Tortoise Noctuid Moth
(*Idia gopheri*)
Florida County Distribution



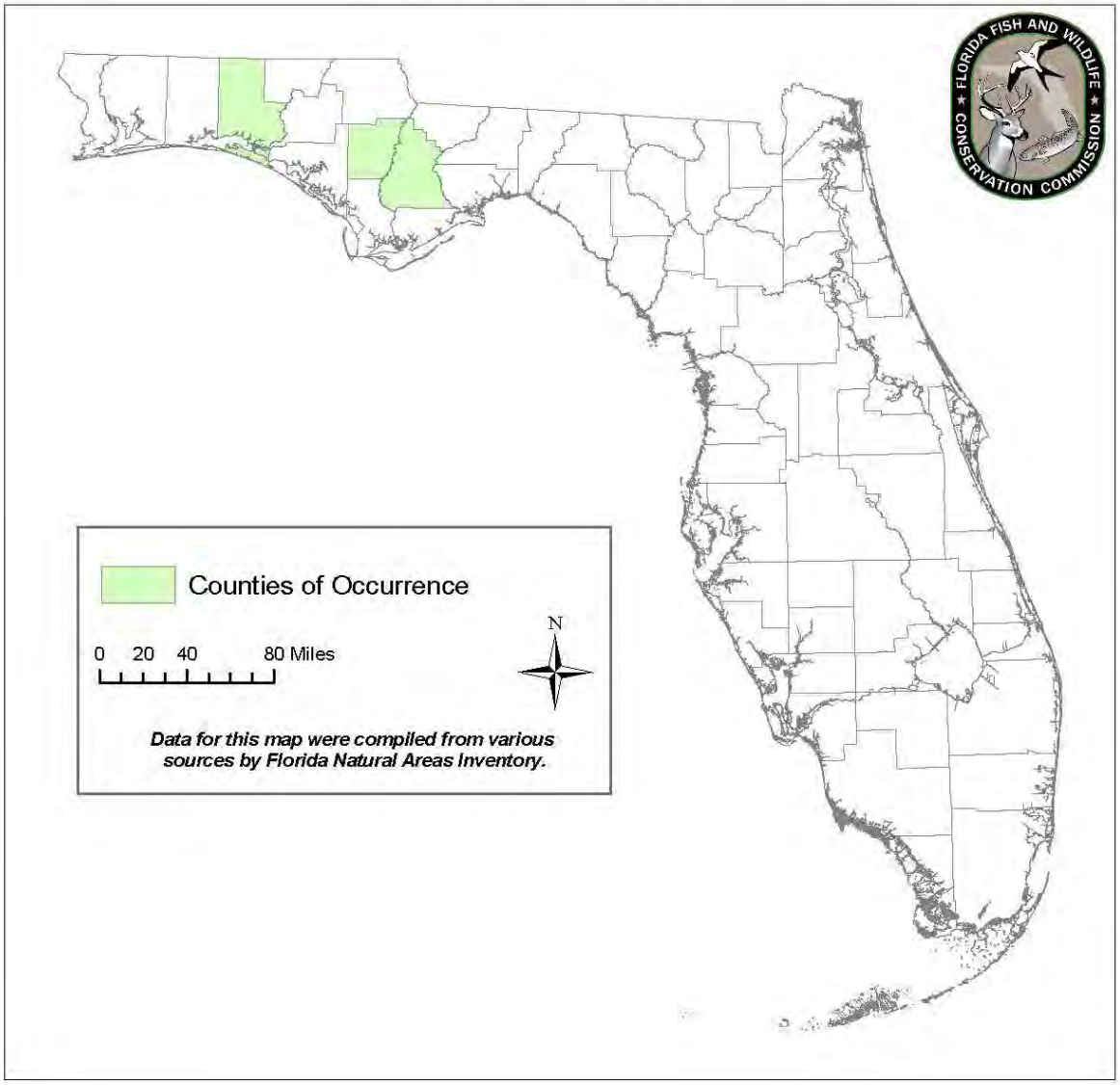
Gopher Tortoise Robber Fly (*Machimus polyphemi*) Florida County Distribution



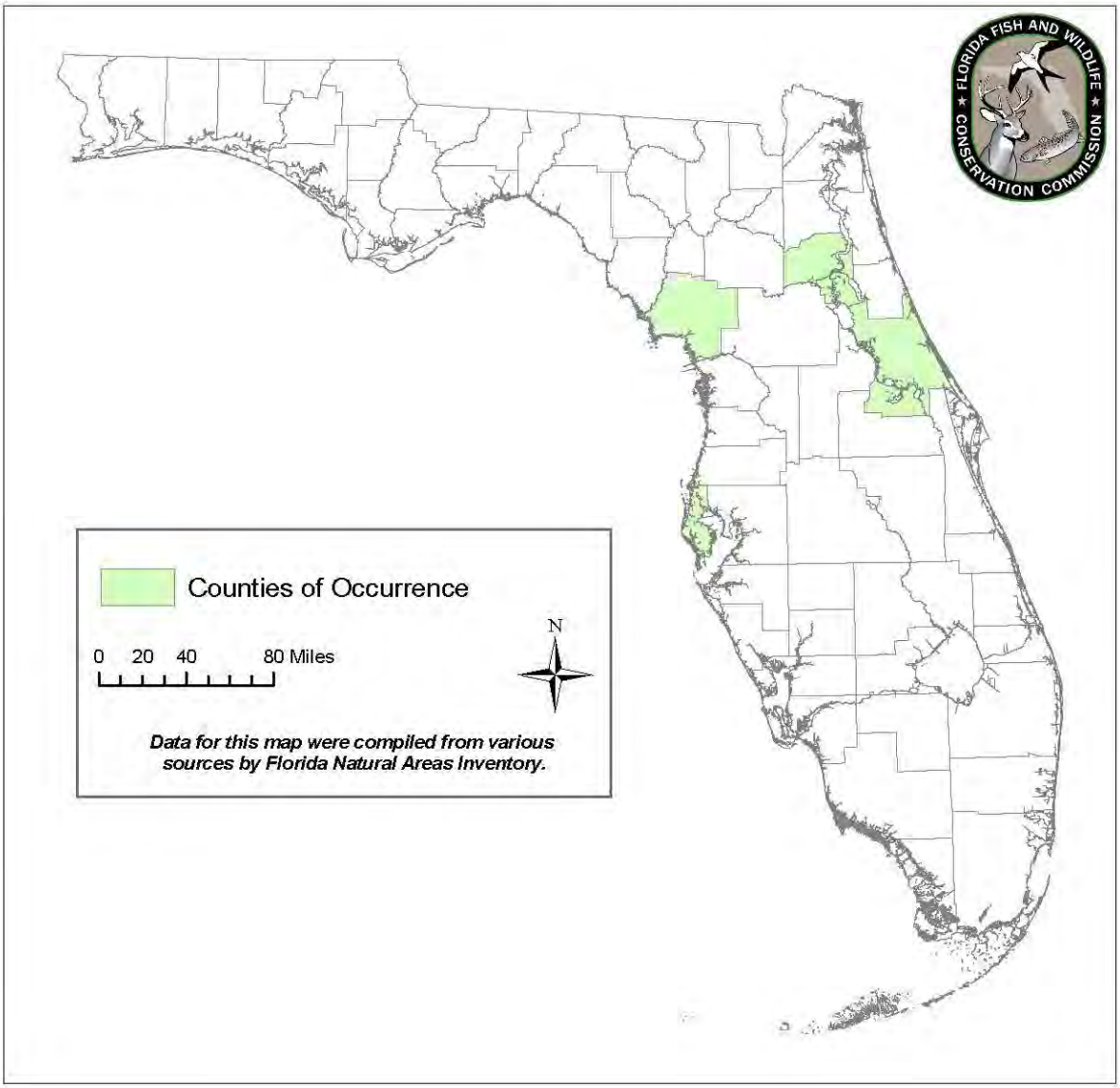
Punctate Gopher Tortoise Onthophagus Beetle
(*Onthophagus polyphemi polyphemi*)
Florida County Distribution



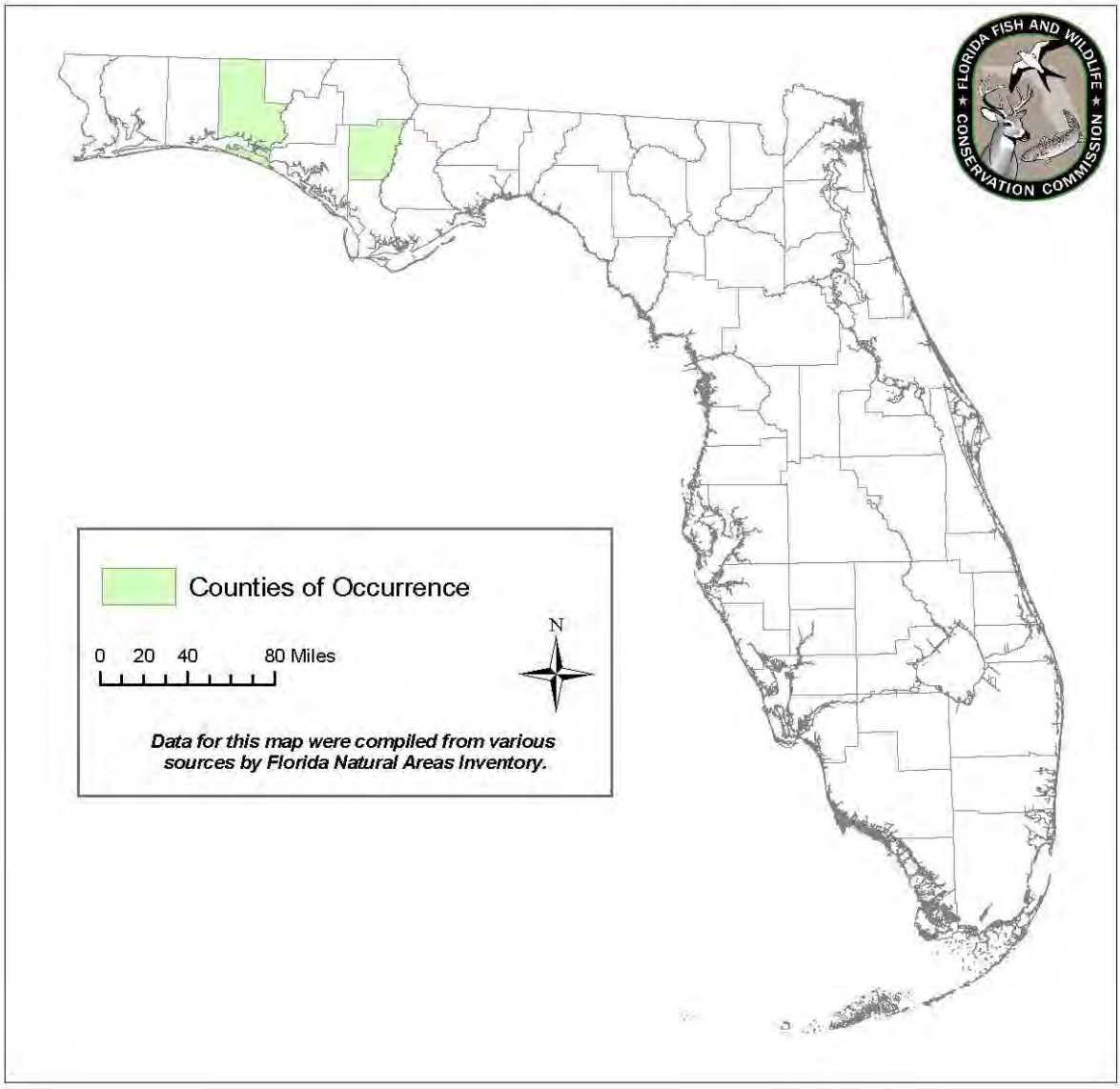
Smooth Gopher Tortoise Onthophagus Beetle
(*Onthophagus polyphemi sparsisetosus*)
Florida County Distribution



Gopher Tortoise Rove Beetle
(*Philonthus gopheri*)
Florida County Distribution



Western Gopher Tortoise Rove Beetle
(*Philonthus testudo*)
Florida County Distribution



APPENDIX 7. Conservation-based Incentive Opportunities

Gopher tortoises are an essential wildlife species. They are considered a keystone species because the burrows they dig become home to more than 350 other species, known as commensals. A decline in the number of gopher tortoises results in a decline in the number of commensals. Conservation-based incentives are available to assist private landowners with managing important habitat for wildlife, protecting habitat into the future, and possibly provide opportunities for landowners to generate revenue for conserving important species, such as the gopher tortoise. *Gopher tortoise conservation depends on the participation of private and public land owners*.

Program	Description	Contact
Landowner Assistance Program (LAP)	The purpose of LAP is to provide assistance that may include technical, financial, educational, and various forms of recognition that seek to award landowners who manage their lands properly for wildlife. The LAP website provides all pertinent information for landowners needing habitat management, land use planning, or other wildlife related assistance.	Visit the web site: http://MyFWC.com/lap
Forest Stewardship Program (FSP)	The FSP seeks to help private landowners develop a plan designed to increase the economic value of their forestland while maintaining its environmental integrity for future generations. Stewardship is based on the multiple-use land strategy. Visit the Florida Forest Stewardship website at: http://www.sfrc.ufl.edu/Extension/florida_forestry_information/additional_pages/forest_stewardship_program.html	Find your FFS County Forester at http://www.fl-dof.com/field_operations/county_foresters/index.html
Wildlife Habitat Incentives Program (WHIP)	Administered by U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat.	Locate your nearest USDA Service Center at: http://offices.sc.egov.usda.gov/locator/app?state=fl
Environmental Quality Incentives Program (EQIP)	Administered by USDA's NRCS. Provides both technical assistance and up to 50 percent cost-share assistance to farmers and ranchers who face threats to soil, water, air, and related natural resources.	Contact your local District Conservationist through the nearest USDA Service Center
Partners for Fish and Wildlife Program (PFW)	Administered by the U.S. Fish and Wildlife Service. Provides technical and up to 50 percent cost-share assistance to private landowners and other partners who conduct habitat restoration and improvement activities on their land. The focus of the program in Florida is on restoration of native habitats, restoration of degraded	Contact a USFWS PFW Program Coordinator at: http://www.fws.gov/northflorida/Staff3.htm

	streams and wetlands, and eradication of invasive, exotic species. USFWS Partners for Fish and Wildlife link at: http://www.fws.gov/northflorida/partners/	
Common Species Common (CSC)	The purpose is to improve habitat conditions for wildlife by focusing conservation on high priority habitats outlined in FWC Comprehensive Wildlife Conservation Strategy.	Contact a USFWS PFW Program Coordinator at: http://www.fws.gov/northflorida/Staff3.htm
Conservation Reserves Program (CRP)	Administered by USDA's Farm Service Agency (FSA). Provides annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible farmland.	Contact your local FSA office through the nearest USDA Service Center
Gopher Tortoise Recipient Site Program	The Florida Fish and Wildlife Conservation Commission (FWC) administers the Gopher Tortoise Management Plan and accept applications from eligible landowners who are interested in becoming a gopher tortoise recipient site.	Visit MyFWC.com/GopherTortoise for criteria and more information.
Conservation Easement	A conservation easement is a legal agreement between a landowner and qualified organization that can provide state and federal tax benefits for landowners who permanently protect and manage habitat for listed wildlife species.	Visit landchoices.org/preserve.htm or edis.ifas.ufl.edu/uw194 for more information.
Conservation Banking	Conservation banks are lands containing natural resources that are protected, conserved, and managed habitats for threatened wildlife species. Landowners can generate income, keep large parcels of land intact, and possibly reduce their taxes.	For more information, visit fws.gov/endangered/landowners/conservation-banking.html.
The Farm Bill	The Farm Bill provides a tax deduction for expenses incurred while achieving recommended site-specific management actions during recovery plans for threatened or endangered species listed under the Endangered Species Act (ESA).	For more information, visit fws.gov/endangered/esa-library/pdf/ES_TaxCredit2a.pdf .
Candidate Conservation Agreements with Assurances (CCAA)	CCAA provides additional incentives for non-federal landowners engaging in voluntary proactive conservation with assurances that limit future conservation obligations, and addresses concerns about potential regulatory implications of having a listed species on their land.	For more information, visit fws.gov/endangered/what-we-do/cca.html#ccaa.
Conservation Stewardship Program (CSP)	Provided by U.S. Department of Agriculture's (USDA) Natural Resource Conservation Service (NRCS), CSP promotes the conservation and improvement of soil,	For more information, visit fl.nrcs.usda.gov/progra

	water, air, energy, plant and animal life on working private and tribal lands by providing incentives to landowners for adopting, improving, and maintaining practices to achieve environmental benefits.	ms/flcsp.html.
Florida Forest Service	The Florida Forest Service provides assistance to private landowners for fire management services such as prescribed burning, fire line maintenance, and longleaf pine restoration through the sale of bare root Longleaf pine tree seedlings.	For more information, visit fl-dof.com/services.html #grants.
Rural and Family Lands Protection Program (RFLPP)	This program specifically addresses the twin concerns of loss of agricultural lands and natural resources through the acquisition of perpetual agricultural protection easement, or conservation easement, for permanent protection of land for agricultural purposes.	For more information, visit fl-dof.com/forest_management/rural_family_lands_index.html.
America's Longleaf Restoration Initiative (ALRI)	The vision of ALRI is to sustain viable longleaf pine ecosystems with the full spectrum of ecological, economic, and social values restored and managed through a voluntary partnership of concerned organizations and individuals.	Visit americaslongleaf.org for more information.
American Forest Foundation	The *Pine Ecosystem Conservation Handbook* for the Gopher Tortoise in Florida is part of an initiative of the American Forest Foundation's Center for Conservation Solutions bringing together conservation partners and family forest owners to create and preserve forest habitats for the gopher tortoise and other declining wildlife of the southern pine forest.	For more information, visit forestfoundation.org. A limited quantity of these handbooks are available upon request from FWC by calling 850-921-1030.

APPENDIX 8. Stakeholders

Gopher Tortoise Stakeholder Group - Individuals on the stakeholder contact list and with access to the stakeholders' public SharePoint site and individuals who participated in stakeholder meetings November 2007 - July 2012. (* indicates member of the group steering committee.)

Acevedo	Jennifer	Crossroads environmental.com
Adair	Ginger	Volusia County
Alger	Yvette	St. Lucie Co.
Allen	Deedra	Mosaic Phosphate
Angel	Patty	
Anne	Mary	
Ard	Sam	AS Law/FL Cattlemen's Assoc.
Aresco	Matthew	Nokuse Plantation
Ashton	Ray	Ashton Biodiversity
Ashton*	Patricia	Ashton Biodiversity
Auerbach	Simon	
Avis	Craig	Citrus Hill
Baker	Jonathan A.	
Barlow	C	Miller Leg, Inc.
Barnwell	Mary	SWFWMD
Barthle	Larry	
Battillo	Rick	
Becker	Chris	DEP-State Parks
Bevan	Laura	HSUS
Bierly	Jim	
Bishop	T	St. John's Co.
Bittner	R	BDA, Inc.
Bixby	Marjorie	FL DOT
Blalock	David	U.S. Army
Blihovde *	Boyd	Gopher Tortoise Council
Bohls	S	DOACS
Bolt	Rebecca	KSC EMS /NASA
Borak	Sarah	
Boschen	Rick	
Braem	Sally	DEP
Brandenburg	Mark	Miller Legg

Braswell*	Staci	Florida Farm Bureau
Brewer	Jan	St. Johns Co.
Brown	Dan	UF Vet
Brown	Kris	
Brown	Mary	UF Vet
Bukata	B	Jones Edmunds
Burnaman	Ross	
Bush	Michael	St. Lucie Co.
Butler	Joe	UNF
Carlson	C	
Carpenter	Cheryl	CN Environmental
Caruso	Kristin	
Catlett*	Paul	FL National Guard
Charles	James	LLW Law
Claridge	Kevin	FL DEP
Clark	Jeff	
Clark	Roger	Lee Co.
Clarkson	Chan	
Clementi	Rosanne G.	SSEI, Inc.
Cockerel	Pat	FL Farm Bureau
Collazo	Mike	HGS Law
Collier	J	GT Law
Collins	Joe	
Colverson	Pete	
Concoby *	Ronald E.	
Connolly	Patty	
Connolly*	Tom	Gopher Tortoise Consultants
Conway Duever	Linda	Consultant
Crooks	Amber	Conservancy of SW Florida
Cornwell	Katasha	FL DOT
Corona	Matthew and Hope	

Crowe	Thad	Clay Co.
Czerwinski	Michael G.	Czerwinski Consulting
D	Dawn	Hernando Co.
Dalton	T	Avid Engineering
Dangleman*	Danielle	Volusia County
Daniel	Ilka	HSUS
Davis	MC	Nokuse Plantation
Deal	Melinda	Earthbalance
Decrenza	Cheryl	Kleinfelder
Deitschel, DVM*	PJ	
Demers	Dr. Nora	
Demetropoulos	Linda	
Derheimer	Suzanne	Charlotte Co.
Dickson	David	ESA, Inc.
Dierolf	Amy	Progress Energy
Dineen	Caroleen	Broad and Cassel
Dinkins	Matt	King Engineering
Dombrova	Louis	
Doran	Jeff	Florida Forestry Association
Duggins	Gail	
Dutton	Mike	Alachua Co.
Dziergowski	Annie	USFWS
Eagan	Rebecca	
Elegant	Justin	Petros Law
EPI FL		EPI FL
Evans	McLane	Earthbalance
Exum	Jay	Glatting.com
Farnsworth	Susan	Citrus Co.
Fickett	Alan	
Folk	Monica	
Foote	Jerris	SC Gov.
Frayer	Robert	Gowebco.com
Friese	Daniel	U.S. Air Force
Fuller	Manley	FL Wildlife Federation
Gates	Cyndi	SWFWMD
Gault	Kathleen	Eglin AFB (DOF)
Gentry	R	FHBA, Inc.
George	Cheryl	Packaging Corp.

Gery	Al	St. Lucie Co.
Gibson	Mark	U.S. Navy
Gibson	Susan	U.S. Department of Defense
Glass	David	U.S. Air Force
Godley *	Steve	Cardo-Entrix
Gordon*	Doria	The Nature Conservancy
Gordon	David	Quest Ecology
Gornicki	Phil	FL Forestry Assoc.
Green	Melissa	Birkitt
Griffiths	Bev	
Griffy	Bill	Ecological Consulting Services
Grubbs	Sarah	Seminole Tribe
Hamilton	Timothy	ESINC
Hand	George	
Handley	Jim	FL Beef Cattlemen's Assoc.
Handy	Vivienne	Quest Ecology
Hardin	Dennis	DOACS
Hart	Kit	Plum Creek Timber
Hawkins	Ronnie	
Heckler	Courtney	Seminole Tribe of FL
Heinrich	George	
Henderson	Connie	Kleinfelder
Henderson	Clay	H.K. Law
Hennig*	Melissa	Collier County
Hicks	Charles	HC Hicks Law
Hicks*	Rob	Plum Creek Timber
Hinderliter	Matt	USFWS
Hobgood	Jennifer	HSUS
Hodgson	Ann	Audubon Soc. FL
Hofstetter	S	Alachua Co.
Holley	Roz	Coastal Wildlife Club, Inc.
Holls	MaryAnne	
Hooker	Allan	ERS Environmental
Howe	Andrew	
Jackson	Dale	FL Natural Areas Inventory
Jacobson	Elliott	UF School Vet Med.
Jennings	Steve	DOACS
Jennings	Michael	USFWS

Johnson	A	ERS Environmental
Johnson*	Joel	Scheda Ecol. Assoc.
Kaiser	Drew	Kaiser Consulting
Kaiser *	Bernard	Hillsborough Co.
Kantor	Imre	
Karsen	Hank	
Karsen	Sharon	
Katz	Wilma	
Kaufmann*	Greg	FPS
Kautz	Randy S.	BDA, Inc.
Kelly	Carrie	kimley-horn
Kent*	Carissa	
Kerr	William W.	CFL, Inc.
Kesler	Reeve	Envtl. Consulting Group
Kintner	S	Volusia Co.
Kiser	C	H.K. Law
Knight	Gary	
Krebs	J	
Landon	Joan	LMA, Inc.
Layman	Bruce	Wilson Miller Engineering
Lee	Michael	
Levine	Aaron	
Lewis	Robin	Save Our Scrub, Inc.
Lichtstein	Jason	Akerman
Lites	Bill	Glatting
Littlejohn	Chuck	FL Land Council
Locke	K	Volusia Co.
Logan	Tom	BDA Inc.
Lombardi	D	Hillsborough County
Lowrimore	Steve	Plum Creek Timber
Loy	D	Birkitt
Lyon	Casey	Volusia Co.
Macdonald *	Laurie	Defenders of Wildlife
MacMilliam	Tyler	NWFWMD
Maidhof	Gary	Citrus Co.
Maltby	D	
Martin	Aaron	Lee County
Martinson	Luke	

Mason	Susan	Collier County
Mason*	Brigham	Deseret Ranches of Florida
Matthews	Frank	HGS Law
McAlpine	Davd	McAlpine Envtl.
McCarthy*	Linda	Lykes Ranch
McCoy	Earl	USF
McGlincy *	Joe	FL Forestry Assoc.
McLemore	Jeff	SFWMD
Meco	Mary	
Media arts		
Meketa	C	
Milch	F	ECFRPC
Miller	Stephen	SJRWMD
Miller	Darla	MSCW, Inc.
Minton	J	DRMP
Mish	Bob	
Moore	Jon	FAU
Morris	V	DOACS
Morris*	Julie	
Moyers	Jim	St. Joe Co.
Mrykalo	Robert	
Munsch	Lisa	Atkins Environmental
Munson	Greg	DEP
Mushinsky	Henry	USF
Nelson	Meg	Nokuse Plantation
Newman	Christian M.	Pandion systems.com
Ober	Holly	UF
Osterhoudt	Matt	SC Gov.
Palmer *	Michael D.	King Engineering
Parent	Maureen	
Parham	David	Panhandle Energy
Patrick*	Sandra	Mosaic Phosphate
Peacock	Byron	Peacock Consulting Group
Pearson	Daniel	FPS
Pennington	D	1000 Friends of Florida
Powell	Barbara Jean	Everglades Coalition
Pulver	Dinah	News Journal
Ramsey	Kristina	Broad and Cassel

Reese	M	For the people.com
Reese	Mr.	ECG, Inc.
Reynolds	Gayle	Reynolds Design
Rice	Roger	Attorney
Richardson	Wayne	Progress Energy
Rillstone *	Douglas	FL Chamber Commerce/Developers Assoc.
Rizkalla	Carol	
Rizzo	Mike	Volusia Co.
Roach	Dan	Rayonier
Roberts	T	Esciences
Robertson	Clayton	VHB, Inc.
Robertson	Preston	FL Wildlife Federation
Rossi	R	
Roth	Cari	Bryant Miller Olive
Rothermel	Betsy	Archbold
Rubinoff	Jay	U.S. Army Nat'l. Guard
Savage	Amelia	HGS Law
Savage	Anne	Disney Wild Kingdom
Saviak	Carol	
Schiller	Laurel	
Schlageter	C	CPH Engineers
Schmidt	J	Birkitt
Schmittler	Craig	Wilson Miller.com
Schroeder	Bill	
Schultz	Carolyn	Advanced-eco
Sekerak	Carrie	UF Forest Svc- Ocala Nat. Forest
Sexton	H	Kleinfelder
Shackelton	Eve	Bats from Ocala
Sharpe	Vicki	FL DOT
Shea	Steve	St. Joe Co.
Shepherd	Jon	
Silk	Sherry	ASPCA
Silverberg	DJ	Lotspeich Associates
Siniawski	Norman	
Sisk	Jody	zevcohen
Skidmore	B	King Engineering.com
Sliester	Randal	Volusia Co.

Small	Parks	FL DEP - State Parks
Smith	Lora	Jones Ecological Research Center
Smithem	Jodie	USFWS
Snieckus	Mary	American Forest Foundation
Songer	K	Avid Eng.
Spear	K	Orlando Sentinel
Spengler	J	Ecological cs.com
Stodola	Ann	Clay Co.
Stowe	Matt	FL National Guard
Straub	Leslie	floridawildlifecare
Sulkers	Rachael	ES, Inc.
Sullivan	Joe	
Sumpter	D	Wildlands Conservation
Tatum	Vickie	NCASI
Telfer	Tim	Flagler Co.
Thomson	Walt	
Thorning*	Micah	USFS
Tonjes	Stephen	FL DOT
Townsend	Amy	
Trebatoski	Kim	Lee Co.
Tvofilat	Marcia	Pappas Metcalfe, Inc.
Tyner	Ray	CI.palm-coast
Ura	C	osceola.org
Walton	Lee	Flatwoods Consulting
Weaver	Natalie	
Wendland	Lori	UF School Vet Med.
Wiley	Keith	
Willliams	Marshall	U.S. Army
Willcox	A	UF-Wildlife Ecology
Willis	Brannen	
Willsey	Beau	SRWMD
Witt	Terry	Chronicle Online
Wooding	John	MSN, Inc.
Wraithmell	J	FL Audubon
Zable	TJ	Atkins Environmental
Zajicek	Paul	DOACS
Zions	Adam	
Zremski	Becky	Sarasota Def. of Animals

APPENDIX 9. An Economic Analysis of the Gopher Tortoise Management Plan
(September 2007, Revised September 2012)

Prepared for: Florida Fish and Wildlife Conservation Commission, Division of Habitat and Species Conservation

By: Michael Thomas, Ph.D., Environmental Economics Inc. and David Harding, Ph.D., Fish and Wildlife Research Institute

Executive Summary

In compliance with Section 120.54(3) (b), Florida Statutes, a Statement of Estimated Regulatory Cost (SERC) was conducted on the revisions to the five-year Gopher Tortoise Management Plan (GTMP). Costs of implementing the GTMP can be divided into three broad categories; direct costs, opportunity costs, and overall economic impact to Florida. The analysis documents a:

- five year total direct costs of
    - $3.8 million to the Florida Fish and Wildlife Conservation Commission (FWC); and,
    - $31.2 million cost to the regulated community, both private and public sectors.
- five year total opportunity costs (non-project redirected funds and/or time) of
    - $2.0 million to FWC; and,
    - $3.1 million cost to non-FWC public agencies.
- five year total economic impact to the state of Florida of
    - 79.5 fewer public sector jobs, and a gain of 88 private sector jobs,
    - for a net increase of 8.5 private sector jobs; and,
    - $2.5 million net increase to Florida's economy.

The five year GTMP revenues are expected to closely match expected cash outflows with:

- $5.61 million in revenues to FWC
- $3.8 in direct costs plus matching grant funds of $1.83 million
- An expected small net shortage of $71,000 (1.2% of total revenues)

Finally, this SERC only considers the GTMP costs, revenues and the larger economic impact to Florida's economy. It is likely that the plan will also significantly improve Florida's habitat for both the gopher tortoise and the numerous commensals. At this time, there has been no effort to document the economic value of the GTMP, yet it may be significantly greater than its cost. For the next five year revision, it is strongly recommended FWC include an effort to evaluate the plan's potential economic benefits and conduct a benefit cost analysis.

Table of Contents

Introduction and Background

The Florida Fish and Wildlife Conservation Commission (FWC) published its first Gopher Tortoise Management Plan (GTMP) in 2007. The revision (2012) of the 2007 gopher tortoise (*Gopherus polyphemus*) management plan is intended to guide the continued recovery of the gopher tortoise in Florida through 2022. This revision is the second 5-year action cycle of the plan. The original plan documents the listing history of the gopher tortoise in Florida and should be reviewed as a reference document for such information. The GTMP was approved by the FWC Commission in September 2007 and the gopher tortoise was reclassified from a species of special concern to threatened (Chapter 68A-27 F.A.C.).

The status of the gopher tortoise was reviewed according to FWC's listing process (68A-27.0012, F.A.C.), by a five-member biological review panel in June 2005. The status review found that the species met Criterion A (population size reduction) for classification as

a threatened species. The species management plan was developed based on the FWC approved Biological Status Report.

The gopher tortoise is a moderate-sized terrestrial turtle, averaging 23-28cm (9-11in) long. The species is identified by its stumpy, elephantine feet and flattened shovel-like forelimbs adapted for digging. The shell is oblong and generally tan, brown or gray. The gopher tortoise occurs in the southeastern Coastal Plain from southeastern South Carolina to extreme southeastern Louisiana. The gopher tortoise is endemic to the United States and Florida represents the largest portion of the total global range of the species. Gopher tortoises remain widely distributed in Florida, occurring in parts of all 67 counties. The burrows of the tortoise also provide refuge for more than 350 other species (called "commensals"), including some species that are currently state and federally listed in Florida.

The current cause of imperilment of the gopher tortoise, as identified by the final Biological Status Report is the rate of population decline, primarily due to habitat loss. Therefore, the overreaching conservation goal for gopher tortoise conservation is to restore and maintain secure, viable populations of gopher tortoises throughout Florida so the species no longer warrants listing. The plan establishes a measurable conservation goal of decreasing the rate of population decline of the gopher tortoise so that, within 1 tortoise generation (31 years) the rate of decline is less than the percentage decline which defines the current listing category (*i.e.,* < 50% over 3 generations to evaluate the threatened designation and potentially delist the species if it does not meet any of the criteria for listing outlined in Chapter 68A-27, Florida Administrative Code.

To accomplish this goal, the revised management plan establishes a series of conservation objectives that:

(1) Minimize the loss of gopher tortoises by 2022 by ensuring humane and responsible translocation of all gopher tortoises from lands proposed for development, minimizing illegal harvest of tortoises, creating best management practices (BMP's) for agricultural and silvicultural lands, implementing guidelines for predator exclusion, reduce loss of tortoises to disease and reduce vehicle-related mortality through education and exclusion measures.
(2) Increase and improve gopher tortoise habitat by 2022. This will require ongoing management of gopher tortoise habitat on protected lands in addition to restoring degraded lands with potential gopher tortoise habitat. Incentives for habitat management and conservation easements on private lands are also instrumental to conserving the species distribution and maintaining wildlife corridors among undeveloped lands.
(3) Finance and restore gopher tortoise populations where the species no longer occurs or has been severely depleted on protected suitable lands by 2022. This will require an evaluation of protected lands to determine where gopher tortoises are needed and the quality of habitat. Implementation of a range wide population monitoring protocol to help evaluate the status of the species throughout Florida will help determine where the gopher tortoise needs to be restored.
(4) Maintain the gopher tortoise's function as a keystone species by 2022 by addressing specific management needs and creating guidelines for translocation of priority commensal species from development sites. Best management practices for priority

commensal species on agricultural and silvicultural lands will also be developed for educating land managers and the general public about the broader role of gopher tortoises as a keystone species.

The revised GTMP presents a suite of conservation strategies and actions that serve to achieve the measurable conservation objectives. These strategies and actions are best accomplished by applying an adaptive management approach that allows for easy adjustments to policies, guidelines, and techniques based on observed conservation benefits/detriments and sound science. The actions are organized into the following broad categories: regulations, permitting, local government coordination, law enforcement, habitat preservation, habitat management, population management, incentives, monitoring, education and outreach, and research. A new section addressing the conservation of commensals is included and contains a suite of actions that help to conserve priority commensals and more than 350 other animal species documented to use gopher tortoise burrows.

Conservation and recovery of the gopher tortoise through implementation of this plan will require the cooperation of local governments; regional, state, and federal agencies; non-governmental organizations; business interests; and the public. Although this plan was developed by FWC in collaboration with stakeholders, it cannot be successfully implemented without significant direct involvement of these agencies and non-governmental organizations.

Review of the Economic Effects

The general goal of a comprehensive effort such as the revised GTMP is to protect and enhance the status of the gopher tortoise in Florida either directly or indirectly for human benefit. Since the GTMP involves an investment of public funds, one gauge of the plan's success can be measured in its economic outcome, such as a comparison of the project's benefits and costs. While a benefit – cost analysis (BCA) is often used as an assessment of public projects, this analysis will consider only costs and not attempt to measure the potential benefits resulting from the GTMP. However, to fully appreciate the potential economic impact of the GTMP it is important to have a clear understanding of both the potential costs and benefits and their relationship to one another.

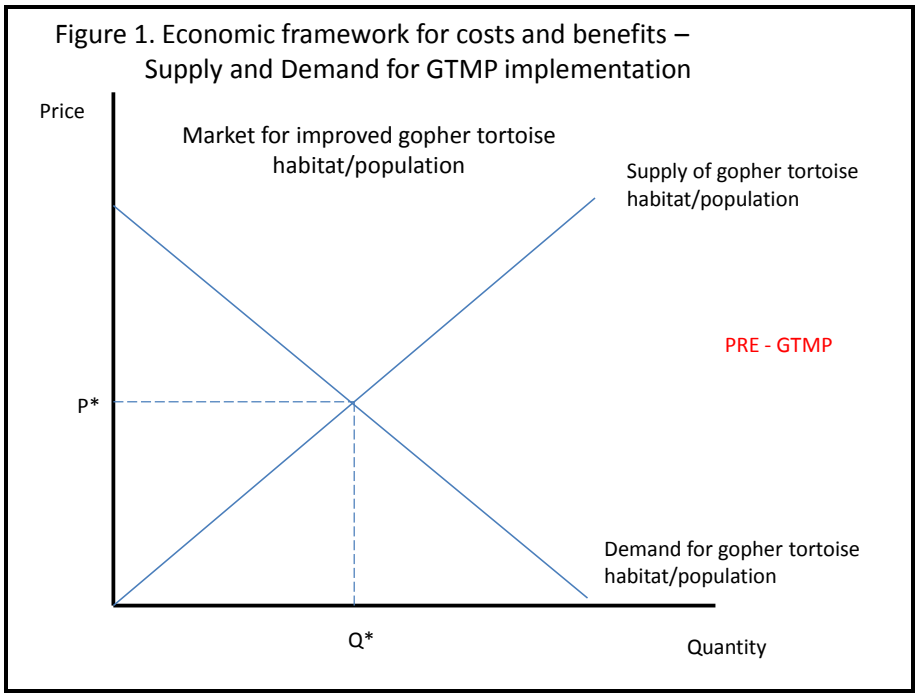
The recent economic and state budgetary retractions provide an even stronger incentive for both the public-at-large and policy makers to spend tax revenues more efficiently. Furthermore, with concern about the effect of regulation on the economy, it is also important to recognize the impact of public policy on the private sector within Florida. Consequently, there is a heightened interest in improving the efficacy of public projects and tracking their effect on the economy at large. To this end, the economics of management plans like the GTMP should be analyzed within the neo-classical economic structure of supply and demand. On the supply side, costs are expenses related to project development and implementation. These include all direct and indirect expenditures necessary to carry out the multiple tasks outlined in the GTMP. These costs are typically covered by public funds and justified by the public nature of the anticipated project benefits. However, cost should also include any value lost to society as a result of implementing the GTMP. On the demand

side, agents with marketable goods and services that benefit from the project will realize a measurable economic gain. Additionally, their gain will ripple indirectly through the economy at large. However, of even greater importance, there are also benefits that lack market value, and often overlooked in typical BCA studies. These include things associated with improved gopher tortoise numbers and habitat, such as improved ecological services and other beneficial non-market activities like improved wildlife viewing, hunting, etc.

To conduct a valid BCA, one must first correctly classify costs and benefits. Unfortunately, there is often confusion over this process, with many studies misclassifying project costs as benefits. One common example of this mistake is when insurance funds expended to restore lost infrastructure, result in economic impacts, which in turn are considered a "benefit" of the recovery. It is not uncommon to see politicians, and even economists, speak of the "benefits" of an economic "rebound" following a disaster recovery effort. Clearly the recovery expenditures are not a net benefit because they were redirected from other productive uses and used to repair functional infrastructure. If it were correct to consider these types of expenditures as beneficial, then it would make sense to pay people to vandalize property because of the positive impact generated by the subsequent repairs. In a similar fashion, public expenditures for capital projects are also erroneously considered benefits to the economy because they create jobs. Again, the funds that generated these "new" jobs were redirected from other useful purposes that in turn led to lost jobs. The reality of these expenditures is that they are project costs and need to be simply classified as such. Ultimately, the true measure of a project's benefit is the productive output of the capital investment. For example, the building of a public library will create benefits that are measured by the economic value people place on borrowing books and using the many services intrinsic to the library. The cost of the library is measured by the funds required to staff and build the facility and should not be considered as benefits. The jobs linked to these costs are not project benefits and to count them as such would mean one should list the jobs lost by removing the funds from their original source (the tax payer) as project costs.

Benefits and Costs: A Taxonomy

To avoid the common confusion surrounding public expenditures a simple taxonomy may be helpful. When defining benefits, it is important to understand the basics of market economics (supply and demand) which identify the costs related to, and the benefits derived from, the production and use of that good or service. Within a price and quantity framework, the demand for a typical good or service can be represented as a downward sloping line (Figure 1). In the case of gopher tortoise population/habitat, this would indicate that as the price for these items increase, the demand would decrease. In a similar fashion, the supply for a typical good or services can be represented as an upward sloping line, representing a positive cost associated with supplying this item, or that creating more gopher tortoises/habitat will cost more (Figure 1). The point where the supply and demand curves intersect (the level supplied equals the level demanded) represents the optimal or efficient price and level of gopher tortoise population/habitat (see P* and Q* in Figure 1). While the shape of the demand and supply curves and optimal levels for items like gopher tortoises are seldom known with exactitude, the graphic still provides the analyst a framework to help define costs and benefits.



Cost can be defined as simply the amount paid or charged for something, or the loss resulting from an action, and can be refined into several subcategories. The funds paid directly for a project (or action) can be termed direct costs and include all direct expenditures. However, most projects also involve costs and/or losses that are less obvious, these can be considered indirect costs. Some of the more important indirect costs include the costs or losses that result by foregoing another action or choice (opportunity cost), a measure of the secondary or "ripple" effect of redirected costs through an economy (economic impacts) and perhaps the most underrepresented of all costs, negative externalities. In the case of negative externalities, these are costs (losses) incurred by third parties not directly related to the project and can include both measureable losses and non-measureable losses, such as lost ecological services. An example of this could be the lost real estate value suffered by home owners adjacent to a noisy new airport, or reduced biodiversity resulting from excessive use of pesticides.

Like any public project, the GTMP entails costs of all types. The direct costs are rather obvious and easily measured. Less obvious, but nonetheless important are opportunity costs. These include the cost of redirecting labor and funds from other useful activities to support the GTMP. Other indirect costs, including the economic impacts of redirecting funds and any negative externalities, are even more obscure, but still worth acknowledging when present. They include the overall ripple effect on the economy-at-large caused by redirecting funds from one business sector to another (economic impact) and any possible externality suffered by unwitting third parties.

Not all costs are easily measurable. In many cases negative externalities are poorly understood and when they involve non-marketable goods and/or services, it is difficult to place a monetary value on their effect. On the other hand, other indirect costs are readily measurable and should be included within a BCA or other economic analyses. The opportunity costs accrued by an agency when it redirects labor and capital is often simple to

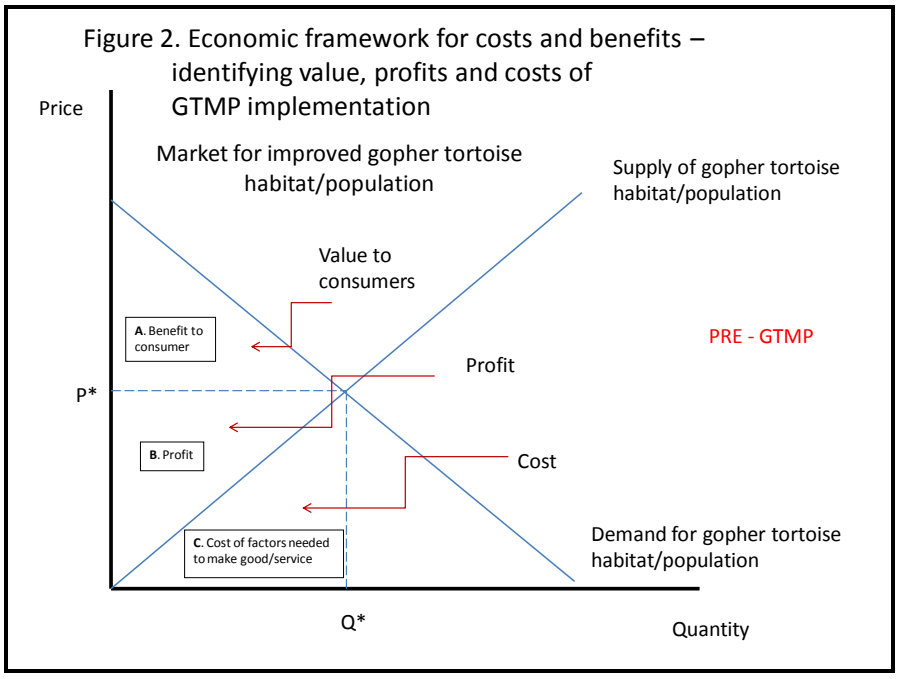
document and should be measured whenever possible. To help guide this effort, Table 1 groups the basic types of costs and their typical availability. This can be viewed as the guiding taxonomy or framework for conducting an economic cost analysis. The taxonomy allows for the systematic accounting for all costs and helps policy makers identify both the strengths and shortcomings in their final report.

Table 1. Taxonomy of Costs (C)

I. **Project Development and Implementation Costs**	***II.*** **Indirect Costs from affected parties and ecological services**
1. Direct Costs ***i.*** Directly budgeted agency expenditures made for the project (FWC) ***ii.*** Direct costs to regulated private firms and non-FWC public agencies	***1.*** Economic impact from successfully implementing the GTMP: impacts on business sectors
Opportunity Costs (not directly identified in project budget) ***i.*** Agency costs in labor and capita ***ii.*** Outside agency costs in labor and capital	***2.*** Negative externalities from successfully implementing the GTMP: indirect costs ***iii.*** Use value Directly measureable ***iv.*** Non-use value Indirectly measurable

This report will only consider the project's direct and opportunity costs (CI.1 and CI.2) and the economic impact of redirecting funds within the economic (CII.1). It is likely that the negative externalities resulting from any lost ecological services resulting from the GTMP are insignificant. However, in future cost analyses it would be useful to at least identify the possible sources of these losses, if any.

Costs can be graphically represented in Box C of Figure 2. This box includes all agency direct costs (CI.1), opportunity costs (CI.2) and the economic impact of redirected funds (CII.1). Typically negative externalities (CII.2) are not included. If negative externalities were added to Box C, it would have the effect of shifting the supply curve up and to the left, resulting in higher prices and fewer goods/services supplied.



Benefits can be defined as the improvement in welfare or well-being resulting from an action. Benefits can be valued both directly and indirectly (see Table 2). In the case of direct benefits, there are analytical procedures to measure the impact of these benefits and their ripple effect through an economy. In the case of the GTMP, these benefits include improvements to an economy resulting from the implementation of the GTMP and the restoration of gopher tortoise habitat and populations. There are also indirect benefits that typically lack market value. In this case these benefits include items such as improved ecological services and other non-market amenities such as improved wildlife viewing, hunting, etc.

Table 2. Taxonomy of Benefits (B)

I. Direct Project Benefits from affected ecological services	**II. Indirect Benefits from affected ecological services**
1. Restored marketable goods/services i. Direct effects ($) ii. Indirect effects ($) iii. Induced effects ($)	1. Restored non-marketable goods/services i. Use value Directly measureable ii. Non-use value

Reporting benefits resulting from the GTMP is not normally required by Florida State Statue and not included in this report. However, in future efforts, it would be useful to estimate these benefits to allow policy makers a more complete picture of the full effect of their management efforts.

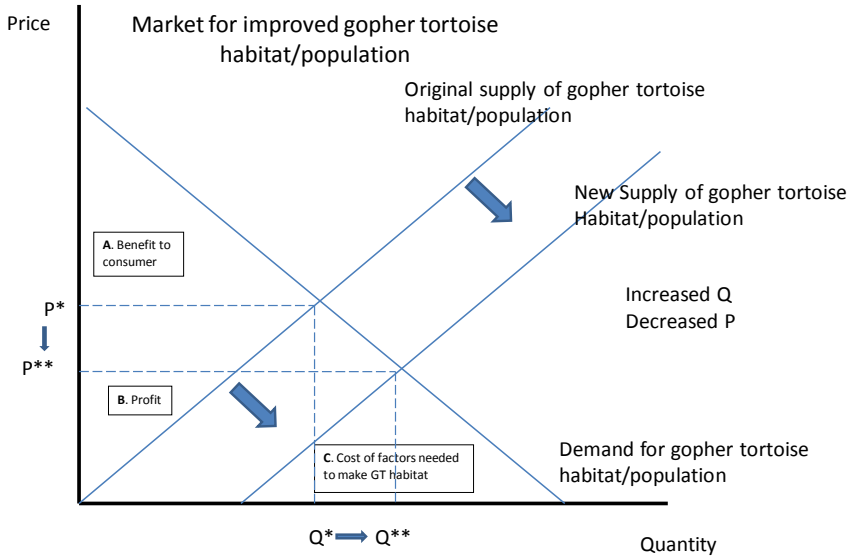
Referring back to Figure 2, benefits can be represented graphically by Boxes A and B. The benefit enjoyed by the consumers of the good or service is represented by Box A. This is often referred to as the consumer's surplus and is the correct measure of the value generated by this good or service to its user(s). This represents the value gopher tortoises

provide to people who value these animals and/or their associated habitat. When the good or service is privately produced, Box B. represents those private profits. In the case of gopher tortoise, there are no profits generated to the regulatory agency and these benefits are captured by the consumers. With publically provided goods and services, it is reasonable to combine Boxes A and B and consider them benefits accrued by the consumer.

A Management Change: The Welfare Effect of GTMP

The welfare change or net benefits resulting from a management plan can be graphically demonstrated by Figure 3. The GTMP results in an increased supply of gopher tortoises and their habitat. This causes a rightward-downward shift in the supply function which lowers the price of tortoises and their habitat, which in turn results in an increase in the use or enjoyment of the additional gopher tortoises and/or their improved habitat (please note the change in Q and P in Figure 3). The final result of implementing the GTMP would be an overall unambiguous increase in benefits enjoyed by those who value gopher tortoises and/or their habitat. The final change in project costs, however, is ambiguous and depends on the final shape of the supply and demand curves. While it may initially entail significant direct and indirect costs, the increase in gopher tortoises and their habitat could change the supply function (curve slope and/or shape) enough to eventually result in either higher or lower long term costs.

Figure 3. Economic framework for costs and benefits – after implementation of GTMP



Florida law requires a thorough cost analysis, the Statement of Estimated Regulatory Cost (SERC) as prescribed by Section 120.54(3)(b)., Florida Statutes (F.S.). This requirement is limited to documenting the incremental changes in costs and do not address the larger welfare picture addressed in Boxes A and B found in Figures 2 and 3. To comply with the SERC format, only the actual direct and appropriate indirect costs will be tracked. This means costs estimates will be limited to items CI.1, CI.2 and CII.1 in Table 1. Cost

estimates are based on the best available data and are provided for FWC and the regulated community.

Direct Costs of the Gopher Tortoise Management Plan (CI.1)

These are the direct costs to maintain the Gopher Tortoise Management Plan. They include the direct costs to the regulating agency (FWC) and direct costs to the regulated firms and non-FWC public agencies. All direct costs are listed in this section.

Direct Costs to FWC (CI.1.i)

The Human Resource Costs (staffing) were developed by identifying the base salary for each position (base salary information and benefits provided by the Office of Human Resources, FWC). Additionally, expenses, OCO (Operating Capital Outlay) and overhead were factored into the assessment to estimate the true cost of each position (Bureau of Accounting, FWC).

FWC Personnel Costs:

The largest reoccurring direct cost for this project is salaries for the staff presently managing the gopher tortoise for FWC. All cost calculations are based on 2011-2012 data and assumed to grow at a 2% rate for the five year period (2013 – 2017). Human resource costs are identified as either OPS or FTE by position title.

Overview: Total positions: 10
OPS – 4
FTE – 6
Actual/Recurring Costs (2011)

OPS Positions:

Biological Scientist III (one position)	
Base salary:	$ 42,240
Benefits:	$ 655
Expense + OCO	$ 11,215
Overhead:	$ 9,145
Total for position:	**$ 63,256**
Biological Scientists IV (one position)	
Base salary:	$ 57,366
Benefits:	$ 831
Expense + OCO	$ 11,215
Overhead:	$ 11,730
Total for position:	**$ 81,143**

Clerk (one position)	
Base salary:	$ 26,000
Benefits:	$ 377
Expense + OCO	$ 9,503
Overhead	$ 6,064
Total for position:	**$ 41,944**
Administrative Assistant II (one position)	
Base salary:	$ 33,280
Benefits:	$ 482
Expense + OCO	$ 9,503
Overhead:	$ 7,312
Total for position:	**$ 50,578**
Total four OPS Positions:	**$236,921**

FTE Positions:

There are 4 FTE Biological Scientist III positions. They will be identified as position a, b, c and d.

a. Biological Scientists III	
Base salary:	$ 36,468
Benefits:	$ 10,633
Expense + OCO:	$ 11,215
Overhead:	$ 9,855
Total for position:	**$ 68,171**
b. Biological Scientists III	
Base salary:	$ 36,468
Benefits:	$ 11,915
Expense + OCO	$ 11,215
Overhead:	$ 10,072
Total for position:	**$ 69,670**
c. Biological Scientists III	
Base salary:	$ 36,468
Benefits:	$ 10,633
Expense + OCO	$ 11,215
Overhead:	$ 9,855
Total for position:	**$ 68,171**
d. Biological Scientists III	
Base salary:	$ 36,468
Benefits:	$ 10,633
Expense + OCO	$ 11,215

Overhead:	$ 9,855
Total for position:	**$ 68,171**
Biological Scientists IV (one position)	
Base salary:	$51,432
Benefits:	$19,274
Expense + OCO:	$11,215
Overhead:	$13,845
Total for position:	**$95,766**
Biological Administrator I (one position)	
Base Salary:	$43,507
Benefits:	$20,096
Expense + OCO:	$11,215
Overhead:	$12,644
Total for position:	**$87,462**
Total all FTE Positions:	$457,411
Total Personnel Costs (4 OPS + 6 FTE) (for 2011)	**$694,332**

FWC Capital Costs:

Capital costs are all other non-salary expenses. These may vary greatly from year to year, however for the purpose of this report they are assumed to grow at a 2% annual rate.

10 Burrow Scopes @ $2,500	$25,000
Software and licenses @ $5,000	$5,000
Total Capital Costs:	$30,000

FWC Total Direct Costs for Five Year Plan

Total direct costs for the five year plan are the sum of personnel and capital costs and based on the 2011 figures. They are assumed to grow at a 2% annual rate to reflect the present level of inflation.

Total Direct Costs = Personnel Costs + Capital Costs

2013 Projected	$738,818
2014 Projected	$753,595
2015 Projected	$768,666
2016 Projected	$784,040
2017 Projected	$799,721
Five year total	$3,844,842

(Note: based on 2011 figure = $724,332)

Direct Costs to Private Firms and Non-FWC Public Agencies (CI.1.ii)

The total direct costs to the regulated community are determined by combining the mitigation contributions paid to FWC and an estimate of the cost paid to private third-party vendors to conduct the mitigation actions required by the mitigation permit. Since these mitigation actions are provided by private third-party vendors, they can vary by market conditions and are estimates, not exact figures. Table 3 lists these costs estimates by mitigation category and was provided by Dr. Perran Ross of the University of Florida in 2007. In 2012, these estimates were validated with a follow-up telephone survey conducted by the FWC Species Conservation Planning Section. The mitigation categories and their costs result from a range of actions that are listed in Table 4. Finally, the total direct costs by the private and public sectors are listed in Table 5 and compared across sectors in Figure 4.

Table 3. List of Estimated Costs to Third-Party Vendors by Mitigation Category:

Cost Category	Average Costs*	Range of costs*
Survey of Tortoises	$168	$15 – $1,000
Permit Application	$200	$125 - $600
Capture of Tortoises	$486	$150 - $1,000
Fencing Enclosure	$249	$250 - $ 1,250
Recipient Site Fee	$943	$450 - $2,000
*per tortoise		

Table 4. List of Mitigation Actions Required to Estimate Costs

Authorized Tortoise Permits – Training

Relocation Permits – (10 or fewer burrows, conservation, Burrow or Structure Protection, Temporary Exclusion, Disturbed Site)

1. Application preparation by consultant when appropriate (authorized agent).
2. Survey of tortoise on the property to be developed (by the authorized agent).
3. Capture (hiring the authorized agent to do and or oversee the work completed along with the costs of renting a backhoe and operator where appropriate).
4. Recipient site fees (when located offsite).

Recipient Site Permits

1. Application and coordination with FWC.
2. Site Survey.
3. Development of the Habitat Management Plan.
4. Easement (attorney fees, time, etc.)
5. Financial Assurance.
6. Additional costs such as fencing.

Table 5. Total Direct Costs to the Regulated Community - Mitigation Contributions Plus Private Third-Party Costs

Permit Type	Private Firms	Single Family Homeowners	Local Govt.	State Govt.	Federal Govt.
Authorized Gopher Tortoise Agent	$72,468	$0	$7,761	$7,761	$0
10 or Fewer Burrows	$202,467	$173,543	$99,238	$23,388	$0
Conservation	$2,314,143	$111,638	$1,003,568	$445,768	$55,426
Temporary Exclusion	$670,220	$0	$587,229	$0	$0
Burrow or Structure Protection	$1,311	$1,311	$874	$874	$0
Recipient Site	$44,000	$0	$33,000	$11,000	$0
Emergency Take	$0	$0	$0	$0	$0
Disturbed Site	$4,546	$0	$0	$0	$0
Total	**$3,309,157**	**$286,493**	**$1,731,672**	**$488,792**	**$55,426**

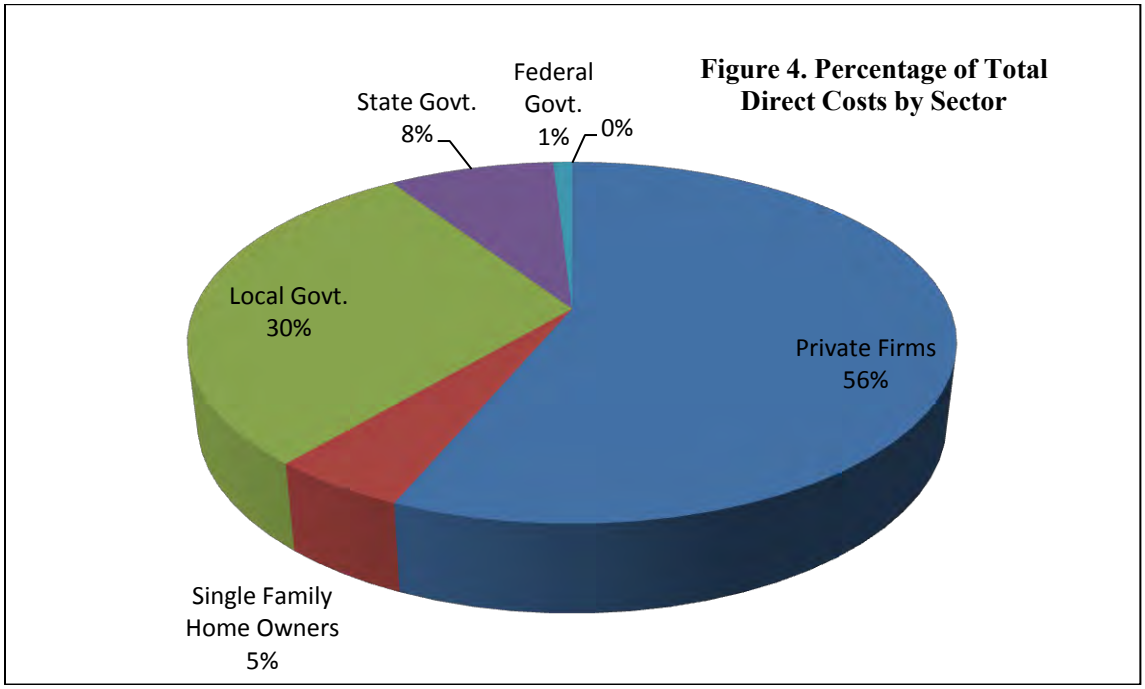


Figure 4. Percentage of Total Direct Costs by Sector

Opportunity Costs of the Gopher Tortoise Management Plan (CI.2)

The opportunity costs of the GTMP can be divided into those related to FWC new initiatives, law enforcement, agency grant match funds and other agency opportunity costs.

To understand the true cost of any action requires the identification and quantification of "opportunity costs." Opportunity costs are often referred to as "hidden costs." They are frequently omitted from cost studies because opportunity costs are not something for which one writes a check, but are still costs in terms of foregone or lost opportunity. Put another way, the true cost of a good or service is what one gives up to get it. Scarcity of resources (including time) is a fundamental economic consideration. Scarcity necessitates trade-offs, and trade-offs result in opportunity costs. Although the cost of a good or service often is thought of in terms of dollars, the opportunity cost of a decision is based on what must be given up (the next best alternative) as a result of the decision. Any decision that requires a choice between two or more options has an opportunity cost.

This current proposed revision of the Gopher Tortoise Management plan is the second five year action cycle of the plan. The following opportunity cost estimates are to take place during this five year period from 2013-2017.

Hourly rates and hourly rates with benefits of FWC personnel were provided by the Florida Fish and Wildlife Conservation Commission, Office of Human Resources. Data are for the year 2011 and assumed to be unchanged in 2012 (see Table 6 below).

Table 6. Listing of FWC staff participating in the conservation initiatives

Position	**Name of person currently in the position (as of August 1, 2012)**
Biological Administrator I (FTE)	Deborah Burr
Biological Scientist III (FTE) (4 positions)	Heather Rigney (1); Daphne McCann (2); Eric Seckinger (3); Samantha Dupree (4)
Biological Scientist III (OPS)	Alexandra Perryman
Biological Scientist IV (OPS)	Sarah Power
Clerk (OPS)	David Mulholland
Administrative Assistant II (OPS)	Donna Jones
Computer Programmer - Level 4 (OPS)	Smita Thakare
Deputy General Counsel	Michael Yaun
LE Officers (FTE)	
Law Enforcement Captain (FTE)	
Assistant Section Leader THCR (FTE)	David Johnson
Land Acquisition and Planning Administrator (FTE)	Gary Cochran
Biological Administrator III (FTE)	Joe Prenger
Biological Scientist IV (FTE)[1]	Richard McCann
Biological Scientist IV (FTE)[2]	Tom Ostertag
Biological Scientist IV (FTE)[3]	Joan Berish
Biological Scientist IV (FTE)[4]	Beth Stys
Biological Scientist IV (FTE)[5]	Dan Sullivan
Biological Scientist IV (FTE)[6]	Melissa Tucker
Biological Scientist IV (FTE)[7]	Bill Turner
Biological Scientist IV (FTE)[8]	Dave Cook
Biological Scientist IV (FTE)[9]	Angela Williams
Interpretive & Conservation Stewardship Programs Section Leader (FTE)	Judy Gillan
Unpaid position	Intern
Art Editor (FTE)	AnnMarie Tavares
Public Relations Specialists	Alicia Wellman
Web Designer	Leeann Feiertag
Web Designer	Jennifer Killingsworth

Conservation Actions – New Initiatives

Conservation actions will serve to achieve the measurable conservation objectives and strategies identified in the proposed revision to the Gopher Tortoise Management plan. These actions are best accomplished by applying an adaptive management approach that allows for easy adjustments to policies, guidelines and techniques based on observed conservation benefits. The following conservation actions are opportunity costs to the Florida Fish and Wildlife Conservation Commission.

Permitting: Enhance the online permitting system to provide better information and collect documentation on relocation of commensal species.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Computer Programmer 4 OPS	$46.32	$37.15	500	$18,575
Biological Scientists IV OPS	$27.98			

Work with military partners to develop a template agreement that will be used to implement the categorical exclusion.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV[1] FTE	$34.51	$42.16	80	$337
Deputy General Counsel	$49.82			

Evaluate the effectiveness of this categorical exclusion, modify the process if needed.

Staff	**Hourly/w benefits**	**Computation Rate**	**Hours To Complete**	**Opportunity Cost**
Biological Scientists IV[1] FTE	$34.51	$34.51	30	$1,035

Proposed Local Government Coordination: Provide gopher tortoise habitat assistance funding for habitat management activities on county/city owned conservation lands (annual funding dependant).

Staff	**Hourly/w benefits**	**Computation Rate**	**Hours To Complete**	**Opportunity Cost**
Biological Scientists III OPS	$22.07	$22.07	160	$3,531

Develop incentives for local government staff to obtain training necessary to qualify for an Authorized Gopher Tortoise Agent permit.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists III (OPS)	$22.07	$22.07	80	$1,765

Proposed Law Enforcement Actions: Implement gopher tortoise enforcement component into law enforcement officers' work plans in the Brooksville Ridge area.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Law Enforcement Captain	$42.19	$42.19	2 hrs.	$84.38
Field officers	$23.91	$23.91	12 hrs.	$286.32 Total - $479.29

Create a fact sheet for LE Dispatch personnel to assist with complainant calls.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Intern				0

Conduct proactive patrols and efficient response to complaints regarding gopher tortoises and development.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Law Enforcement Captain	$42.19	$42.19	1 hr.	$42.19
Field officers	0	0	0	0

Law Enforcement personnel required to engage in training

Staff	Hourly/w benefits	Computation Rate	Hours to Complete	Training Session	Opportunity Costs
Field officers engaged in training	$23.91	$23.91	1	216	$5,146.56

Law Enforcement Academy Recruits engaged in training

Staff	Hourly/w benefits	Computation Rate	Hours to Complete	Training Session	Opportunity Costs
200 Academy Recruits	$19.00	$19.00	1	200	$3,800

Trainer for Law Enforcement Training

Staff	Hourly/w benefits	Computation Rate	Hours to Complete	Opportunity Costs
Biological	$31.17	$31.17	Assumes 10 1 hr	$311.00

Administrator 1 FTE			sessions @40 per session	

Research calls for service and complaints to prioritize law enforcement efforts.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
LE Captain	$42.19	$42.19	2	$84.38
Field Officers	0	0	0	0

Develop a self study guide to be posted on the LE web page to assist officers with gopher tortoise enforcement methods.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
				Unknown

Proposed Habitat Management Actions: Implement ground cover restoration techniques on degraded and agriculturally disturbed sites to restore natural plant community functions and create suitable habitat for use by gopher tortoises and associated commensal species.

Staff	Hourly/w benefits	Computation Rate	Hours to Complete	Opportunity Costs
				Unknown

Coordinate with partner organizations to identify and prioritize local government and state lands in need of assistance with management activities.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists III (OPS)	$22.07	$22.07	200	$4,414

Coordinate with FWC's Landowner Assistance Program, and partner agencies to provide support and technical assistance to private landowners for managing gopher tortoise habitat.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Administrator III FTE	$31.00	$31.00	100	$3,100

Proposed Incentives Actions: Implement as appropriate Habitat Conservation Plans (HCPs), conservation banking, and Candidate Conservation Agreements with Assurances (CCAA) to benefit the conservation of gopher tortoises with interested landowners.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost

Biological Scientists IV[2] FTE	$30.22	$31.00	400	$12,400
Biological Administrator 1 FTE	$31.17			

Identify practices and land use changes that result in a positive habitat value for gopher tortoises on agriculture and silviculture lands. Develop a habitat value index to assist landowners with evaluating the identified land use practices.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Administrator III FTE	$31.00	$31.00	300	$9,399

Develop Payment for Ecosystem Services pilot incentive program for landowners.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Administrator I FTE	$31.17	$31.17	300	$9,351

Proposed Population Management: Coordinate with public land management agencies to identify sites that could benefit from either facilitated or directed population restoration.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV[3] FTE	$36.29	$36.29	200	$7,258

Determine best sources of gopher tortoises for restocking on select publicly owned conservation lands.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV[3] FTE	$36.29	$36.29	200	$7,258

Proposed Disease Management: Create a gopher tortoise mortality event database and coordinate with other agencies and local governments to document incidences of unusual or large-scale tortoise die-offs.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV OPS	$27.98	$32.00	130	$4,160

Biological Scientists IV[3] FTE	$36.29			

Conduct study to sample serology of tortoises on select recipient sites following multiple relocations to determine exposure status to mycoplasma.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV[3] FTE	$36.29	$36.29	200	$7,258

Provide link on FWC website to *Handbook on Gopher Tortoise (Gopherus polyphemus) Health Evaluation Procedures for Use by Land Managers and Researchers* to assist with determination of tortoise health and illness.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Web Designer[1]	$27.39	$27.39	10	$274

Proposed Monitoring Actions: Create and use a conservation easement database allowing summarization of gopher tortoise habitat preserved by FWC efforts outside of the gopher tortoise permitting process.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV (OPS)	$27.98	$27.98	250	$6,995

FWC will coordinate with other agencies and organizations to assess and record the acreages of private lands protected under conservation easements or through other programs.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV (OPS)	$27.98	$27.98	100	$2,798

Create a form to standardize monitoring data collected from recipient sites.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV (OPS)	$27.98	$36.00	150	$5,400
Computer Programmer 4 (OPS)	$43.62			

Conduct periodic GIS and permitting data assessments to monitor the rate of gopher tortoise habitat loss.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV[4]	$28.11	$28.11	160	$4,498

Conduct a GIS analysis on patch sizes 250 acres or greater to include parcels, SHCAs, and Landowner Assistance Program focal areas.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV[4]	$28.11	$28.11	150	$4,216

Once developed, FWC will implement the monitoring protocol created by the CCA partners when assessing tortoise populations on its lands and work with partner agencies to implement it on all public conservation lands that contain gopher tortoises.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV[5] FTE	$31.84	$31.84	400	$12,736

Summarize the number of gopher tortoises relocated annually.

Staff	**Hourly/w benefits**	**Computation Rate**	**Hours to Complete**	**Opportunity Cost**
Biological Scientists IV (OPS)	$27.88	$27.88	50	$1,399

Create series of maps that include potential habitat maps for commensal species (species richness maps) to aid in identification of areas with highest priority.

Staff	**Hourly/w benefits**	**Computation Rate**	**Hours To Complete**	**Opportunity Cost**
Biological Scientists IV[4] FTE	$28.11	$28.11	160	$4,498

Enhancements to the online permitting system will be examined to allow more flexibility in site selection, and to promote more standardized recording of commensal species encounters and relocations.

Staff	**Hourly/w benefits**	**Computation Rate**	**Hours To Complete**	**Opportunity Cost**
Computer Programmer 4 (OPS)	$43.62	$36.00	150	$5,400
Biological Scientists IV (OPS)	$27.98			

FWC will continue to assess and summarize commensal species relocation events.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV (OPS)	$27.98	$27.98	50	$1,399

Proposed Education and Outreach Actions: Create fact sheet on the gopher tortoise's keystone species role and its associated commensal species.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Intern			155	0

Create a tortoise-wise community program, and establish one new community per year. Program can include information on road mortality, role as a keystone species, laws and regulations, appropriate yard plantings, and impacts of pets.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Interpretive Stewardship Programs Section Leader (FTE)	$33.04	$27.55	80	$2,204
Biological Scientists III (OPS)	$22.07			

Establish one new tortoise-wise community project per year.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists III (OPS)	$22.07	$22.81	120	$2,737
Biological Scientists III[1] FTE	$23.56			

Create a presentation and offer it to targeted communities; include distribution of the "Living with Gopher Tortoises" brochure.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Intern				0

Create a gopher tortoise plant list for property owners.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Intern				0

Create web pages on the FWC gopher tortoise website, including a "Save Space for Wildlife" page, a commensals page, and a road mortality issues page.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Web Designer[2] FTE	$20.27	$20.27	100	$2,027

Develop and implement a citizen science web portal.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Web Designer[2] FTE	$20.27	$20.27	300	$6,081

Investigate use of billboards for messaging.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Interpretive Stewardship Programs Section Leader FTE	$33.04	$33.04	Unknown	Unknown

Evaluate educator's packet as the basis for an electronic field trip activity guide regarding gopher tortoise conservation.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Interpretive Stewardship Programs Section Leader FTE	$33.04	$33.04	25	$826

Promote availability of fact sheet on proper housing, handling, record keeping, and release guidelines.

Staff	Hourly/w benefits	Computation Rate	Hours to Complete	Opportunity Cost
Biological Scientists IV[9] FTE	$30.85	$30.85	25	$771

Create a fact sheet on gopher tortoise best management practices for agriculture and silviculture.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Intern				0

Create a "safe roads for people and tortoises" card for use by law enforcement for use when stopping motorists.

Staff	Hourly/w	Computation	Hours To	Opportunity

	benefits	Rate	Complete	Cost
Intern				0

Create a fact sheet to address minimizing road mortality.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Intern				0

Use social media outlets as appropriate to advance gopher tortoise awareness (e.g. Facebook, Twitter, YouTube, and Flickr).

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Web Designer[2] FTE	$20.27	$20.27	100	$2,027
Public Relations Specialists	$20.27			

Proposed Commensal Conservation Actions: Develop effective relocation strategies and guidelines for each species as appropriate.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV[6] FTE	$27.36	$29.27	500	$14,635
Biological Scientists IV[7] FTE	$26.70			
Biological Scientists IV[8] FTE	$33.75			

Develop monitoring protocols for priority commensals that are relocated to collect information to inform future management.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV[6] FTE	$27.36	$29.27	500	$14,635
Biological Scientists IV[7] FTE	$26.70			
Biological Scientists IV[8] FTE	$33.75			

Identify and prioritize appropriate potential recipient sites for commensal species when relocated.

Staff	Hourly/w	Computation	Hours To	Opportunity

	benefits	Rate	Complete	Cost
Biological Scientists IV[6] FTE	$27.36	$29.27	100	$2,927
Biological Scientists IV[7] FTE	$26.70			
Biological Scientists IV[8] FTE	$33.75			

Determine best protocols for releasing commensals at recipient sites that increase their chance for survival.

Staff	Hourly/w benefits	Computation Rate	Hours To Complete	Opportunity Cost
Biological Scientists IV[6] FTE	$27.36	$29.27	200	$5,854
Biological Scientists IV[7] FTE	$26.70			
Biological Scientists IV[8] FTE	$33.75			

Summary of New Initiative Opportunity Costs

In summary, the total FWC opportunity costs for the second five year action cycle of the Gopher Tortoise Management Plan (2013 – 2017) is $189,407. This is a measure of the indirect agency costs that would be committed to this effort and not available for other FWC functions.

Agency Grant Match Funds

The following opportunity costs are the second five year action cycle FWC funds needed for matching grants for new research and management actions. These are funds that will not be available for alternative FWC purposes.

Proposed Local Government Coordination:

- Provide gopher tortoise habitat assistance funding for habitat management activities on county/city owned conservation lands (annual funding dependant). **Amount: $150,000**

Proposed Law Enforcement Actions:

- Create a fact sheet for LE Dispatch personnel to assist with complainant calls. **Amount: $600**

- Develop a self study guide to be posted on the LE web page to assist officers with gopher tortoise enforcement methods. **Amount: $3,000**

Proposed Habitat Management Actions

- Implement ground cover restoration techniques on degraded and agriculturally disturbed sites to restore natural plant community functions and create suitable habitat for use by gopher tortoises and associated commensal species. **Amount: $400,000**

- Coordinate with FWC's Landowner Assistance Program, and partner agencies to provide support and technical assistance to private landowners for managing gopher tortoise habitat. **Amount: $600,000**

Proposed Incentives Action

- Develop Payment for Ecosystem Services pilot incentive program for landowners. **Amount: $300,000**

Proposed Monitoring Actions

- Conduct a comprehensive qualitative assessment of gopher tortoise habitat on public conservation lands. **Amount: $150,000**

- Once developed, FWC will implement the monitoring protocol created by the CCA partners when assessing tortoise populations on its lands and work with partner agencies to implement it on all public conservation lands that contain gopher tortoises. **Amount: $20,000**

Proposed Education and Outreach Actions

- Create fact sheet on the gopher tortoise's keystone species role and its associated commensal species. **Amount: $1,000**

- Create a tortoise-wise community program, and establish one new community per year. Program can include information on road mortality, role as a keystone species, laws and regulations, appropriate yard plantings, and impacts of pets. **Amount: $2,000**

- Create a gopher tortoise plant list for property owners. **Amount: $600**

- Create videos and 30 second public service announcements on pertinent gopher tortoise topics. **Amount: $5,000**

- Enhance educator's packet as needed to incorporate new or revised materials. **Amount: $1,000**

- Train volunteers to offer the educator materials at appropriate venues. **Amount: $1,000**

- Create a fact sheet on gopher tortoise best management practices for agriculture and silviculture. **Amount: $600**

- Create a "safe roads for people and tortoises" card for use by law enforcement for use when stopping motorists. **Amount: $1,200**

- Create a fact sheet to address minimizing road mortality. **Amount: $600**

Summary of Agency Grant Match Funds

In summary, the total FWC funds needed for grant match projects in the second five year action cycle of the Gopher Tortoise Management Plan (2013 – 2017) is $1,836,600. This is a measure of the indirect agency costs that would be committed to this effort as grant matches and not available for other FWC functions.

Other Non-FWC Public Agency Opportunity Costs

The following costs estimates are not direct or indirect costs sustained by the Florida Fish and Wildlife Conservation Commission or the state of Florida. They are, however, indirect costs sustained by non-FWC funding authorities for the purpose of providing research grants. These indirect costs are associated with the second five-year action cycle.

Proposed Research Actions

- Determine marking technique for juvenile tortoises that will persist over time. **Amount: $45,000**

- Find improved method to more accurately determine tortoise age. **Amount: $150,000**

- Evaluate usefulness of satellite telemetry for intensive monitoring of tortoise movements. **Amount: $100,000**

- Evaluate minimum patch size and population size needed to maintain a functional population. **Amount: $300,000**

- Evaluate survival of older juvenile and subadult size classes to help alleviate detection problem associated with hatchling tortoise burrows. **Amount: $45,000**

- Evaluate best methods to detect hatchling and juvenile burrows, *e.g.*, post-burn surveys; use of canines to locate burrows. **Amount: $45,000**

- Gather additional data on opportunistic sheltering, use of microhabitats, and dispersal by juvenile tortoises. **Amount: $45,000**

- Determine if winter burns contribute to calcium depletion in juvenile tortoises. **Amount: $45,000**

- Determine which factors enhance site fidelity and overall relocation success, *e.g.*, source, number, and size/sex of tortoises; habitat type; season of relocation, etc. **Amount $50,000**

- Evaluate habitat use and movements in poorly-drained flatwoods, especially in South Florida. **Amount: $75,000**

- Conduct follow-up studies of tortoises moved under temporary exclusion permits to determine response to temporary displacement along linear, disturbed habitats. **Amount: $75,000**

- Conduct surveys of the genetic variation to determine subpopulations and the level of gene flow among subpopulations. **Amount: $200,000**

- Identify habitat characteristics that influence home range sizes, habitat utilization, and species densities in various habitats. **Amount: $150,000**

- Determine and implement effective methods for surveying priority commensal populations on areas where gopher tortoises are found. **Amount: $150,000**

- Monitor relocated priority commensals to assess the survivorship and behavior of those individuals and impacts on recipient populations. **Amount: $200,000**

- Evaluate the disease susceptibility and transmission in advance of relocating priority commensals**. Amount: $150,000**

- Conduct surveys for invertebrate commensals to determine distributions, habitat, and collect specimens and data for analyses. **Amount: $100,000**

Summary of Other Agency Opportunity Costs

In summary, the total of non-FWC agency opportunity costs for the second five year action cycle of the Gopher Tortoise Management Plan (2013 – 2017) is $3,075,000. This is a measure of the indirect non-FWC agency costs that would be committed to this effort and not available for other non-FWC functions.

Permitting and the Economic Impact of the Gopher Tortoise Management Plan CII.1

The gopher tortoise has been protected in Florida for over 30 years, initially as a Species of Special Concern, and since 2007 as a Threatened species. Any activity involving its take has required the prior issuance of an appropriate permit or authorization from the Florida Fish and Wildlife Conservation Commission (FWC). The permitting system for gopher tortoises has been restructured to provide greater conservation benefit to reflect this change in status. A summary of permits can be found in Table 7.

Permitting – Summary

The funds collected via the permitting system (mitigation contributions) constitute a transfer of funds from the regulated community to FWC and provide the income needed to implement the GTMP. Additionally, permitting often requires the regulated community to hire third-party private vendors to complete actions required by the permit (see Tables 3 and 4). The actions of hiring private third-party vendors to meet the conditions of the permit constitute a transfer of funds from the regulated community (both private and government sectors) to the private sector via the third-party vendor. The resulting economic transfers in both directions (private to public and public to private) necessarily cause secondary impacts within the economy that reach beyond the regulated community and the collecting agency. The following section will estimate the economy-wide economic impact resulting from these transfers.

Permitting – A Summary of Permit Type and Corresponding Mitigation Contribution

- **Authorized Agent -** $500 (one-time contribution). Authorized gopher tortoise agents are individuals who are permitted by FWC for some or all of the following activities: surveying, trapping, marking, transporting, and relocating gopher tortoises, and relocating gopher tortoise commensals. Use of an authorized agent is required for: all off-site relocation projects, regardless of capture method; on-site relocation projects that involve the relocation of more than five gopher tortoises (10) burrows; on-site relocation projects that involve any method of capture other than bucket trapping, live trapping, or hand shovel excavation. Some consultants qualify for the authorized agent permit by completing FWC approved training courses at an estimated cost to the consultant of $1,200. The $1,200 contribution to complete the FWC approved training courses is a transfer of income to the private sector and is not reverted to FWC.

- **10 or Fewer Burrows** – Tortoises are relocated on-site or off-site. Gopher tortoises relocated off-site under 10 or Fewer Burrows permit cannot be relocated to an unprotected site. The mitigation contribution is $200.

- **Conservation**
  >10 Burrows relocated to long-term protected area, to public conservation lands, or from public projects to contiguous public conservation land. The mitigation contribution is $200 for the first group of 10 burrows (up to five gopher tortoises) and $300 for each additional tortoise.

- **Conservation**
  >10 burrows relocated to short-term protected area - The mitigation contribution is $200 for the first group of 10 burrows (up to five gopher tortoises) and $3,000 for each additional tortoise.

- **Conservation**
  >10 burrows relocated to unprotected area - The mitigation contribution is $3,000 per tortoise.

- **Temporary Exclusion –** Exclusions for more than 6 months must apply for a Conservation permit. The mitigation contributions are $100 per tortoise (exclusions < 2 months), $200 per tortoise (exclusions 2 to 4 months), and $300 per tortoise (exclusions 4 to 6 months).

- **Burrow or Structure Protection –** On-site relocation only. The mitigation contribution is $25 for up to 2 burrows.

- **Emergency Take –** The mitigation contribution is $4,000 per tortoise.

- **Disturbed Site –** The Disturbed Site permit may be required in situations where premature disturbance to the vegetation or ground has occurred before gopher tortoise borrow surveys are complete or before gopher tortoise capture and relocation activities have been completed. The mitigation contribution is $500 additional per tortoise added to the standard mitigation for 10 or Fewer Burrows permits and Temporary Exclusion permits (exclusion 4-6 months only) and $1,500 additional per tortoise added to the standard mitigation Conservation permit.

Permitting Costs to the Regulated Community

The economic analysis that follows will demonstrate costs to the regulated community based on costs to private firms, single family homes, local govt., state government and the federal government and by permit type. Cost data are for the year 2011. These costs represent a redirected cost within the economy (CII.1 in Table 1). The redirection of funds will have a ripple effect on the economy and its many sectors and reported in Tables 7 – 12 below.

General Background Data (All Permits) - Data are provided where available (see Figure 5 below).

- **Authorized Gopher Tortoise Agent:** In 2011 the Authorized Gopher Tortoise Agent permit comprised 13.20% of all permits issued and there were 68 of these permits issued during the year. The estimated average cost of this permit is $1,294.12 and the estimated range of total costs is $500 - $1,700. Additionally, 45 of the 68 newly permitted Authorized Gopher Tortoise Agents in 2011 were permitted after completing an FWC approved training course. The cost of the training course is approximately $1,200 and is paid by the individual seeking authorization.
- **10 or Fewer Burrows:** This category comprises 49.71%, or almost one-half of the total number of permits issued in 2011. The total number of permits issued in this category was 256. The estimated average costs and range of costs were not available. There were 1,003 tortoises permitted in this category in 2011.
- **Conservation:** Within this category, Conservation permits comprised 27.38% of all permits issued in 2011. The estimated average cost is $27,879 and the estimated range of costs for this permit is $13,371 - $72,116. There were 3,522 tortoises permitted and 2,083 tortoises relocated in this category in 2011.
- **Temporary Exclusion for Major Utility Corridors:** There were 30 permits issued in 2011. This category represents 5.83% of all permits issued by FWC in 2011. The estimated average cost for this permit is estimated at $41,915 and the estimated range of costs is $18,511 - $107,433. There were 2,123 tortoises permitted in 2011 within this category.
- **Burrow or Structure Protection:** In 2011 this category of permit represented 1.94% of all permits issued. There were 10 permits issued and 13 tortoises permitted and relocated.
- **Recipient Site:** This category represents 1.55 % of all permits issued in 2011. The estimated average costs for this permit was $11,000 and the range of costs is estimated at $6,500 - $25,000. There were 8 permits issued in 2011.
- **Emergency Take:** This category of permit is highly variable based on emergencies like hurricanes, etc. Currently, there are no data available for this category.
- **Disturbed Site:** This category represented 0.39% of all permits issued in 2011 and there were only 2 permits issued during the year. The average costs are estimated at $2,273 and the range of costs is estimated at $2,005 - $6,150. There were 4 tortoises permitted in 2011.

Comparison of Permits by Type and Total Costs

Half (50%) of all permits issued in 2011 were for the 10 or Fewer Burrows permit which represented only 5% of the total costs to the regulated community. The Conservation permit represented 28% of all permits issued in 2011 and accounts for 59% of the total costs for members of the regulated community. Additionally, the Temporary Exclusion permit represented only 5% of all permits issued but 32% of the costs paid by the regulated community. This permit is highly variable and costs are directly related to utility corridor development (Figs. 5 and 6).

Figure 5. Percentage of Permits by Type

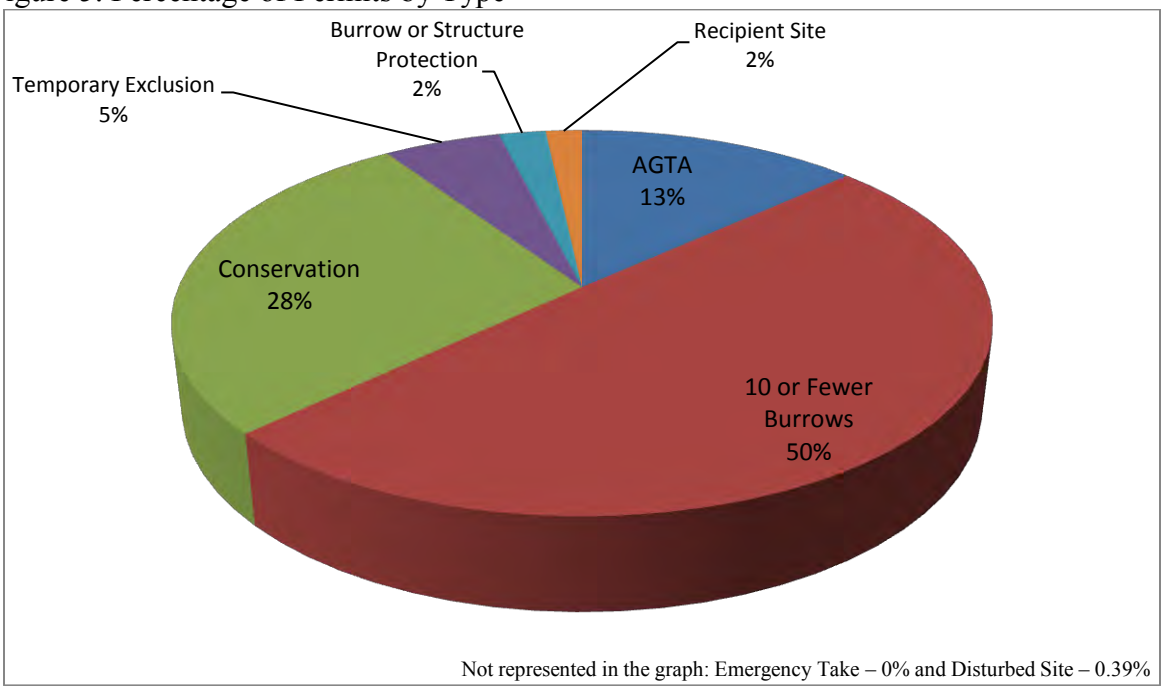
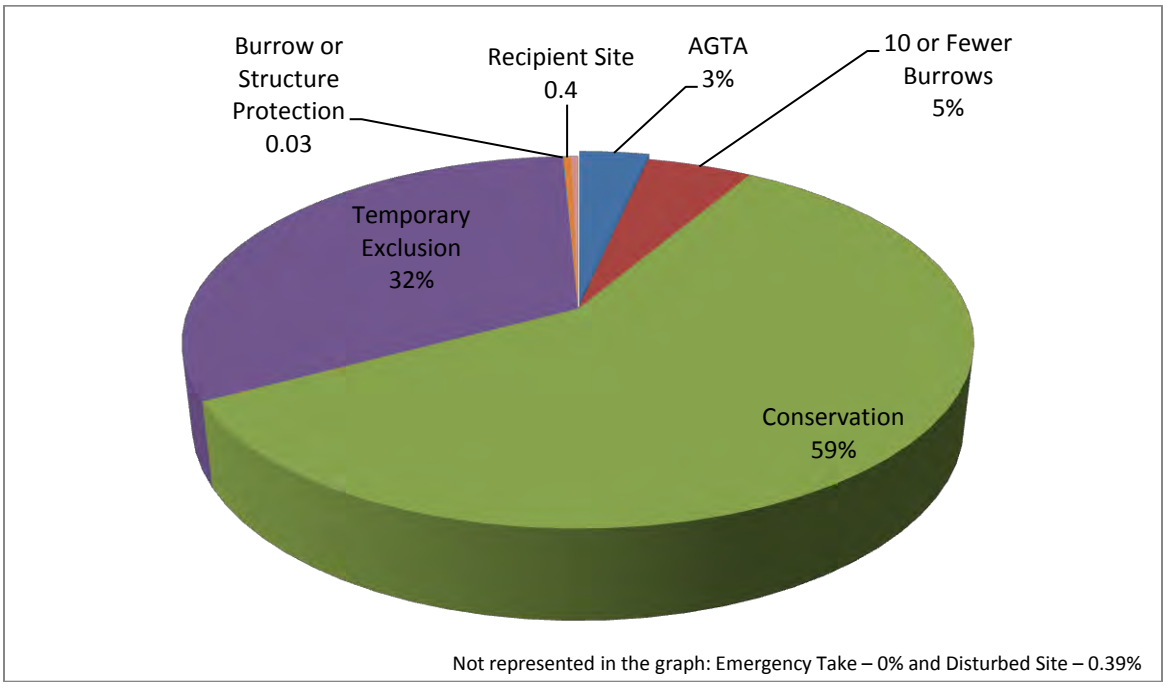


Figure 6. Percentage of Mitigation Contributions by Permit Type



Mitigation Contributions by Economic Sector (All Permit Types) 2011

The largest costs sustained for mitigation contributions were sustained by private firms at $570,279.02. Local government sustained costs of $314,310.18 followed by state government at $72,470.52 and single family home owners at $34,552.04. Federal government costs were $8,271.06 (Table 8, for a total of $999,882.82).

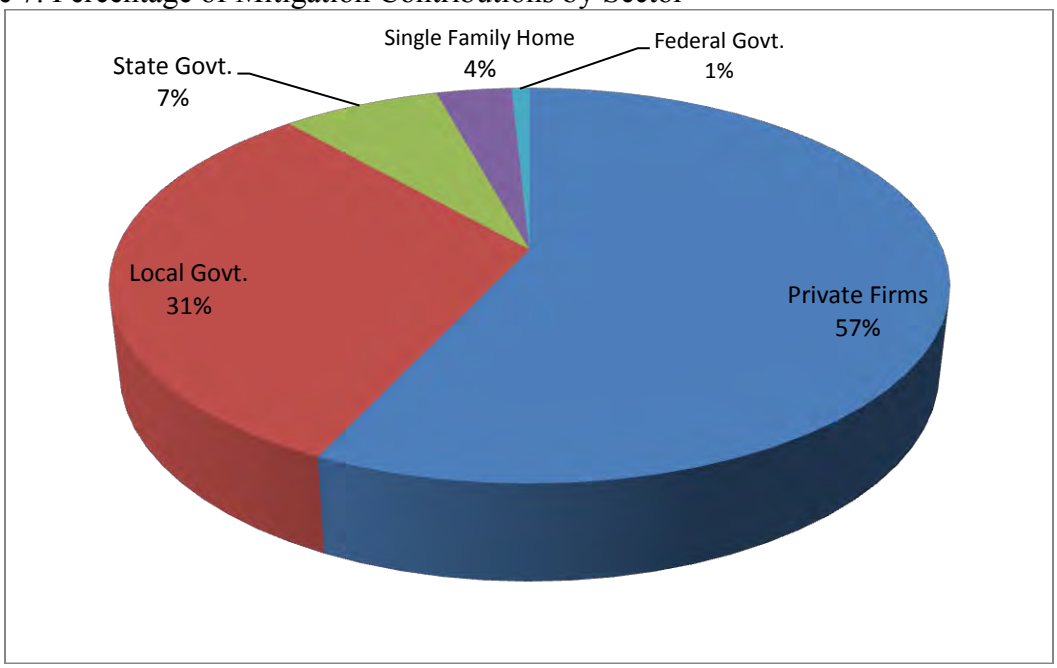
Table 8. Mitigation Contributions by Sector (All Permit Types)

Sector	Costs
Private Firms	$570,279.02
Local Govt.	$314,310.18
State Govt.	$72,470.52
Single Family Home	$34,552.04
Federal Govt.	$8,271.06

Percentage of Mitigation Contributions by Sector

Private firms represented the largest percentage of mitigation contributions at 57 % followed by local government at 31%. State government represented 7% of total mitigation contributions followed by single family home owners at 4% and the federal government at 1% of total mitigation contributions for the regulated community (Figure 7).

Figure 7. Percentage of Mitigation Contributions by Sector



Cost of Mitigation Contributions to the Regulated Community by Sector and Permit Type

Private firms represent 57 percent of the mitigation contributions and the largest expenditure is for the Conservation permit at $345,331.02 followed by the Temporary

Exclusion permit at $170,986.40. Total mitigation contributions for private firms in 2011 were $570,279.02. Local government represented 31 percent of all mitigation contributions by the regulated community. The largest expenditures for local government was $149,813.60 for Temporary Exclusion permits and $149,758.98 for Conservation permits and total costs for this sector was $314, 310.18. State government represented approximately 7 percent of the total mitigation contributions. The Conservation permit was by far the largest expenditure for state government at $66,520.44 followed by the 10 or Fewer Burrows permit at $2,401.28 total mitigation contributions for this sector were $72,470.52. This was followed by single family home owners who represented 4 percent of total mitigation contributions. The largest mitigation contribution for single family home owners was for the 10 or Fewer burrows at $17,817.60 followed by the Conservation permit at $16,659.44. Total mitigation contributions for single family home owners were $34,552.04. The Federal government represented 1 percent of total mitigation contributions for permitting and their costs came in only one category of permit, the Conservation permit at $8,271.06 (Tables 8 and 9).

Table 9. Mitigation Contributions to the Regulated Community by Permit Type (Cost CII.1)

Permit Type	Private Firms	Single Family Homeowner	Local Govt.	State Govt.	Federal Govt.
Authorized Gopher Tortoise Agent	$27,999.00	$0.00	$2,998	$2,998	$0.00
10 or Fewer Burrows	$20,787.20	$17,817.60	$10,188.80	$2,401.28	$0.00
Conservation	$345,331.42	$16,659.44	$149,758.98	$66,520.44	$8,271.06
Temporary Exclusion	$170,986.40	$0.00	$149,813.60	$0.00	$0.00
Burrow or Structure Protection	$75.00	$75.00	$50.00	$50.00	$0.00
Recipient Site	$2,000.00	$0.00	$1,500	$500.00	$0.00
Emergency Take	$0.00	$0.00	$0.00	$0.00	$0.00
Disturbed Site	$3,100	$0.00	$0.00	$0.00	$0.00
Total	$570,279.02	$34,552.04	$314,310.18	$72,470.52	$8,271.06

Table 10. Total Mitigation Contributions to the Regulated Community by Permit Type (All Sectors) (Cost CII.1)

Permit Type	**Total Permitting Cost to the Regulated Community**
Authorized Gopher Tortoise Agent	$33,996.60
10 or Fewer Burrows	$51,194.88
Conservation	$586,541.34

Temporary Exclusion	$320,800.00
Burrow or Structure Protection	$250.00
Recipient Site	$4,000
Emergency Take	$0.00
Disturbed Site	$3,100.00
Grand Total *	**$999,882.82**

*Note: The actual revenue received by FWC for 2011 was $999,950.00. The $999,882.82 in Table 10 above is due to rounding error of 0.0068.

Economic Impact

The following economic analysis was performed with version 3.0 of IMPLAN (Impact Analysis for PLANning), a software program designed to analyze economic impacts. IMPLAN's structure is based on the conventional input/output (I/O) approach to determining economic impacts. Input output models provide rigorous mathematical expression of the economic relationships among sectors of the economy (groupings of businesses and government based on their economic function), and between businesses and consumers. An input/output model represents the flows of economic activity between sectors within a region, capturing each sector's purchases from other sectors of the economy in order to produce a dollar's worth of goods and services.

One advantage of the input/output models is the broad economy wide perspective they take. In economic terminology, they provide a "general equilibrium" framework instead of a "single-market" analysis, or "partial equilibrium" perspective. The general equilibrium approach examines not only the markets in which the primary transactions of interest take place, but also tracks the economic effect through all related markets and sectors of the economy. So, the input/output model captures not only the direct impact of permitting costs (expenditures) but also the secondary, or indirect and induced effects as the impact moves (ripples) through the economy as a whole.

The following is an analysis of the economic impacts resulting from all direct costs related to the GTMP. All data files for this analysis are specific to Florida. The analysis will look at the economic impact of two distinct transfers of funds: private funds to FWC to cover mitigation contributions (see summary in Tables 9 and 10 above), and government funds to private sector vendors to cover mitigation actions. Table 11 is an estimate of total third-party costs by permit type and section regulated community.

Table 11. Private Third-Party Costs by Permit Type and Sector

Permit Type	Local Government	State Government	Federal Government
Authorized Gopher Tortoise Agent	$4,763	$4,763	$0
10 or Fewer Burrows	$89,050	$20,987	$0
Conservation	$853,809	$379,248	$47,155
Temporary Exclusion	$437,415	$0	$0
Burrow or Structure Protection	$824	$824	$0
Recipient site	$31,500	$10,500	$0
Emergency Take	$0	$0	$0

Disturbed Site	$0	$0	$0
Total	**$1,417,362**	**$416,322**	**$47,155**

The Economic Impact of Transfers from the Private Sector to FWC – Mitigation Contributions

Permitting costs for private firms in 2011 were $570,279. Employment, labor income and value added represent a loss to the industry sectors identified in this economic analysis. Table 12 provides an identification and description of the sectors used in the economic analysis and Table 13 provides the distribution of loss for private firms in 2011; and Table 14 identifies the top five industries affected. The economic effect of funds transferred from government agencies to FWC are not considered because the ripple effect of money within the government sector is the same regardless of level (local, state or federal).

Table 12. Sectors and Description

Business Sector	**Description**
34	Construction of new non-residential buildings
35	Construction of new non-residential manufacturing structures
37	Construction of new residential permanent site structures

Table 13. Description of Loss – Private Firms (2011) within Florida

Impact Type	**Employment**	**Labor Income**	**Value Added**	**Output**
Direct Effect	-4.4	-$210,582	-$243,724	-$570,279
Indirect Affect	-1.3	-$66,726	-$100,466	-$173,457
Induced Effect	-1.9	-$82,376	-$148,609	-$243,003
Total Effect	-7.6	-$359,685	-$492,798	-$986,739

Table 13 above describes the loss of transferring permitting costs in 2011 of $570,279 from the private sector to state government. The economic model reports an annual direct loss to the affected industries of 4.4 jobs. The indirect loss is associated with the affected industries purchasing goods and services among themselves and the model reports a loss of 1.3 jobs. The induced effects are a result of a decrease in household spending and result in an additional 1.9 job losses. The total annual affect is the sum of the direct, indirect and induced losses. Labor income (all forms of employment income, including employee compensation which includes wages and benefits) is reduced by $359,685. The value added economic effect is a combination of labor income, other property income and indirect business taxes which result in an annual loss to the private sector of $492,798. The annual loss of economic output (total value of all goods and services) is estimated at $986,739. This is the economic affect statewide of the costs of permitting in 2011(statewide model) as opposed to regional or local impacts.

Table 14. Top 5 Industries Affected (2011)

Business Sector	Description	Employment	Labor Income	Value Added	Output

34	Construction of new non-residential buildings	-2.7	-$128,685	-$144,853	-$320,279
35	Construction of new non-residential manufacturing structures	-0.9	-$43,271	-$48,356	-$100,000
37	Construction of new residential permanent structures	-0.8	-$38,627	-$50,514	-$150,000
369	Architectural Engineering Firms	-0.3	-$16,429	-$17,348	-$31,210
413	Food Services	-0.2	-$5,705	-$8,031	-$14,855

The following tables identify the economic effects of permitting costs paid by private firms in 2011 to state government (FWC).

Table 15. Economic Analysis of Private Firms 2011 Monetary Permitting Contributions to State Government - Geographic Area: State of Florida - Sector: 3437 – Employment and Payroll (state and local government non-education)

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	+6.9	+$481,760	+$547,286	**+$570,279**
Indirect Effect	$0	$0	$0	$0
Induced Effect	+3.4	+$142,393	+$256,581	+$419,883
Total Effect	+10.3	+$624,153	+$803,867	+$990,162

In Table 15 above, the model demonstrates the economic effects of private firms monetary permitting contributions to *state government* of $570,279.These are costs paid by the private sector for permitting costs in 2011. The direct effect shows an additional 6.9 jobs will be added to state government and a total increase of 10.3 jobs. Of these 10.3 jobs, 3.4 jobs are in the private sector. Labor income is estimated at $624,153 and the total output from the monetary permitting contributions estimated at $990,162.

Table 16. Top Five Industries Affected (2011)

Sector	Description	Employment	Labor Income	Value Added	Output
3437	State and Local Govt. Employment and Payroll	+6.9	+$481,760	+$547,286	+$570,279
413	Food Services	+0.3	+$8,389	+$11,808	+$21,843
394	Offices of Physicians and Dentists	+0.2	+$14,705	+$15,681	+$26,535
397	Private Hospitals	+0.2	+$11,191	+$11,946	+$24,946
360	Real Estate	+0.2	+$2,378	+$17,796	+$24,562

	Establishments				

Table 17. Comparison of Private Sector Annual Losses and Gaines to State Government and Private Sector (based on 2011)

	Employment	Employment	Labor Income	Labor Income	Value Added	Value Added	Output	Output
Impact Type	**Losses to Private Sector**	**Gains to State Govt. and Private Sector**	**Losses to Private Sector**	**Gaines to State Govt. and Private Sector**	**Losses to Private Sector**	**Gains to State Govt. and Private Sector**	**Losses to Private Sector**	**Gaines to State Govt. and Private Sector**
Direct Effect	-4.4	+6.9	-$210,582	+$481,760	-$243,724	+$547,286	-$570,279	+$570,279
Indirect Effect	-1.3	0	-$66,726	$0	-$100,466	$0	-$173,457	$0
Induced Effect	-1.9	+3.4	-$82,376	+$142,393	-$148,609	+$256,581	-$243,003	+$419,883
Total Effect	-7.6	+10.3	-$359,685	+$624,153	-$492,798	+$803,867	-$986,739	+$990,162

Table 17 above is a direct comparison of the economic effects of transferring permitting contributions of $570,279 from the private sector to the state of Florida during 2011. Simply put, the loss to the private sector is a gain to the state government sector. On net, the impacts have a nearly equal and opposite reaction in the economy. If one assumes a relatively small change in the cost of permitting during the next five years, then one can assess the overall economic impact of the GTMP. Overall, it is estimated the plan will result in an annual loss of 7.6 jobs (all from the private sector), yet at the same time create 10.3 jobs per year, 6.9 jobs to state government (non-education) and 3.4 jobs to the private sector. The net annual effect of the monetary permitting contributions of private firms is 2.7 new jobs; 4.2 fewer private jobs and 6.9 more state employees. Likewise, labor income from the permitting monetary contribution of the private firms to *state government* is estimated at $624,153 per year and represents a loss to the private sector of $359,685 per year. Output (total value of all goods and services) represents an annual loss to the private sector of $986,739. The monetary contribution of permitting costs by private firms produces $990,162 of annual output to the *state government* sector. The economic impact of the permitting system costs is minute, yet positive producing $3,423 in positive economic impact for Florida annually.

Many of the categories above in Table 17 represent very close relationships (employment, output) while there are some differences in other categories (labor income and value added). It is therefore important to understand that these are two very different economies. One of the best ways to explain these differences is with the concept of leakage. Leakages are any payments made to imports or value added sectors which do not in turn re-spend dollars within a region. For example, if a product was not made here (Florida) the leakage out of the economy can be considerable. Yet, the economic impact from the private sector losses to the state government sector is very small.

<u>The Economic Impact of Transfers from the Non-FWC Public Sector to Private Third-Party Vendors – Mitigation Actions</u>

Costs required by non-FWC public agencies to hire private third-party vendors for mitigation actions in 2011 were estimated to be $1,880,839 (see Table 11 above). Employment, labor income and value added represent a loss to the industry sectors identified in this economic analysis. Table 18 provides the distribution of loss for public non-FWC agencies in 2011 and Table 18 identifies the top five industries affected. The economic effect of funds transferred from the private regulated community to private third-party vendors are not considered because the ripple effect of money within these private sectors will generate essentially no net change.

Table 18 below reflects a transfer (or loss) to state government of $1,880,839. These funds are what state, local and federal government pays to the private sector for services (tortoise surveys, capture of tortoises) and other mitigating actions in 2011. The transfer of funds to the private sector represents a direct loss to government of 22.8 jobs and 11.1 jobs lost to the private sector. The total output loss (value of all goods and services) is estimated at $3,265,656 and these estimates represent annual losses.

Table 18. Loss to Non-FWC Government Sectors From Transfers to Private Third-Party Vendors

Impact Type	Employment	Labor income	Value Added	Output
Direct	-22.8	-$1,588,893	-$1,805,005	-$1,880,839
Indirect	$0.0	$0.0	$0.0	$0.0
Induced	-11.1	-$469,628	$-846,231	-$1,384,816
Total	-33.9	-$2,058,521	-$2,651,237	-$3,265,656

Table 19. Top Five Industries Affected from Transfer From Non-FWC Public Agencies (2011)

Business Sector	Description	Employment	Labor Income	Value Added	Output
3437	Government employment and payroll	-22.8	-$1,588,893	-$1,805,005	-$1,880,839
413	Food Services	-1.1	-$27,668	-$38,945	-$72,040
394	Offices of Physicians and Dentists	-0.7	-$48,498	-$51,716	-$87,516
397	Private Hospitals	-0.6	-$36,909	-$39,398	-$82,275
360	Real Estate	-0.5	-$7,843	-$58,691	-$81,008

Table 20. Gain to Third-Party Vendors From Transfers from Non-FWC Government Sectors

Impact Type	Employment	Labor Income	Value Added	Output
Direct	17.9	$1,139,719	$1,188,439	$1,880,839
Indirect	5.3	$245,022	$367,963	$607,109
Induced	9.7	$410,915	$741,126	$1,212,072
Total	32.9	$1,795,657	$2,297,529	$3,700,020

Table 21. Top Five Industries Affected From Transfer to Private Third-Party Vendors (2011)

Business Sector	Description	Employment	Labor Income	Value Added	Output
375	Environmental and Technical Consulting Services	18.0	$1,145,375	$1,194,337	$1,890,173
413	Food Services	1.3	$32,615	$45,908	$84,920
382	Employment Services		$29,382	$35,023	$43,361
360	Real Estate	1.0	$11,517	$86,185	$118,956
394	Offices of Physicians and Dentists	0.6	$38,383	$40,531	$76,118

Table 20 represents *government* money ($1,880,839) paid to third party vendors, private sector entities for services associated with mitigating actions associated with the proposed revisions to the Gopher Tortoise Management Plan. This transfer of funds from government to third party vendors creates 17.9 direct jobs and results in 32.9 positions to the private sector on an annual basis. The output (total value of all goods and services) related to the transfer of funds from government to the private sector for mitigation efforts is estimated at $3,700,020.

Table 21 represents an analysis of cost by permit type associated with the transfer of funds from government to third party vendors (private sector) for 2011.

Permitting Revenue/Cost Projected for Five Years

Applications for permits are likely to increase over the next five years and will probably reflect the state's economic rate of growth. This is centered on the assumption that gopher tortoise permitting is most often initiated by projects tied to economic growth and development. During their March 2012 meeting of the Open Market Committee, the U.S. Federal Reserve Board projected national gross domestic product (GDP) to grow at an inflation adjusted rate of between 3% and 4% over the next three years. This is slightly more than the 20 year moving average of 2.9%. Furthermore, they project that Florida will grow at a slightly lower rate than the national average. Using these figures as best estimates and that the rate of growth will continue for two additional years, a figure of 2.9% is used to project the growth of total permitting revenues/costs for the next five years (Table 22 below).

Table 22. Projected annual permit revenues/costs for 2012 – 2016. Based on 2011 figures of $999,882 and 2.9% annual growth rate. (Figures are nominal)

Year	Projected Permit Revenue/Cost
2013	$1,058,722.41
2014	$1,089,425.36
2015	$1,121,018.70
2016	$1,153,528,24
2017	$1,186,980.55

Chapter 120.54(3) (b) Compliance

The following are answers to the general question of related to Florida Statute, Chapter 120.54(3)(b), "**Are the proposed revisions to the gopher tortoise management plan…**

" … likely to have direct or indirect adverse economic impact on economic growth, private sector job creation or employment, or private sector investment in excess of $1million in the aggregate within 5 years after implementation?"

The proposed revisions to the Gopher Tortoise Management Plan present a suite of conservation strategies and actions that serve to achieve the measurable objectives of the plan. Costs to the regulated community are directly tied to the health of the economy as there is a linear relationship between total costs and development. As the economy improves from the "Great Recession" development is expected to improve and total costs to the regulated community will be consistent with the increase in development. However, individual sector costs to the regulated community are not expected to increase over the course of the 2nd five-year Action Cycle (2013-2017). Therefore, the proposed revisions to the Gopher Tortoise Management Plan are not likely to pose direct or indirect adverse economic impact on economic growth, private sector job creation or private sector investment in excess of $1 million in the aggregate within 5 years of implementation. Local, state and Federal government transfers to third-party private vendors create a positive gain in employment estimated at 32.9 jobs and $3,700,020 in economic output.

"… **likely to have an adverse impact on business competiveness, including the ability of persons in the state to compete with Persons doing business in other states or domestic markets, productivity, or innovation in excess of $1 million in the aggregate within five years after implementation?"**

The proposed revisions to the Gopher Tortoise Management Plan permits anyone who completes the FWC approved training course to compete as an Authorized Gopher Tortoise Agent doing business in the State of Florida. Additionally, the gopher tortoise has been protected in Florida for over 30 years, initially as a Species of Special Concern, and since 2007 as a Threatened species. Any activity involving the take has required the prior issuance of an appropriate permit or authorization from FWC.

The proposed revisions to the Gopher Tortoise Management Plan is not likely to have an adverse impact on business competiveness, including the ability of persons in the state to compete with persons doing business in other states or domestic markets, productivity, or innovation in excess of $1million in the aggregate within 5 years of implementation.

"… likely to increase regulatory costs, including transactional costs, in excess of $1 million in the aggregate within five years after implementation?"

Regulatory and transactional costs for permitting are not expected to increase over the course of the second 5-year action cycle of the plan (2013-2017) as the costs for permits remain static. However, total costs to the regulated community are directly tied to the health of the Florida economy. As Florida begins to emerge from the recessionary effects of the *economic downturn* total costs will increase over time as more permits are issued and more development takes place. Additionally, additions to private sector job growth will also

increase as the government sector transfers more revenue to private third-party vendors for mitigation action. Estimates of total costs to the regulated community for the second 5-year action cycle of the plan (2013-2017) are provided below.

Year	Projected Permit Revenue Costs
2013	$1,058,722.41
2014	$1,089,425.36
2015	$1,121,018.70
2016	$1,153,528.24
2017	$1,186,980.55

"Provide a good faith estimate of the number of individuals and entities likely to be required to comply with the proposed revised Gopher Tortoise Management Plan together with a general description of the types of individuals likely to be affected by the plan."

The proposed revisions to the Gopher Tortoise Management Plan will affect landowners, commercial, residential (private home owners) construction companies and other land development entities; local, state, and federal government agencies, utilities, small businesses, the general public and all other entities who qualify for a permit.

"Provide a good faith estimate of the cost to the agency, and to any other state and local government entities, of implementing and enforcing the proposed revisions to the Gopher Tortoise Management Plan and any anticipated effect on state or local revenues."

The proposed revisions to the Gopher Tortoise Management Plan include no increase to staffing or in compensation, so the revisions will produce no increases in costs due to staff, salary or benefits. Beyond staff salaries and rather small capital expenditures, there is an additional estimated direct payment to vendors of $1,836,600 through the second 5-year cycle of the action plan (2013-2017). Costs to the Florida Fish and Wildlife Conservation Commission and other government agencies include the following:

FWC Direct Costs – Human Resources and Capital	$ 3,844,842
FWC Opportunity Costs	$ 2,026,007
Other Agency Opportunity Costs	$ 3,075,000
Total	**$ 8,945,849**

Total Costs

In 2011 the total costs to *local government* was $1,731,672, to *state government* $488,792, and Federal Government $55,426. Enforcement of the proposed revisions to the Gopher Tortoise Management Plan will be the responsibility of the Division of Law Enforcement, Florida Fish and Wildlife Conservation Commission and are incurred as an opportunity cost. No additional state agency enforcement responsibilities are anticipated through the life cycle of the second 5-year action cycle of the plan. Revenue to the FWC should increase during the life cycle of the second 5-year cycle of the action plan as the

economy begins to recover from the recession. There are no anticipated effects on local revenues.

"Provide a good faith estimate of the transactional costs Likely to be incurred by individuals and entities, including local government entities, required to comply with the requirements of the proposed revisions of the gopher tortoise management plan. As used in this section "transactional costs" are direct costs that are readily ascertainable based on standard business practices , and include filing fees, the cost of obtaining a license, the cost of equipment required to be installed or used or procedures required to be employed, additional operating costs incurred, the cost of monitoring and reporting and any other costs."

Transactional costs as defined here are direct costs readily ascertainable based on standard business practices. Transactional costs (direct costs) for the regulated community for 2011 include the following: Please see the section on regulatory costs for projections through 2017.

Private Firms -	$ 3,309,157
Local Government -	$ 1,731,672
State Government -	$ 488,792
Single Family Home Owner	$ 286,493
Federal Government -	$ 55,426

"Provide an analysis of the impact on small businesses as defined by s. 288.703, and an analysis of the impact on small counties and small cities as defined in s.120.52."

Section 288.703, F.S. defines small business as "an independently owned and operated business concern that employs less than 200 or fewer permanent full-time employees and that, together with its affiliates, has a net worth of not more than $5 million or any firm based in this state which has a Small Business Administration 8(a) certification. As applicable to sole proprietorships, the $5million net worth requirement shall include both personal and business investments." In s.120.52, F.S., "Small City" is defined as "any municipality that has an unincarcerated population of 10,000 or less according to the most recent decennial census. 'Small County" is defined as "any county that has an unincarcerated population of 75,000 or less according to the most recent decennial census."

Regarding the identification of small businesses affected by the plan, these statutory definitions are most difficult to satisfy. Regulated business is under no obligation to provide estimates of net worth to the agency. Privately operated services, such as Dun and Bradstreet do provide ratings of various businesses (including small businesses) but that information is proprietary; and provides estimates of risk (which are based on net worth, credit appraisal and other considerations), not income statements or balance sheets. These services rate specific companies, not broad categories such as small businesses. The Small Business Administration (SBA) data on firms with 8(a) certification is easily available and indicates 590 firms. The SBA website defines the 8(a) certification as "providing eligible firms with greater access to the resources they need to grow and develop their businesses. Elsewhere, the SBA describes their certification program as having been created to "help small

disadvantaged businesses to compete for federal contract opportunities." So the SBA website is clearly not, nor intended to be an estimate of the number of small businesses in Florida. The statutory definitions also make no distinction between individually owned firms with few employees, and those with up to 20 employees, which may have higher profits and greater market share. The effects of regulation on the two firms may be quite different.

The following counties qualify as small counties by definition in Section 120.52, F.S.,: Baker, Bradford, Calhoun, Columbia, De Soto, Dixie, Franklin, Gilchrist, Glades, Gulf, Hamilton, Hardee, Hendry, Holmes, Jackson, Lafayette, Levy, Liberty, Madison, Nassau, Okeechobee, Putnam, Sumter, Suwannee, Taylor, Union, Wakulla, Walton and Washington.

Recommended Future Research

Typically a Schedule of Estimated Regulatory Cost is limited in scope to the cost of regulation and not required to consider any potential economic benefits. However, agencies presumably impose regulations for some perceived benefit and, while the source of these benefits might be difficult to quantify, they are often related to human health and/or welfare either directly or indirectly. In the case of the GTMP, the desired outcome is to improve the condition of gopher tortoises and their associated habitat. The presumption is that it is important to humans to protect this species and the associated commensals, otherwise why would people go to the trouble to develop and enforce a far-reaching plan such as the GTMP?

Referring back to Table 2, the basic framework to estimate the benefits of the GTMP is clearly identified. There are potentially both market and non-market benefits to humans resulting from the GTMP, the question is, are they measureable? The short answer is yes, however they may be difficult to identify and quantify. While this task may be difficult, it should none-the-less be considered because regulations should ultimately be evaluated on their net benefit to society and methods that only evaluate their cost are insufficient for informed decisions.

Marketable Project Benefits

There are probably few, if any marketable goods and services that are promoted by the GTMP. However, it might still be a reasonable exercise to consider their possibly. For example, does the GTMP result in an improvement in the habitat that allows for increased harvesting of a plant or animal that has commercial value?

Non-marketable Project Benefits

It is more likely that the GTMP provides benefits lacking established markets (see below). Yet, the lack of established markets does not mean these benefits lack economic value. An entire field of economics is devoted to quantifying and measuring non-market values for a wide range of goods and services. It is important to understand that the lack of established markets should never deter policy makers from recognizing and measuring the importance of these goods and services anymore than they would ignore the importance of marketable goods and services.

For methodological reasons, non-market benefits are further divided into values derived from humans using the affected resource and those derived from humans not directly using the resource, also known as passive use values. In the case of wildlife, people are more familiar with assigning value to species they directly use. This could include the value of increased deer numbers to hunters, more fish available to anglers or more bald eagles for bird watchers to view. Since the gopher tortoise is not directly used and even viewing is a rare event, there is likely little use value to consider.

The most likely value for the gopher tortoise is in the area of passive or non-use. It's already been established that by constructing burrows, gopher tortoises provide a unique service to dozens of commensals. In some systems these burrows might be critical to not only to the gopher tortoise itself, but perhaps dozens of other species as well. A better understanding of these ecological services and their importance to ecosystem health is an important first step to valuing the impact of the GTMP. There are well established and widely published economic valuation methods that permit an evaluation of these services if they can be clearly identified. Using the economic methodology of contingent market valuation and conjoint analysis, researchers have successfully assigned economic value to ecological services such as vegetative buffers and water clarity and the importance of edge effect and increase of bird life. Similar studies with the importance of gopher tortoise burrows should be possible.

In addition to ecological services, some species of wildlife are popular on their own merit and have considerable value to many people. It is well known that the West Indian Manatee is widely popular among not only Floridians, but even people who have never seen them. Furthermore this "existence" value has been documented by several studies. In the case of the GTMP, there is evidence that the gopher tortoise may also enjoy a limited amount of "celebrity" status and, while individual people may place a relatively small value on an animal's well being, if this value is widespread it may collectively represent a large sum.

Suggested areas of GTMP benefits in terms of non-marketable goods/services can include:

- Ecological Services (ES) from Increased Gopher Tortoise Actions
    - Catalogue ES resulting from gopher tortoise
    - Develop contingent market survey for ecosystems with and w/o ES
    - Estimate market for identified ES
- Gopher Tortoise Abundance
    - Use value –gopher tortoise viewing?
    - Existence value – knowing gopher tortoises exist and/or thrive

The process of conducting studies to estimate the potential of GTMP benefits will likely involve resource economists working with biologists to better understand the ecological services likely affected by the plan. This process may be difficult and time consuming so it should be planned well in advance of the next SERC revision. With an ever growing desire to evaluate regulations for their overall benefit and cost, it is recommended that the GTMP consider this more balanced assessment in future revisions.

Summary and Conclusions

This document sets forth the economic analysis of the proposed revision to the Gopher Tortoise Management Plan. The Florida Fish and Wildlife Conservation Commission published its first Gopher Tortoise Management Plan in 2007 and the gopher tortoise was reclassified from a Species of Special Concern to Threatened. The economic analysis contained herein covers the second 5-year action cycle of the plan (2013-2017).

All economic analysis contained in this review are limited to documenting the incremental changes in cost and do not address the larger welfare picture. In this case only the actual direct and appropriate indirect costs are estimated and reported following the format established by the Statement of Estimated Regulatory Cost as prescribed by Section 120.54(3)(b), Florida Statutes (F.S.).

The total estimated costs and revenues for the five year GTMP are summarized in Table 23 below. The five year total for direct costs and opportunity costs are estimated at $35 million and $5.1 million respectively, for a combined total cost of $40.1 million to FWC and the regulated community. Looking at the net of mitigation contributions and private third-party vendor revenues, there is a transfer of $7.4 million over the five year period from the public sector to the private sector. This will result in a net increase of 1.7 new private sector jobs annually and a shift of 15.9 public sector jobs to the private sector per year for a total of 8.5 new private sector jobs in five years (see Table 24). On the revenue side, FWC will see $5.6 million in total revenue ($3.2 million from the private sector and $2.4 million from government agencies). In terms of economic growth, the GTMP will result in a net annual growth of $437,784 or $2.8 million in five years.

In conclusion, to truly evaluate the economic efficiency of the GTMP, one would need to include the projected public benefits and compare them to project costs. At this point, there are no efforts to collect these data. However, it is recommended that in future evaluations, an effort to collect this information be attempted.

Table 23. Summary of Five Year Project Costs, Revenues and Impacts

	Year 2013	Year 2014	Year 2015	Year 2016	Year 2017	Total
Costs						
Total Direct Costs CI.1						
To Regulated Community	$5,988,971	$6,108,750	$6,230,925	$6,355,544	$6,482,655	$31,166,845
To FWC	$738,818	$753,595	$768,666	$784,040	$799,721	$3,844,840
Opportunity Costs CI.2						
New Initiative						$189,407
Agency Grant Match						$1,836,600

Other Agency						$3,075,000
Total Opportunity Costs						$5,101,007
Total Costs						$40,112,692
Economic Impact CII.1						
Transfers to Private	$1,991,509	$2,049,263	$2,108,692	$2,169,844	$2,232,769	$10,552,078
Transfers to Public	$603,835	$621,346	$639,365	$657,907	$676,986	$3,199,438
Net Private-Public	$1,387,675	$1,427,917	$1,469,327	$1,511,937	$1,555,783	$7,352,640
Economic Growth	$463,544	$476,986	$490,819	$505,053	$519,699	$2,456,101
Revenue						
Economic Impact CII.1						
Private Revenue to FWC	$603,835	$621,346	$639,365	$657,907	$676,986	$3,199,438
Public Revenue to FWC	$454,881	$468,073	$481,647	$495,615	$509,988	$2,410,203
Total of all Revenue						$5,609,642

Table 24. Jobs Created and Lost per Year by the GTMP

Action	**Public Jobs**	**Private Jobs**	**Net Jobs**
Mitigation Contributions	6.9	-4.2	2.7
Third-party Vendor Payments	-22.8	21.8	-1
Total	-15.9	17.6	1.7

ENDNOTES: Internet URLs Hyperlinked in this Document

[1] https://www.flrules.org/gateway/ChapterHome.asp?Chapter=68A-27
[2] http://www.myfwc.com/wildlifehabitats/imperiled/listing-action-petitions/
[3] http://www.myfwc.com/wildlifehabitats/managed/gopher-tortoise/
[4] MyFWC.com/GopherTortoise
[5] http://www.fws.gov/endangered/what-we-do/hcp-overview.html
[6] http://www.fnai.org/clip.cfm
[7] http://myfwc.com/WILDLIFEHABITATS/Legacy_index.htm
[8] http://fwcg.myfwc.com/
[9] http://www.fnai.org/pdf/nc/FNAI_NatComGuide_2010.pdf
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[11] http://fga.freac.fsu.edu/georgie/obvmV5/
[12] http://www.fnai.org/Reference_NC_Sampling_Design.pdf
[13] http://www.fnai.org/FNAI_RNC_Measures_Definitions.pdf
[14] http://myfwc.com/conservation/special-initiatives/fwli/archive/taking-action/scrub/
[15] http://www.floridaforestservice.com/index.html
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[42] http://share.myfwc.com/GT2/default.aspx