BIOLOGICAL STATUS REPORT
Gopher Tortoise

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(Gopherus polyphemus)

EXECUTIVE SUMMARY

In May 2002, the Florida Fish and Wildlife Conservation Commission (FWC) received a petition to evaluate the status of the Gopher Tortoise, *Gopherus polyphemus* (Daudin), a species that is currently listed as Species of Special Concern (SSC: Rule 68A-27.005 F.A.C.). A moratorium on listing actions precluded action on the petition until a review of the listing process was completed. At the April 2005 Commission meeting, the Commission approved a new listing process rule and directed staff to move forward on pending petitions, including the petition for the Gopher Tortoise. Following the guidance of the listing process rule (68A-27.0012 F.A.C.), a five-member biological review panel (BRP) for the Gopher Tortoise was approved at the June 2005 Commission meeting. Public input on the status of the tortoise was sought from 15 July 2005 through 31 August 2005, and all 58 respondents recommended reclassification to Threatened or Endangered status. The BRP met on 16 September 2005 and conducted the biological assessment that is the bulk of this biological status report by evaluating the species against the imperilment criteria found in 68A-1.004 F.A.C. Please visit http://myfwc.com/imperiledspecies/listingproceduresanddefinitions.pdf to view the listing process rule and the criteria found in the definitions. The BRP concluded from the biological assessment that the Gopher Tortoise warranted reclassification to Threatened status based upon past and/or future reductions in population size because of declines in the area of occupancy and quality of habitat, exploitation, and possibly the effects of pathogens. Independent scientific review of the biological assessment was sought and received from seven scientists. Six of the reviewers supported the conclusion of the panel, but one reviewer felt that the evidence presented was not strong enough to support reclassification and that the listing criteria were not always followed. Staff of the FWC gratefully acknowledges the assistance of the members of the Biological Review Panel and of the Independent Reviewers, and the BRP is indebted to Beth Stys for her GIS analysis of historic and present potential Gopher Tortoise habitat, and to Paul Moler for preparing an earlier version of the BSR.

BIOLOGICAL INFORMATION

We provide a brief biological information section to provide the basics about the species. For more detailed information on these aspects see Diemer (1986), Cox et al. (1987), Landers et al. (1980), McCoy and Mushinsky (1995), McRae et al. (1981), Ashton and Ashton (2004), and Mushinsky et al. (*in press*).

Taxonomy

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

Life History and Habitat Requirements

The Gopher Tortoise is a moderate-sized, terrestrial turtle, averaging 23–28 cm (9–11 in) in length. 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 in coloration.

The Gopher Tortoise typically inhabits relatively well-drained, sandy soils. The Gopher Tortoise is generally associated with longleaf pine (*Pinus palustris*)–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, 1992; Breininger et al. 1994). Gopher Tortoises excavate burrows that average 4.5 m (14.8 ft) in length and 2 m (6.6 ft) in depth (Hansen 1963). These burrows, which provide protection from temperature extremes, desiccation, and predators, serve as refuges for approximately 360 other species, including listed species such as the gopher frog (*Rana 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 April–November. Nests are constructed (often in burrow mounds) from mid-May to mid-June, and only one clutch is produced annually (Landers et al. 1980). Clutch size is usually five to nine eggs, with an average of six (Diemer and Moore 1994, Butler and Hull 1996). Predation on nests and hatchlings is heavy (Alford 1980, Landers et al. 1980, Butler and Sowell 1996, Smith 1997).

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 >300 species of plants (Ashton and Ashton 2004). 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 $\geq$100 m from its burrow for specific forage requirements (see R. E. Ashton, Jr., Appendix 3). Home range size varies with habitat type, season, and sex of the tortoise; moreover, considerable individual variation has been found (Diemer 1992). Reported annual 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 1992, Smith et al. 1997). Multiple burrows are typically used (McRae et al. 1981, Auffenberg and Franz 1982, Diemer 1992), which complicates estimates of population density (McCoy and Mushinsky 1992b).

Distribution

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; however, their current range in South Florida is limited because of unsuitable habitat and increased urbanization (Mushinsky et al. *in press*). Tortoise populations occur as far south as Cape Sable and on islands off the east and west coasts (Auffenberg and Franz 1982, Kushlan and Mazzotti 1984).

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). 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, overharvest, 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. *in press*).

Destruction of tortoise habitat occurs not only from urbanization and development, but also when xeric upland habitats or pastures are converted to row crops or citrus groves (Landers and Garner 1981; Auffenberg and Franz 1982; Diemer 1986, 1987; Berish 2001), or are mined for phosphate (Mushinsky and McCoy 1996, 2001). Agricultural interests have no incentive to sustain listed species, such as the Gopher Tortoise, on their property, and they can use "best management practices" to eliminate these species and increase the value of their land for future development (Ashton 2005). In most areas, landowners living on their property have to pay higher property taxes if the land is in natural habitat than if it is planted in pine trees at a density of 985–1,475 trees/ha (400–600/ac) or converted into cropland or grazing land (Ashton 2005).

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 provide 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).

The spread of exotic plant species such as Brazilian pepper (*Schinus terebinthifolius*), Australian pine (*Casuarina equesetifolia*), cogongrass (*Imperata cylindrica*), and hairy indigo (*Indigofera hirsute*) also degrades tortoise habitat (Berish [Diemer] 1991, Hicklin 1994, Berish 2001, Basiotis et al. 2005). 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. *in press*).

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). Approximately 80–90% of nests are typically depredated, primarily by mammalian predators such as the raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), gray fox (*Urocyon cinereoargenteus*), and opossum (*Didelphis virginianus*) (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). 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. *in press*). Gopher Tortoise populations can typically sustain natural predation pressure, with only one to three 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; see R. E. Ashton, Jr., Appendix 3). Also, potential 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*) (Douglas and Winegarner 1977, Auffenberg and Iverson 1979, Main et al. 2000, Epperson and Heise 2003; Enge et al. 2004; Owens et al. 2005; see J. M. Thomas, Appendix 1).

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, one 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 sustained human predation (Mushinsky et al. *in press*; see M. J. Eich, Appendix 1, and R. E. Ashton, Jr., Appendix 3). Road development facilitates human access into remote areas and may lead to exploitation of additional Gopher Tortoise populations (see R. E. Ashton, Jr., Appendix 3).

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, Berish 2001, Gates et al. 2002, Rabatsky and Blihovde 2002). Besides at least two *Mycoplasma* species responsible for URTD, Gopher Tortoises also may have herpesvirus and iridovirus. Pathogens may be partially responsible for

recent declines in some Gopher Tortoise populations, but URTD may have a long evolutionary history as a Gopher Tortoise disease. McCoy et al. (2005) speculate that *Mycoplasma agassizii* may be detected in virtually every population, if enough tortoises are sampled. There are several possibilities why URTD has only been discovered recently: 1) increased research on the species, 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 (Mushinsky et al. *in press*). On Sanibel Island, 87% of tortoises tested were seropositive for exposure to the pathogen, and at least one population here appears to have experienced a 25–50% reduction in breeding age adults (McLaughlin 1997, McLaughlin et al. 2000). However, McCoy et al. (2005) found that observed declines in the demographic well-being of Gopher Tortoise populations did not appear to be related to the presence of *Mycoplasma agassizii*.

BIOLOGICAL STATUS ASSESSMENT

Available data on the Florida Gopher Tortoise population were evaluated relative to each of the five criteria for state listing under Rule 68A-1.004 F.A.C. Many of these data were derived from on-going studies and represent the best professional opinion of FWC scientific staff and their peers. There are two steps in assessing the status of a regional population: (1) use FWC criteria for a preliminary categorization and (2) investigate whether conspecific populations outside the region may affect the risk of extinction within the region.

Generation length of the species is important for some of the criteria. Generation length is defined as the average age of parents of the current cohort, which is greater than the age at first breeding and less than the age of the oldest breeding individual (IUCN 2001). Female age at maturity for Gopher Tortoises has been reported as 12–13 years in south-central Florida (Linley 1986, McLaughlin 1990), 9–16 years in central Florida (Godley 1989, Mushinsky et al. 1994), and 14–18 years in north-central Florida (Diemer and Moore 1994). Body size, rather than age, seems to determine sexual maturity, and growth is a function of both the length of the activity season and the quality of forage (Mushinsky et al. *in press*; see R. E. Ashton, Jr., Appendix 3); thus, maturity may be reached at an earlier age on well-managed sites (Mushinsky et al. 1994). Males likely mature at a smaller size than females (Mushinsky et al. *in press*). Longevity is estimated to be 40–60 years but could be much longer (Landers 1980, Cox et al. 1987). Adult Gopher Tortoises cannot be accurately aged by counting growth rings on plastral scutes (Wilson and Tracy 2003); this technique seems to produce reliable results on tortoises up to 12–15 years old (Mushinsky et al. 1994, Aresco and Guyer 1999). There is no literature on the age of tortoises in wild populations, only size-class distributions.

VORTEX, a simulation software program for population viability analysis, calculated regional tortoise generation lengths as 27 years in South Florida, 31 years in north-central Florida, and 35 years in the Panhandle, for a rough statewide average of 31 years (Miller 2001). However, because mean generation length is only an estimate, we also will use an alternative mean generation length of only 20 years, which is a very conservative figure based upon an average age at first breeding of approximately 15 years and longevity that may exceed 60 years.

STEP 1

Criterion A: Population Size Reduction

Criterion A is designed to identify species that have undergone a significant decline in the recent past, or are projected to experience a significant decline in the near future. Population size is defined to include only mature individuals. There are four subcriteria within this criterion, and a species only needs to meet one subcriterion to warrant listing under this criterion.

Subcriterion 1

The first subcriterion requires an observed, estimated, inferred, or suspected population size reduction of ≥80% (Endangered), ≥50% (Threatened), or ≥30% (Species of Special Concern) over the last ten years or three generations, whichever is longer, where the reduction or its causes may not have ceased or may not be understood or may not be reversible, based on (1) direct observation; (2) an index of abundance appropriate to the taxon; (3) a decline in area of occupancy, extent of occurrence, and/or quality of habitat; (4) actual or potential levels of exploitation; or (5) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors, or parasites. "Area of occupancy" is defined as the area within the taxon's "extent of occurrence" that is occupied, excluding cases of vagrancy (IUCN 2001). "Extent of occurrence" is defined as the area contained within the shortest continuous imaginary boundary that can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy and excluding large areas known to contain unsuitable habitat for the species.

Based upon the *VORTEX*-calculated mean generation length of 31 years, 93 years (three generations) would be the relevant time interval to consider when assessing the reduction in tortoise population size. Using the alternative, conservative mean generation length of 20 years, the time interval for assessment would be 60 years. Because the most currently available Landsat Thematic Mapper imagery, which was used to assess landcover types (i.e., available Gopher Tortoise habitat), is from 2003, the periods of assessment are either 1910–2003 or 1943–2003. A reduction in the population size of the Gopher Tortoise in Florida within the past 60 or 93 years can be inferred based on (3) a decline in area of occupancy and quality of habitat. Actual estimates of Gopher Tortoise population size three generations ago do not exist; therefore, declines in population size will be inferred from losses in the extent of suitable habitat and declines in the quality of habitat.

Decline in Area of Occupancy— We assume that the Gopher Tortoise population has declined as the human population in Florida has increased and converted tortoise habitat to urban, agricultural, and other land uses, although the relationship is probably not linear between human population growth and Gopher Tortoise population decline. During the past 93 years (1910–2003), the human population in Florida increased 2,161% from 752,619 to 17,019,068 (U.S. Census Bureau 2005). During the past 60 years (1943–2003), Florida's human population increased 618% (U.S. Census Bureau 2005). During the 1900s, Florida's human population about doubled every 20 years (Reynolds 2002), the minimum length of one tortoise generation. From 1964 through 1997 (approximately one *VORTEX*-calculated tortoise generation), urban land area increased 317% from 0.5 million ha (1.2 million ac) to 2 million ha (5 million ac) in Florida

(Reynolds 2002). These urban land-use data estimates were obtained from The Mapping and Monitoring of Agricultural Lands Project conducted by the Department of Community Affairs, which used aerial photography and LANDSAT data to calculate the amount of land in nonvegetated urban, vegetated urban, and rural–urban transition categories (Reynolds 2002). However, all of this increase in urban land did not occur in tortoise habitat, and some urban lands are occupied by tortoises, although viable populations may not be present.

Based on the maps of Davis (1967), the natural extent of tortoise habitat in Florida before European settlement was an estimated 4,388,978 ha (10,845,015 ac) out of a total land area of 14,356,518 ha (35,474,469 ac) (Stys, FWC, 2005, unpublished). (Hereafter, all analyses of the areal coverage of landcover types and suitable tortoise habitat in Florida, both historic and current, that Beth Stys with the FWC conducted in 2005 will be referred to as Stys 2005.) A landcover map of Florida developed using 1985–1989 Landsat Thematic Mapper imagery was used to modify Davis' map to more accurately reflect actual tortoise habitat. These modifications included deleting water bodies and wetlands that Davis included in his large, generalized areas of xeric cover types and adding xeric landcover types outside of the xeric areas mapped by Davis (Stys 2005). The following Davis landcover types were added as potential Gopher Tortoise habitat if they occurred on xeric soils: mixed hardwood pine forest, North Florida pine flatwoods, South Florida pine flatwoods, and cabbage palm forest. Based on GIS analysis of 2003 Landsat imagery, an estimated 688,963 ha (1,701,736 ac) of former tortoise habitat in Florida are now urban, which by itself represents a 15.7% loss of historic tortoise habitat to urbanization (Stys 2005). In this case, urbanization is defined as development-related land use conversion. However, unmodified GIS analysis of habitat loss underestimates the actual loss of tortoises because much of the clearing of land for single-family residences on tracts of 0.4–4 ha (1–10 ac) goes undetected (see R. E. Ashton, Jr., Appendix 1), and the actual suitability of the remaining habitat and potential numbers of tortoises present are overestimated by GIS analysis as opposed to actual surveys (McCoy et al. 2002). By 2003, at least 1,257,878 ha (3,109,432 ac) of Florida had been paved over or built upon (i.e., high impact urban cover type) (Stys 2005), making most of this area uninhabitable by Gopher Tortoises; remaining populations may not be reproductively viable.

Using 2003 Landsat imagery and the modified analysis methods developed by McCoy et al. (2002), the current total extent of tortoise habitat remaining in Florida is estimated at 1,344,630 ha (3,322,536 ac), which represents a decline of 69.4% since European settlement (Stys 2005). The landcover types included as suitable Gopher Tortoise habitat are coastal strand, sandhill, sand pine scrub, xeric oak scrub, dry prairie, mixed hardwood pine forest, pinelands, shrub and brushland, and unimproved pasture. For this analysis, habitat types were restricted to "suitable" areas based on soils and LULC (land use and land cover) data (Stys 2005). Pine plantations on xeric soils were included if they occurred on public lands, because these plantations are often less densely stocked and are burned more frequently than commercial or privately owned pine plantations. Some of the 69.4% loss of original tortoise habitat occurred prior to 1910, but the decline in habitat is presumed to exceed 60% since 1910, when the human population was 4.4% of its 2003 size, and the habitat decline is presumed to exceed 50% since 1943, when the human population was 13.9% of its 2003 size.

Florida loses 182 ha (450 ac) of forest and 166 ha (410 ac) of farmland to development every day (Bouvier and McCloe Stein n.d.). Commercial scrub oak stands, which likely were suitable

tortoise habitat, declined 63.3% in less than two calculated (three alternative) tortoise generations (1936–1995) (Kautz 1998). However, tortoises have not necessarily been eliminated from all converted habitat. Pasture and rangeland increased 29.9% from 1959 through 1995 (Kautz 1998). Using 2003 Landsat imagery, agricultural lands now comprise 24.1% of the original tortoise habitat (Stys 2005). Tortoises are still found on or around the periphery of many of the less intensively developed lands and may be common in some pasturelands. When determining the extent of suitable tortoise habitat remaining in Florida, Stys (2005) included unimproved pastures, which comprised 21,795 ha (53,855 ac) of original tortoise habitat in 2003. Similarly, although tortoise populations typically decline following conversion of natural pine forests to high-density pine plantations, they may still remain in reduced numbers around the periphery of the plantations or by moving among early successional stands generated as areas are harvested. Some ruderal habitats support fairly dense populations of tortoises (Auffenberg and Franz 1982).

Along the Atlantic and Gulf coasts in southern Florida, tortoises are (or were) largely restricted to the often narrow ridges of higher, well-drained lands near the coast. These areas are highly sought for development, and competition with urban development has eliminated or severely reduced tortoise populations in Dade, Broward, Palm Beach, Martin, St. Lucie, Indian River, Brevard, Collier, Lee, and perhaps other counties (Berish [Diemer] 1991). Inland, the dramatic growth of Orange, Osceola, Seminole, and Lake counties since 1950 has eliminated extensive areas of tortoise habitat, and considerable additional habitat has been eliminated by urbanization in Highlands, Polk, Pasco, Hernando, Citrus, Marion, and Alachua counties, among others (Berish [Diemer] 1991).

Decline in Habitat Quality—The Florida population of the Gopher Tortoise also has declined in response to dramatic changes in land management practices in the past 50 years. Habitat degradation and fragmentation may not represent actual habitat loss, but the decline in habitat quality reduces the effective population size of Gopher Tortoises. Only mature individuals can be included when considering population size; the IUCN (2001) defines mature individuals as those known, estimated, or inferred to be capable of reproduction. Gopher Tortoises that will never produce new recruits (i.e., offspring) because of social, ecological, or physical parameters cannot be counted. For example, tortoises cannot be counted if they are isolated from the opposite sex, are in too poor condition from inadequate forage or disease to breed, or sustain 100% loss of eggs from predation, infertility, or other factors.

Extensive conversion of natural pine stands to pine plantations began in the 1950s. Kautz (1998) estimated that between 1970 and 1995, natural pine forests in Florida declined from 2.26 million ha (5.58 million ac) to 1.14 million ha (2.82 million ac), a 49.4 % loss in approximately one tortoise generation. Kautz (1998) further estimated that acreage of pine plantations increased from 1.01 million ha (2.50 million ac) to 1.89 million ha (4.67 million ac) between 1970 and 1995. Auffenberg and Franz (1982) noted that selective removal of trees from natural pine stands could benefit tortoise populations, but they cautioned that the more recent practice of clear cutting and replanting in dense stands of slash pine (*Pinus elliottii*), or sand pine in the Panhandle, detrimentally affects tortoise populations. Gopher Tortoises often do well in the early years following plantation development, but as the dense pines shade out groundcover forage plants, the tortoises are forced to move to peripheral areas to find food (Landers and Buckner 1981, Diemer Berish and Moore 1993). The response of the Gopher Tortoise is to

relocate to road shoulders, where they are more easily seen; their numbers may convey a false impression of abundance, even though adjacent pine plantations are largely unoccupied.

More recently, fire suppression and the decline in the use of prescribed fire in both natural pine forests and pine plantations have resulted in substantial decline in Gopher Tortoise habitat quality. Some of the 69.4% loss of historic Gopher Tortoise habitat is likely due to succession of sandhill habitat to unsuitable natural landcover types, such as upland hardwood forest. Auffenberg and Franz (1982) reported that in the absence of fire, tortoise density declined by an average of 0.26 tortoises/ha (0.64 tortoises/ac) for each five-year period following cessation of burning. In at least some habitats, tortoises may completely disappear following fire suppression of less than 20 years. Between the late 1980s to early 1990s and 2000–2001, tortoise populations declined at nine of ten protected sites in northern peninsular Florida (McCoy et al. 2006). Population decreases of at least 10% occurred at eight of the nine sites, and these decreases were significant at four of the eight sites. The declines, however, could not be directly attributed to a decline in habitat quality (i.e., decreased ground cover and/or increased canopy cover) (McCoy et al. 2006).

The construction of roads results in loss of habitat and increased mortality of Gopher Tortoises from motor vehicles, but the indirect effects of roads on habitat quality are less obvious but more insidious. Roads help fragment Gopher Tortoise habitat and populations, and proper management of these small habitat fragments (e.g., prescribed burning, invasive species control) becomes more complicated. Tortoise populations that persist in small, fragmented "habitat islands" are forced to abandon these sites as habitat quality degrades over the years, and these populations seem doomed if better-quality habitat is unavailable in the area (Mushinsky et al. *in press*). During the past 93 years (1910–2003), the length of rural and urban roads in Florida increased 567% from 28,291 km (17,579 mi) to 188,779 km (117,302 mi) (U.S. Census Bureau 2005). During the past 60 years (1943–2003), the length of roads in Florida increased 224% (U.S. Census Bureau 2005). Highway mortality of Gopher Tortoises is probably greatest in urban areas with heavy vehicular traffic and relatively high numbers of displaced tortoises (Mushinsky et al. *in press*), and in areas where tortoises are attracted to roadsides because where most of the open habitat and suitable forage still remains. Vehicular traffic was the greatest mortality factor on tortoises on a study area in rural Georgia (Landers and Buckner 1981), and Gopher Tortoises were the third most frequently killed wildlife species along a highway north of Orlando (J. Roof, unpublished data *in* Mushinsky et al. *in press*).

Exploitation—Population size reduction might also be partially attributed to (4) actual or potential levels of exploitation. The Gopher Tortoise long has been exploited for food, especially in the Panhandle and northern peninsula (Auffenberg and Franz 1982, Taylor 1982, Diemer 1987; see Threats Section). Extensive potential tortoise habitat still remains in the Florida Panhandle, but tortoise populations are sparse in most areas. Because of their low reproductive rate, slow maturation rate, long reproductive period once mature, and limited dispersal capabilities, Gopher Tortoise populations take many decades to recover from heavy exploitation of adults. Populations in the Panhandle likely are still recovering from the heavy harvest of adults for food during and after the Great Depression (Mushinsky et al. *in press*). Auffenberg and Franz (1982) found that tortoise populations in longleaf pine-turkey oak (*Quercus laevis*) habitat in the Panhandle averaged only 20% of the density of populations in similar habitat in the peninsula.

Using 2003 imagery, Eglin Air Force Base and Blackwater River State Forest contain an estimated 159,555 ha (394,254 ac) of Gopher Tortoise habitat, which represents 73.8% of potential habitat on conservation lands in the Panhandle (Stys 2005). However, tortoises are absent or scarce throughout much of the apparently suitable habitat in both areas. Johnson and Hipes (1997) surveyed seven areas on Blackwater thought to potentially have Gopher Tortoises. They found tortoises at five sites, but densities averaged only 0.030 tortoises per ha (0.074/ac), with a range of 0.001–0.067 tortoises/ha (0.024–0.166/ac). Similarly, Printiss and Hipes (1999) surveyed ten areas on Eglin thought to potentially have Gopher Tortoises. They observed tortoises at eight areas, but densities averaged only 0.031 tortoises per ha (0.077/ac), with a range of 0.012–0.055 tortoises/ha (0.029–0.136/ac). Low tortoise densities on these large tracts of seemingly suitable land are thought to be primarily the result of past, and possibly present, exploitation by humans for food.

Pathogens—Another possible contributing factor to the decline of Gopher Tortoise populations is (5) pathogens. Upper respiratory tract disease is suspected as a contributing factor in recent tortoise die-offs (see Threats Section). Like many other diseases, URTD has the potential to influence the survival and reproduction of individual tortoises, but definitive data are lacking (Brown et al. 2002). *Mycoplasma agassizii*, the principal causal agent of URTD may have been introduced into Florida populations through the pet trade, or it may be a naturally occurring bacterium that can become pathogenic when a tortoise is stressed due to habitat fragmentation, diminished food resources, relocation, drought, or captivity (Diemer Berish et al. 2000). However, McCoy et al. (2005) found that rates of mycoplasmal infection in Gopher Tortoise populations did not appear to be connected to their demographic well-being, and plasma corticosterone levels (indicators of physiological stress) did not appear to be different among sites or between seropositive and seronegative individuals.

Summary—Based on the preceding calculations, we believe that a population size reduction of between ca. 50% and 60% can be inferred for the Gopher Tortoises in Florida in the past three generations (60–93 years) based on (3) a 50–60% decline in the area of occupancy, a decline in habitat quality, accidental mortality, human exploitation, and possibly the effects of pathogens. The impacts of human exploitation, accidental mortality, and pathogens remain unquantified, and these threats are in addition to documented declines in the area and quality of Gopher Tortoise habitat. Thus, the Gopher Tortoise meets the criteria for listing as a Threatened species (i.e., a species with a population size reduction of ≥50%, but less than 80%) (Appendix 2).

These conclusions are supported by other researchers. Auffenberg and Franz (1982) estimated that 56.2% of the original Gopher Tortoise habitat (longleaf pine–oak uplands, sand pine–scrub oak, and xeric hammock) in Florida was already gone by 1973, and that about 33% of the estimated total original carrying capacity of 2 million tortoises in these three major habitat types had already been lost because of:

(1) a decline in area of occupancy and quality of habitat caused by urbanization,
(2) extensive conversion of sandhill habitats to pine plantations,
(3) extensive conversion of scrub and sandhill habitats to agriculture,
4) a lack of prescribed fire and suppression of natural fire, and
(5) a long history of human predation.

Primarily because of continuing human population pressures, Auffenberg and Franz (1982) predicted that only 389,200 Gopher Tortoises would remain in Florida by 2000, which would represent a loss of 68% of the population in a 27-year period (approximately one tortoise generation). Recently, Mushinsky et al. (*in press*) estimated that there has been at least an 80% decline in the Gopher Tortoise in Florida since the 1960s. This estimate of population decline was based upon a conservative estimate that <20% of the xeric upland habitat in the 1960s remained in 2000, and undeveloped uplands surrounding human developments have undergone habitat degradation because of altered burn cycles.

Although GIS mapping of historic and current potential habitat for Gopher Tortoises does not provide estimates of population density or habitat occupancy, it does show that the amount of potential habitat has declined ca. 70% since European settlement. From this habitat decline, we can infer that the state's Gopher Tortoise population has declined, and increased habitat fragmentation and isolation of populations will affect the long-term viability of remaining populations. Disease, harvesting, habitat degradation, and other threats may have long-lasting consequences for local tortoise populations, and very little information is available regarding the capacity of such populations to recover following a major decline in numbers (McCoy et al. *in press*).

Subcriterion 2

Subcriterion 2 requires a projected or suspected population size reduction of ≥80% (Endangered), ≥50% (Threatened), or ≥30% (Species of Special Concern) within the next three generations (60–93 years). If we use Year 2003 as the present, three generations would be 2063 or 2096. If current population trends continue, Florida's human population will be 20.4 million in 2010, 25 million in 2030, and 32 million in 2050 (Bouvier and McCloe Stein n.d.). In less than three tortoise generations, the human population in Florida will have doubled. If this rate of growth were sustained, Florida's population will approximately triple in three *VORTEX*-calculated tortoise generations. Kautz (1998) projected that natural pine forests could disappear from all commercial forest lands in Florida by 2021, within one tortoise generation. It may be inevitable that Gopher Tortoises will be largely eliminated from private lands in Florida within the next three generations, which would represent a further 60% decline of tortoise habitat. In addition, tortoises may continue dying from URTD and other diseases, which may be exacerbated in the future by increased overcrowding, habitat degradation, and number of relocations. Vehicular mortality and human exploitation of tortoises may increase with continued road construction. Hence, the listing of the Gopher Tortoise as a Threatened species is supported by Subcriterion 2 based on a projected ≥50% population size reduction in the next three generations because of (3) a decline in the area of occupancy or quality of habitat and possibly (5) the effects of pathogens.

Subcriterion 3

The Gopher Tortoise also warrants listing as Threatened based on Subcriterion 3, which requires an observed, estimated, inferred, projected, or suspected population size reduction of ≥50% over any three-generation period, where the time period must include both the past and the future, and where the reduction or its causes may not have ceased, be understood, or be reversible. In approximately one *VORTEX*-calculated tortoise generation (2000–2030), Florida's human population is projected to increase by 9 million people (Bouvier and McCloe Stein n.d.),

with concomitant tortoise habitat loss and degradation. During the period 2000–2020, an estimated 1.05 million ha (2.58 million ac), or 7.5% of the total land area of Florida, is expected to be converted to urban uses (Reynolds 2002). This estimate of urban land conversion was calculated using urban land-use coefficients from MSA (Metropolitan Statistical Area) and non-MSA counties in each of three regions of Florida multiplied by the expected increase in population for each county from the Bureau of Economic and Business Research.

Based on preceding calculations and considering the time period encompassed by the past two generations and the next one generation of tortoises (i.e., 1963–2023 or 1941–2034), we suspect that Gopher Tortoise populations will have declined ≥50%. These past and future population declines are attributed to (3) a decline in the area of occupancy or quality of habitat, (4) actual levels of exploitation, and possibly (5) the effects of pathogens. Auffenberg and Franz (1982) predicted that the Gopher Tortoise population in Florida would decline by 70.0% during the period 1973–2000 and by 98.4% during the period 1973–2025.

Subcriterion 4

Subcriterion 4 requires an observed, estimated, inferred, or suspected population size reduction of ≥90% (Endangered), ≥70% (Threatened), or ≥50% (Species of Special Concern) over the last ten years or three generations, whichever is longer, where the causes of reduction are clearly reversible and understood and have ceased. Subcriterion 4 does not apply to the Gopher Tortoise because the causes of population size reduction (e.g., habitat loss) are not clearly reversible and have not ceased.

Criterion B: Extent of Occurrence and /or Area of Occupancy

Criterion B was designed to identify species with a restricted distribution that also is fragmented, undergoing decline, and/or exhibiting extreme fluctuations. To meet the requirements for listing under criterion B, the general distributional threshold must first be met for at least one of the categories (extent of occurrence or area of occupancy). If the general threshold is met, the taxon must then meet at least two of three subcriteria listed for criterion B.

This criterion requires an estimate of the Gopher Tortoise's extent of occurrence (i.e., total range) and area of occupancy. These two parameters may differ considerably for species that are patchily distributed. To meet this criterion for listing, the extent of occurrence must be estimated at <100 km^2 (ca. 40 mi^2) for Endangered status, <5,000 km^2 (ca. 2,000 mi^2) for Threatened status, or <20,000 km^2 (ca. 7,700 mi^2) for Species of Special Concern. Alternatively, the area of occupancy must be estimated at <10 km^2 (4 mi^2) for Endangered, <500 km^2 (200 mi^2) for Threatened, or 2,000 km^2 (770 mi^2) for Species of Special Concern. The criterion also includes an assessment of the species' distribution (i.e., severely fragmented or a limited number of locations) and a determination of whether or not the species is experiencing population declines.

The Gopher Tortoise occurs throughout Florida except for the Everglades region (Diemer 1987). The land area of Florida encompasses 139,798 km^2 (53,997 mi^2), and if Big Cypress Swamp and the Everglades are excluded, the area remaining is still 132,689 km^2 (51,251 mi^2). This extent of occurrence is much greater than the 20,000 km^2 (7,700 mi^2) minimum requirement for listing as a Species of Special Concern. Based upon GIS analysis of 2003 imagery, 13,446

km^2 (5,192 mi^2) of potential Gopher Tortoise habitat remain in Florida. Hence, area of occupancy significantly exceeds the 2,000 km^2 (770 mi^2) that would be required to trigger listing as a Species of Special Concern under this criterion. Thus, under the criteria of extent of occurrence and area of occupancy, listing the species as Endangered, Threatened, or Species of Special Concern is not supported (Appendix 2).

Criterion C: Population Size and Trend

Criterion C is designed to identify species with a small population size that is currently declining or may decline in the near future. To qualify for listing under this criterion, the numeric threshold must first be met, as well as one of two subcriteria that describe decline. To meet this criterion for listing, the number of mature individuals must be fewer than 250 (Endangered), 2,500 (Threatened), or 10,000 (Species of Special Concern).

On 44 selected "conservation lands" (i.e., national forests, national wildlife refuges, state parks) in Florida, McCoy et al. (2002) estimated tortoises to number 81,448 on 55,790 ha (137,855 ac) of suitable habitat (i.e., 1.46 tortoises/ha; 0.59 tortoises/acre), whereas Stys' method of GIS analysis underestimated by 12% the total amount of tortoise habitat (49,912 ha; 123,332 ac) with $\geq$20 ha (50 ac) of habitat and overestimated by 46% the total number of tortoises present (149,796). Diemer (1992) found that adults comprised 40–62% of three study populations in northern Florida. Using Diemer's (1992) minimum value of 40% adults, the tortoise populations reported by McCoy et al. (2002) on 44 conservation lands would conservatively contain at least 32,579 adult tortoises. If these same calculations are applied to all suitable tortoise habitat identified using GIS analysis, then Florida has ca. 785,000 adult tortoises. However, all lands with suitable habitat are not occupied by tortoises, and all adult tortoises do not produce offspring. The IUCN defines mature individuals as those known, estimated, or inferred to be likely of reproduction. Therefore, the number of mature tortoises in Florida is probably lower than 785,000, despite using conservative estimates for population density and percentage of adults.

According to GIS analysis of 2003 imagery, public conservation lands in Florida contain an estimated 542,069 ha (1,339,452 ac) of good-quality tortoise habitat, which represents 40.3% of the present tortoise habitat identified in Florida. Cox et al. (1987) state that a minimum of 40–50 tortoises is needed to ensure population persistence for several decades, and 10–20 ha (25–50 ac) of appropriate habitat is needed to sustain a population of this size. Eubanks et al. (2002) found that 19–41 ha (47–101 ac) were necessary to maintain a population of 50 tortoises in a landscape. If 20 ha (50 ac) is considered as the minimum patch size needed for short-term population viability, then 86.2% of tortoise habitat (2,345 patches) on public lands meets this criteria. However, Gopher Tortoise densities tend to plateau on parcels of land ca. 100 ha in size, suggesting that a population may require 100 ha (ca. 250 ac) of habitat to prevent overcrowding and ensure long-term viability (Mushinsky et al. *in press*). Public lands contain 630 of these larger patches totaling 392,388 ha (969,591 ac) of suitable tortoise habitat, which comprise 72.4% of the total tortoise habitat on public lands. However, tortoise populations are not necessarily secure on these lands, even when the habitat appears to be properly managed. For example, large areas of potentially suitable habitat in the Panhandle contain relatively few tortoises (see Exploitation subsection). If we delete the 216,719 ha (534,506 ac) of mostly under-stocked tortoise habitat in the Panhandle, there still remains 175,669 ha (434,078 ac) of

suitable tortoise habitat in patches ≥100 ha on public conservation lands. If these lands support Gopher Tortoises at the densities reported by McCoy et al. (2002), then a minimum of 256,477 tortoises (>102,000 adults) occur on public conservation lands in peninsular Florida. Because we are considering only large patches of suitable habitat, most of the adult tortoises can be considered mature (i.e., likely to reproduce). Auffenberg and Franz (1982) estimated an overall tortoise density of 3.73 individuals/ha (1.51/acre), which would yield an estimate of 262,000 mature tortoises on these same public conservation lands in peninsular Florida.

It is clear that Gopher Tortoises in Florida far exceed the listing thresholds for population size. Conservative estimates of the number of adult tortoises on public conservation lands, which contain 40% of the state's suitable tortoise habitat, exceed by an order of magnitude the threshold level for Species of Special Concern (i.e., 10,000 mature individuals). If private lands are included, it is reasonable to assume that >200,000 mature tortoises inhabit Florida. Because the number of mature individuals exceeds thresholds for listing under criterion C, population trends are not considered under this criterion. Under the criterion of population size, listing of the species as Endangered, Threatened, or Species of Special Concern is not supported (Appendix 2).

Criterion D: Number of Mature Individuals

Criterion D identifies species with very small or restricted population size. A species qualifies for listing under criterion D if the population size of mature individuals is smaller than the threshold for the category of threat.

This criterion requires an estimate of the number of mature individuals in the Florida population to determine if the population is extremely small or restricted. To meet this criterion for listing, the Florida population estimate for the species must be no greater than 50 (Endangered), 250 (Threatened), or 1,000 (Species of Special Concern) mature individuals. As discussed under Criterion C above, the minimum number of mature tortoises is estimated to exceed 100,000 just on public lands in peninsular Florida. Under the criterion of number of mature individuals, listing of the species as Endangered, Threatened, or Species of Special Concern is not supported (Appendix 2).

Criterion E: Quantitative Analyses

Criterion E identifies species that have been modeled to have a high probability of extinction. To qualify for listing under this criterion, a species must have had a quantitative analysis such as a population viability analysis (PVA) conducted to determine the species risk of extinction.

This criterion requires an estimate of the probability of a species' extinction in the wild within a particular timeframe. In order to be listed as Endangered, Threatened, or Species of Special Concern, that probability would have to be at least 50% within the next three generations (93 years), 20% within the next five generations (up to a maximum of 100 years), or 10% within the next 100 years, respectively. Miller (2001) conducted a PVA for the Gopher Tortoise and concluded that it had neither a 50% probability of extinction within the next three generations (ca. 100 years) (Endangered) nor a 10% probability of extinction within the next 100 years (Species of Special Concern). Hence, listing of the Gopher Tortoise as Endangered, Threatened,

or Species of Special Concern is not supported under this criterion (Appendix 2). Population sizes >250 were deemed necessary to provide significant protection against stochastic extinction if juvenile and adult mortality rates increased, such as from the introduction of severe forms of URTD (Miller 2001).

STEP 2

After assessing the status of the regional population using Red List Criteria, a procedure must be followed to determine if the risk of extinction is affected by populations outside the region. This procedure involves answering a series of questions in a flow chart (IUCN 2003:12):

2a. Is the taxon a non-breeding visitor? The answer is NO.

2b. Does the regional population (i.e., Florida) experience any significant immigration of propagules capable of reproducing in the region? The answer is NO. Although tortoise populations occur in adjacent areas of Alabama and Georgia, tortoise dispersal is limited and would not be expected to significantly augment Florida's population, thereby affecting its risk of extinction.

The conclusion based upon the answers to the two questions above is that there should be no change made to the preliminary assessment of Threatened status derived in Step 1.

LISTING RECOMMENDATION

The Gopher Tortoise is currently listed by the FWC as a Species of Special Concern. This status review finds that it meets Criterion A (population size reduction) for classification as a Threatened species. The Gopher Tortoise meets the classification for Threatened status under three subcriteria in Criterion A (summarized in Appendix 2). The first subcriterion is an inferred population size reduction of $\geq$50% over the last three generations (60–93 years) based on a decline in area of occupancy or quality of habitat, as well as the effects of exploitation and pathogens. The second subcriterion is a projected $\geq$50% population size reduction in the next three generations in response to a decline in the area of occupancy or quality of habitat and possibly the impact of pathogens. The third subcriterion is an estimated $\geq$50% population size reduction in the past two generations and the next one generation in response to a decline in the area of occupancy and quality of habitat, and the effects of exploitation and possibly pathogens.

PUBLIC INPUT

The FWC requested written information from the public on population size and trends, distribution and range, threats to the species, published population viability models, and specific aspects of the Gopher Tortoise's life history that may influence its status. Notification of the 15 July–31 August 2005 public input period occurred via a notice in the Florida Administrative Weekly, an FWC press release, and notices on the FWC website.

All 58 public responses pertaining to reclassification are paraphrased or quoted in their entirety in Appendix 1, except for two responses that consisted of newspaper clippings of letters to the editor that did not mention reclassification. All respondents recommended reclassifying the Gopher Tortoise to Threatened or Endangered status. Three people provided pertinent information that has been referenced in this report.

An article by David Fleshler on the Gopher Tortoise appeared on 21 August 2005 in the South Florida Sun-Sentinel (http://www.sun-sentinel.com/news/local/southflorida/sfl-ctortoiseaug21,0,291368.story?coll=sfla-news-sfla). An addendum mentioned the public comment period on the state's proposal to reclassify the Gopher Tortoise. This newspaper article elicited at least 39 of the public comments, but none provided new information pertinent to the proposed reclassification (Appendix 1). Most responses decried the present policy that permits tortoises to be "incidentally taken" (killed) during land development when habitat is preserved as mitigation.

SUMMARY OF INDEPENDENT REVIEWS

Independent scientific reviews of the Biological Status Report were solicited and received from seven scientists with knowledge about the Gopher Tortoise or the IUCN Red List criteria. Six reviewers concurred with the proposed reclassification to Threatened status, although some reviewers had problems with certain aspects of the report. One reviewer, the president of an environmental consulting firm, did not think that the report provided strong enough evidence to warrant reclassification, and he felt that the IUCN criteria were not followed in all cases. All the reviews are included in Appendix 3, and responses by the authors to recommendations or criticisms by the reviewers appear in brackets. Many suggestions by the independent reviewers were used to revise and clarify various sections of the report.

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APPENDIX 1. Summary of public comments that were received 15 July–31 August 2005 regarding the proposed reclassification of the Gopher Tortoise. Comments not in quotation marks were slightly paraphrased, and for consistency, some words were capitalized (i.e., listing status categories and the word "Gopher Tortoise").

Ray E. Ashton, Jr., President, Ashton Biodiversity Research and Preservation Institute, Inc., Gopher Tortoise Conservation Initiative, 14260-331 W. Newberry Road, Newberry, FL 32669

The Ashton Research and Preservation Institute has petitioned the U.S. Fish and Wildlife Service to list the Gopher Tortoise as a Threatened species under the Endangered Species Act. The petition has been accepted but is currently on hold along with a number of other species.

We suspect that the loss of tortoises due to development is significantly higher than stated in the draft Biological Status Report prepared by the Florida Fish and Wildlife Conservation Commission (FWC). To test this hypothesis, we checked five counties across the state to see what the estimated loss of tortoises was from land being cleared for single family homes in excellent to acceptable tortoise habitat. Due to data collection problems in some counties, septic tank permits might be the best indicator that a site is being cleared. In many parts of the state, clearing of land for family homes or ranchettes on 1–10 ac is among the largest forms of development, and it is the kind of development that is the most likely not to be detected by the FWC. Most people do not know or care about getting permits for less than five tortoises.

Our very rough preliminary review indicates that at least 25 tortoises per county are likely lost each week due to this form of development. "If you remove some counties that are mostly urban or possibly have fewer or just call them a fudge factor, Say we have 50 counties loosing [sic] 50 tortoises That is a loss of 500 per week or 6000 per month." This loss does not include other forms of development, such as larger developments that require some scrutiny by the FWC, Department of Environmental Protection, or other agencies; state, county, or city projects; agriculture, and silviculture.

We hope to obtain a clearer picture of this situation, unless FWC staff could be directed to spend more time gathering data on the real rate of development and loss of local tortoise populations. This should be done by looking at county permits, areas that have been established for development through Comprehensive Plans, GIS analysis of farm land-use changes (e.g., conversion from pasture to row crops, which is demonstrable habitat loss), and loss of habitat in silvicultural areas due to the lack of burning and subsequent desertification caused by canopy closure. GIS analysis does not tell the whole story and gives a false impression of the rate of loss.

Despite the fact that the actual listing of a species matters very little in the level of protection, it may be better to have the Gopher Tortoise listed as Threatened in the state before the U.S. Fish and Wildlife Service lists it as Threatened in Florida.

James M. Thomas, President, Biosphere Consulting, Inc., 14908 Tilden Road, Winter Garden, FL 34787

I do not have hard data but would like to present the following long-term observations of the Gopher Tortoise. I have been an environmental consultant in the Orlando area since 1973 and have frequently encountered tortoise populations in the region. In my opinion, the following threats to this species should be considered in decisions regarding reclassification:

1. In Central Florida, vast populations were eradicated as citrus groves were developed, and the remaining upland areas are currently being developed at a rapid rate. New regulations that increased costs and time for Gopher Tortoise relocation permits have resulted in widespread permitted and non-permitted taking. There is little or no enforcement on new development sites. These things have resulted in vast reductions in numbers in this area.

2. I have great concern that increasing coyote populations in this area may be having a detrimental effect on tortoise populations. I have observed several cases where active tortoise burrows were extensively excavated, and coyote tracks were around the area. I have also found empty tortoise and box turtle carapaces with chewed edges. I do not have hard-core data, but I am of the opinion that this is one more major threat to the species.

Please take these observations into account and seriously consider reclassification of the species.

Mary J. Eich, 16409 NW Oak Hollow Lane, Altha, FL 32421

As a concerned citizen, I would like to provide input regarding reclassification of the Gopher Tortoise. I have lived on the Chipola River in Calhoun County for the past 18 years and have walked an hour per day over a 400-acre tract of fields, lawns, woods, and swamp. Each year, I encounter fewer Gopher Tortoises, and they have declined in size from about 12 inches to 6 inches and smaller. I would estimate that I saw at least one Gopher Tortoise per day 18 years ago, but the frequency of sightings has dropped each year, and I now see less than one tortoise per month.

Driving through Calhoun, Jackson, and Gadsden counties on the way to and from work, I rarely see tortoises trying to cross roads, which was a frequent occurrence years ago. Furthermore, my job requires weekly travel in the Panhandle from Escambia to Jefferson County, and I rarely encounter a Gopher Tortoise trying to cross the road. When I do see one, it is much smaller than in years past.

Finally, the eating of Gopher Tortoises "in the country" is common, as they are considered a delicacy. To this day, I encounter groups of people bragging that they caught one or more last weekend and had a feast. I am sickened by this and inform them that they just ate a protected species, but they look at me with disbelief and say "I've been eating them all my life and don't plan to stop." I believe an aggressive public information campaign with listing of fines needs to take place immediately if these wonderful creatures are to survive.

I hope this account is what you need and feel free to contact me if needed.

Kristoffer Bowman, Ecologist, 1813 Hanson Street, Ft. Myers, FL 33901

"I'm writing in response to the FWC's request for information related to the Gopher Tortoise. I've been working for an ecological consulting firm for the past six years, since leaving my position at Joe Budd WMA. Among various other projects, I've been involved in Gopher Tortoise (GT) surveys, infrared camera scoping of burrows, permitting, habitat management plans, etc. We all know that development in Florida is rampant and uplands are the first areas to be targeted. Typically, these uplands are occupied by Gopher Tortoises. In my opinion, this species deserves more protection. From what I've seen, it is relatively easy to permit the development of GT habitat, and destroy or relocated GTs. Even when management plans are written for individuals to be protected, there is no guarantee that the landowner will follow these management guidelines. I suspect that often times they do not.

There are too many issues related to the management of this species to discuss here. Suffice it to say, again, it is relatively easy to get permits to alter or destroy habitat and individuals. In addition, populations are lost over time in some areas due to single-family residences taking a burrow here or there, which seems innocuous, but eventually it all adds up. Relocation is riddled with problems, not the least of which is the spread of URTD. I'm also curious as to where the money goes when people buy GT mitigation credits. Is suitable habitat being created somewhere in the state? The bottom line is that GTs need our help for a variety of reasons, primarily because of extensive permitting and development of their habitat. I would like to see all regulatory agencies get it together and protect all listed species to a greater degree. Since working on the front lines of development and habitat protection, I can see that we may have a long way to go before that happens.

That's all I have for now. No population viability models or hard data, but I do have strong feelings about the management, or lack thereof, of some listed species in this state. I've seen enough over the last few years tom make me concerned about their protection and I do hope some changes, for the better, are forthcoming in the near future."

Sunny Parson, 17845 Beach Street, Umatilla, FL 32784

"Include mine among the voices of the Florida citizenry urging the FWC to raise the threat level against the Gopher Tortoise to the status of 'Threatened Species.' This change in status is vital to the survival of this species, and in the long run, to the survival of our own species.

Environmental terrorism is not sabotaging logging machinery, or liberating animals from laboratories, or splattering paint on the pelts of dead animals being worn as apparel. True environmental terrorism is the decimation of the natural world, and in Florida this destruction takes its most lethal form in the guise of 'development.' As growth continues, willy-nilly and unchecked, despite legal measures to mitigate its effects, ecosystems are shrinking and species are still in danger of disappearing. Old news to you, Kevin, I know. But the alarm needs to be sounded until it's met with the appropriate response.

The state has made some valiant strides in its conservation efforts, but considering the dire rate of growth in Florida, far more strident measures need to be taken to salvage what's left of Florida's flora and fauna. The change in the Gopher Tortoise's status from 'Species of Concern' to 'Threatened Species,' along with the abolition of the insane 'incidental take' concept, would be a step toward our salvation. On the subject of 'take,' burying tortoises alive is indicative of a cruel, impatient, and unimaginative mindset. Surely there is enough brain power in the government to come up with some other, more humane way of dealing with tortoises found "in the way" of development. Relocation of these tortoises **is** a viable option. The land exists. What's required is the wherewithal to make it work.

I appreciate your taking my opinion in account on the matter of the tortoises. I believe there's more likeminded people out there than the powers-that-be realize."

John and Donna Schubert, 16897 Captiva Drive, PO Box 696, Captiva, FL 33924

"As pertains to public comment regarding the proposed reclassification of Gopher Tortoises to 'Threatened' status please be advised that both my wife and I are strongly supportive of such an upgrade. In fact, we support the classification of Gopher Tortoises as 'Endangered.' Thank you for your consideration of our comment and for any effort you can expend to protect Gopher Tortoises."

Suzy Fay, Quincy, FL

"I understand that FWC is considering uplisting the status of Gopher Tortoises in Florida to Threatened. I strongly urge that FWC do this. As you know, developers are currently free to pay into a 'mitigation' bank, which permits them to kill gophers onsite in the most cruel ways: crushing tortoises with heavy machinery or burying them alive so that they suffer a slow, painful death by starvation. Awarding this new status to the Gopher Tortoise, and publicizing it, would help correct the perception of many Florida citizens that our present state government has an insanely negligent and cavalier attitude toward Florida's environment, while possibly preserving some of our precious resources."

Rebecca Eagan, 1311 Palmer Avenue, Winter Park, FL 32789

"As an attendee of the FWC/stakeholder meeting in June, I have made my feelings about incidental take policy vis-a-vis the status of the Gopher Tortoise well-known. But *for the record: by ALL means* ***uplist the tortoise to Threatened***---it' the least the agency helping usher *Gopherus polyphemus* to extinction can do. And it will position FWC to announce it has taken measures to rescue gophers from the brink---even though colusion [sic] with developers will continue as usual, in the blood money pact of 'incidental' (ha-ha) take, and the label will shine as ineffectual in stemming FWC-abetted decline as a bandaid on a Grand Canyon-sized wound. ***There is no euphemism for cruelty***, no high ground FWC can pretend to occupy if it won't physically protect its own listed species, the very *mission* citizens depend on it to fulfill. What does it stand for? Helping developers more smoothly accomplish profit? **Yes PLEASE uplist the tortoise to Threatened.** And it would be nice to quit permitting the routine slaughter of *irreplaceable, indigenous* animals that are the cornerstone of the upland ecosystem.

In a practical sense, 'legal' take is too often blurred in characterization (e.g., the recent illegal entombment of tortoises in Edgewater and the hasty *ex post facto* IMPROPER permit issued by FWC) with casual clandestine entombments, so that *people are disregarding FWC's permit requirements anyway.* It's frontier law---and why not? Why WOULD a piece of paper make all right an act that in most circles would brand a pre-teen a juvenile delinquent destined to become a serial killer?

Sorry, really, to put this all on YOU. But FWC needs to not only apply the Threatened label, but also to wean itself off take mitigation $$$ as a 'solution'---for it is deluding itself, and permitting itself into stark irrelevance to the reality: *the disappearing tortoise.* ***It is FWC's job to protect the tortoise, not developer business interests.***"

Vivienne Handy, PWS, Qwest Ecology Inc., 735 Lakeview Drive, Wimauma, FL 33598

"I am writing to express my strong support to re-classify the Gopher Tortoise to a 'Threatened' designation. I believe this up-listing may help to provide better protections and better management for this species. The Gopher Tortoise regulations and policies as they stand today do not reflect current science, and have not done an adequate job of protecting the species or its habitat. It is my hope that the required management plan that would accompany this re-classification will address many of the policies and poor management that are in dire need of change.

As a professional biologist and consultant, I deal with implementing current Gopher Tortoise policy, and see first hand the results of these. There is far too much red-tape, permitting, and poor policy decisions, and little or no habitat protection or actions that will actually result in long-term conservation of the species. The current policies regarding both take permits and relocations simply do not work, and are completely inadequate to ensure sustaining long term, viable <u>local</u> populations. The current policy regarding URTD testing is in complete opposition to current science regarding the disease; results in the destruction of healthy populations; and is a waste of time and money that could otherwise be spent on tortoise conservation. This testing policy should be terminated immediately. The current mitigation policies are also completely inadequate, and have failed to ensure protection of habitats, particularly in areas under threat of development.

The continued decline of viable, local Gopher Tortoise populations, and the current policies that have failed to protect the species, warrants increased protection. The up-listing of the Gopher Tortoise to Threatened status, and the accompanying management plan is a step in the right direction, and should be the top priority of the FWC."

Sandy H. Straus, President, Senior Engineer, ESRA Consulting Corporation

"The Florida Fish and Wildlife Conservation Commission needs to take a more proactive role in protecting Florida's Threatened and Endangered species, including the Gopher Tortoise. We urge Florida officials to increase the Gopher Tortoise's legal status to Threatened in order to draft a management plan and to reduce if not eliminate the unnecessary burial of these reptiles. Funds, however, should ultimately be allocated to federally classify the Gopher Tortoise as an

Endangered species since Florida is not the only state facing a dwindling population of Gopher Tortoises.

First, it may be most advantageous and cost-effective to call for independent volunteers to assist the agency and the developers. Volunteers shall be linked through databases and contacted by e-mail and/or telephone to reduce paperwork and minimize costs for all parties, if necessary. Such modes of communication are in accordance with the Paperwork Reduction Act of 1995. Second, the volunteers shall be called upon to assist in a wildlife survey of and/or an oversight of the community slated for development. Third, the volunteers shall be dispatched to the sensitive areas where burrows and other places of animal refuge are identified. There they shall proceed to collect these animals, including the Gopher Tortoise and other reptiles, amphibians, and mammals, and relocate them to nearby federal and state parks, such as Loxahatchee National Wildlife Refuge, Big Cypress National Preserve, etc.

Such measures not only prevent a cycle of relocation, which may later be subject to development, but ensure the future of Florida's fragile ecosystem, and, in particular, the survivability of the Gopher Tortoise and its burrow mates. Alternatively, the Gopher Tortoise shall be identified and relocated to other state parks where similar climate, species, and/or geography exist to accommodate these reptiles. In this case, a consorted effort to connect and exchange information with other park officials shall be initiated. Development is inevitable but the extinction of wildlife is preventable."

Eric Draper, Policy Director, Audubon of Florida, 444 Brickell Avenue, Suite 850, Miami, FL 33131

"Because the Gopher Tortoise population has declined greater than 50% (estimated 60-80%) over the last three generations, and is anticipated to continue declining into the foreseeable future (FWC, Preliminary Biological Status Report, 2001), Audubon of Florida believes the uplisting of this species from 'Species of Special Concern' to 'Threatened' in the State of Florida is supported by meeting these listing criteria. It is also vital to efficiently complete, and fund the implementation of, an effective management and conservation plan that has been pending for too long.

Additional aspects of Gopher Tortoise existence in Florida that should influence any listing decision include the comparative rarity of suitable upland habitats in areas where wetland ecosystems dominate the landscape, such as south and southwest Florida. It appears upland development pressure is disproportionately reducing these regional tortoise populations. Also, both the State Fish and Wildlife Conservation Commission and U.S. Fish and Wildlife Service are missing vital opportunities to conserve Gopher Tortoises, and other listed species, by not cooperating with, and encouraging local governments to incorporate stronger local protection policies into their permit review processes and comprehensive land use planning. There is coordination where wetlands are concerned, but typically not for upland imperiled species which have vague or non-existent wildlife agency review entry points where there are no wetlands. This is resulting in further undocumented impacts to habitat and tortoise populations."

Linda A. Jennings, 1398 Middle Gulf Drive, Unit B, Sanibel, FL 33957

"I am writing to urge you to increase the Gopher Tortoise legal classification to Threatened. Gopher Tortoises are considered among the most important animals in the state because their burrows provide shelter for hundreds of species. The widespread development in Florida resulting in more and more loss of habitat makes it necessary to provide additional protection for this species. I realize that this measure alone will not stop the killing tortoises for development, but hope that the management plan will provide alternatives."

Jacqueline Eckert, 5620 Robert Scott Drive North, Jacksonville, FL 32207

"I agree with the state's proposal to reclassify the Gopher Tortoise as Threatened. According to estimates, there are 500,000 to one million left. That is really not a lot, especially when one considers the amount of development going on in Florida. Just because there is seemingly unstoppable growth, that is no reason to do nothing to protect these tortoises whose burrows create refuges for 100 or more species of other animals."

Ellen Petrick

"Please upgrade the status of the Gopher Tortoise to 'Threatened.'"

Claudia Burns, Sanibel, FL

"Please change the legal status of Gopher Tortoises to 'Threatened.'"

Barbara Ziemian,1807 Buckthorn Lane, Sanibel, FL 33957 (form letter)
Prida Contada (form letter)
Almaida s de la Cruz (form letter)

"I am writing to express my support for the listing of the Gopher Tortoise as a Threatened species in our State of Florida. The Gopher Tortoise is an integral part of Florida's natural heritage. The species and its ancestors have been present in our State for millions of years. Florida is one of six states containing Gopher Tortoise habitat, but because the tortoise's range in Florida comprises approximately half the Gopher Tortoise's total range, our State is vital to the specie's continued existence. Moreover, the ecological importance of the Gopher Tortoise extends beyond itself to the more than 360 animal species which use Gopher Tortoise burrows for shelter.

Despite being a keystone species in its Florida ecosystem, the Gopher Tortoise is extremely vulnerable to threats. The tortoise matures slowly, and a female may produce a successful nest as infrequently as once in ten years. Juvenile tortoises are susceptible to perdition until their shells harden, at 6–7 years of age. But the greatest threat to the Gopher Tortoise is the loss of its habitat to land development throughout the State. I urge the Florida Fish and Wildlife Conservation Commission to upgrade the status of the Gopher Tortoise to Threatened."

Jéanne DeVore, 20701 Sugarloaf Mountain Road, Clermont, FL 34715

"I'm writing in support of your efforts to reclassify the Gopher Tortoise to Threatened. We have them on our property and I can vouch for the importance of their burrows to so many other species of native animals and reptiles. There are 1400 ac nearby that will soon be developed and the typical Florida scrub will cease to be available to not only the Gopher Tortoise but the Florida scrub jay as well. Please continue to fight for a solution so Gopher Tortoises don't end up extinct soon."

Public input received in response to an article that appeared in the South Florida Sun-Sentinel about tortoises being killed to construct a Wal-Mart store in Palm Beach County. An addendum mentioned the public comment period on the state's proposal to reclassify the Gopher Tortoise, and the following letters (with extraneous portions deleted) were sent to Kevin Enge:

Ellen Donahue, 3000 Florida Boulevard, Apartment 105D, Delray Beach, FL 33483

"You must find a better solution for the plight of the Gopher Tortoise than burying them alive. I'm certain that rehabilitation cannot be that difficult. Please do what you can to solve this problem. I have remembered Florida Fish and Wildlife in my will and I'm becoming disenchanted with your decisions. Protection of these species should be number one."

Susan I. Lowe, 5400 NE 22nd Terrace, Apartment B, Fort Lauderdale, FL 33308

"I read an article in the Sun-Sentinel newspaper here in Ft. Lauderdale, FL where I live. It told of how the construction industry are killing off our wildlife. In particular, Gopher Tortoises and other burrowing animal that happens to be in the way. I find this very alarming, such a disrespect for life. Some day we will be killing ourselves off for the sake of greed as well.

I noticed at the end of the article that August 31st you may reclassify this issue. It didn't really say whether that would be good or bad, on the side of wildlife or developers. I implore you as someone with responsibility and authority to find a way to save our wildlife and satisfy the need for homes and businesses. If I had had time I would have tried to get this issue out to more people, as it is, I will just be able to talk to some friends who feel the same as I do. We need our wildlife, they are important."

Colleen M. Kelly, 3700 Galt Ocean Drive, #810, Fort Lauderdale, FL 33308

"This letter is in support of the proposal to reclassify the Gopher Tortoises to 'Threatened.' Based on their ability to live underground for some time before suffocating or starving as well as the fact they are living creatures of substantial size and purpose, their intentional burying is unconscionable.

We, as humans, must persist in finding the right balance between development and allowing nature to continue to grow around us. The developers must be held accountable for relocating the animals in their path. We all must be held accountable for doing the right thing around the

ethical treatment of nature's 'critters' and each other. To kill the tortoises for consumption is natural. To bury them alive is murder.

Please count me among the many Floridians who are behind you in your role to find a solution to this important issue. I respect your commitment as chairman of the Gopher Tortoise committee. I trust that you and the others will be guided to find answers that will serve not only the Gopher Tortoises but all of nature well."

Tom and Gwen Harris, 15318 Fiorenza Circle, Delray Beach, FL 33466

"Turtles or any animal for that matter should not be allowed to die a slow death for the sake of development. We are more civilized than that. Please change its legal status from Special Concern to Threatened."

Debbie L. Rubin, 320 North Ocean Boulevard #409, Fort Lauderdale, FL 33308

"After reading about the Gopher Tortoise plight, I cannot help but be angered and concerned. We recently returned from a trip to Alaska where wildlife is welcome, protected and recognized as an integral part of the preservation of our eco-system. I understand that one should not stand in the way of progress. But, a Wal-Mart on land that the tortoises have occupied and consider home, is a bit short of 'progress.' Certainly, we can find the monies to move them permanently to a viable home where they will be content, and not turn around to move them yet, again when that particular land is sought for a housing project!

Let us petition to declare them an Endangered species. Let us slap people with a hefty fine for killing these wonderful species for consumption, as well. Certainly, we can divert monies from parking tickets, the lottery, license plates or fines to propel these studies forward so that we can locate land suitable for the tortoises so that we do not have to trade progress with killing off wildlife that deserve to be here, as well. Thank you for your attention to this matter."

Maylin, Patrick, Colin, and Austin Travers, 4344 Fox Hollow, Weston, FL 33331

"After reading the article in the Sunday edition of the Sun Sentinel, our family was shocked and dismayed to learn about how the state of Florida legally permits developers to heartlessly kill Gopher Tortoises. Since their habitats are being destroyed to accommodate the ever-growing human population, we feel that we need to do whatever we can to help preserve these animals and their quickly decreasing habitats. We agree that their status should be changed immediately. Please let us know how else we can help to protect Florida's wildlife."

Ms. Clymene Rudder, Apartment 805, 7290 Kinghurst Drive, Delray Beach, FL 33446

"It is imperative for the common good, for the highest good of all creatures and humanity alike, to increase the Gopher Tortoise's legal classification to Threatened. The exigency of this animal's plight calls for all of us to marshal our best efforts to save the species. While I am deeply concerned about the well-being of our environment which of course, includes the Gopher Tortoise, I felt relieved somewhat to know that the state is looking into alternatives for the Gopher Tortoises' survival. At least the legal reclassification is a step in the right direction. By

all means include my wholehearted support for the Commissions' proposal to increase the Gopher Tortoise's legal classification to Threatened. Thank you for your attention in this manner."

Sheree Morea, 324 East Alexander Palm Road, Boca Raton, FL 33432

"I just finished reading the article in the Sunday paper on the plight of the Gopher Tortoise. Needless to say I found it quite disturbing. I very strongly feel the gopher turtle should be put on the critically Endangered list. It is very painful to imagine the horrific death these innocent animals must endure. By protecting these tortoise you will also be helping other species which rely on their homes for shelter. Florida would also benefit, we need these open grassy areas to help support the drainage in many areas due to our heavy rainy season. If the developers cannot find permanent adequate homes for these tortoise then they should build smaller structures or parking areas and allow for the tortoise to keep their homes on some of the proposed building property.

By way of the article, it sounds to me that there is adequate relocation for them in the panhandle, but, the people seem to think they can eat them. I believe a public awareness program would help alleviate that problem followed by a stiff penalty and or jail time for the capture and consumption of these tortoise. Maybe we can repopulate an area they once thrived in. There are many options to consider, but one of them is not allowing these animals to fade away into non-existence."

Don Jally

"Please change the legal status of the Gopher Tortoise from special concern to Threatened. No animal should have to suffer like this for the sake of more development."

Ursula Landsman, 2900 NE 17th Avenue, Apartment 106, Pompano Beach, FL 33064

"I am writing to strongly ask your support for reclassification of the Gopher Tortoise to Threatened. I do realize that this act alone will not end their plight, but it would certainly be a step in the right direction. Their numbers are dwindling and, as you know, their burrows create shelters for many other species, too. Please support the reclassification of these precious, necessary creatures."

Stella Rossi, 625 Whispering Pines Road, Boynton Beach, FL 33435

"Some 8 to 10 years ago, I stood before the Commission and begged them to put the Gopher Tortoise in South Fla. on the Endangered list. Their habitat has all but vanished. To no avail. Now I see Wal Mart (the worlds largest chain) has been made to give $11,409 for 1.49 ac out of 38 ac.

(1) $11,409.00 is outrageous!
(2) Wal Mart's consultant assessed this?
(3) Did the Game & Fish asses [sic] this?
(4) You may not be able to legislate but you sure can raise your fees for more than 1.49 ac.

(5) Does this 1.49 ac sustain a half of a Gopher Tortoise? Or 1 G/T.
(6) Your hands may be tied, however whoever sits on this committee needs to wake up and triple those fees so that more habitat be purchased!
(7) Anyone knows 50 G/T needs 50 ac, more correct 100 ac.
(8) Re-location should be outlawed.

Destroyed	Paid	Saved	
Centex	17 G/T	52,200	5.22 ac
DiVosta	29 G/T	87,700	8.77 ac
Wood Part.	10 G/T	25,700	2.57 ac
Wal Mart	7 to 9 G/T	11,409	1.49 ac

Why is Wal Mart not being fined more!!! This is a joke!"

Joshua M. Rosayn, 400 NW 30th Court, Wilton Manors, FL 33311 (form letter)
Cathryn Vivas, 5325 SW 9th Street, Margate, FL 33068 (form letter)
Edwin J. Vivas, 5325 SW 9th Street, Margate, FL 33068 (form letter)
Carrie P. Mohanna, 12354 153rd Court North, Jupiter, FL 33478 (form letter)
Marcia Karasoff, 332 Orange Tree Drive, Apartment 2, Atlantis, FL 33462 (form letter)
Sadie Whittaker, 4170 Verdugo View Drive, Los Angeles, CA 90065 (form letter)
Wyona Claxton, 2525 Florida Boulevard #133, Delray Beach, FL 33483 (form letter)

"I recently was dismayed to learn that the state allows developers to obtain permits to 'entomb or kill' Gopher Tortoises occupying desirable pieces of land. I find this practice cruel and deplorable, and I believe the tortoises should be protected for a variety of reasons.

As I'm sure you are aware, these quickly-disappearing animals are an important part of the state's native habitat. They create burrows that serve as homes for as many as 81 other creatures, some of them Endangered, like the East indigo snakes and Florida mouse, and fill a niche in the food chain. **I believe they should be protected and placed on the Endangered Species List**. Considering the blinding speed at which their habitat is disappearing, these animals will no doubt be lost forever unless they are given every protection possible under the law.

Please take this letter as my contribution to the public comment on the question of adding Gopher Tortoises to the Endangered Species List. I say YES to increased protection for the tortoises."

Debbie Eberlin, 1111 Larrabee Street, Apartment 8, Los Angeles CA 90069 (slightly modified form letter)

"As a native Floridian (I only recently moved to Florida), I recently was dismayed to learn that the state allows developers to obtain permits to 'entomb or kill' Gopher Tortoises occupying desirable pieces of land. I find this practice cruel and deplorable, and I believe the tortoises should be protected for a variety of reasons.

As I'm sure you are aware, these quickly-disappearing animals are an important part of the state's native habitat. They create burrows that serve as homes for as many as 81 other creatures,

some of them Endangered, like the East indigo snakes and Florida mouse, and fill a niche in the food chain. **I believe they should be protected and placed on the Endangered Species List**. Considering the blinding speed at which their habitat is disappearing, these animals will no doubt be lost forever unless they are given every protection possible under the law.

Please take this letter as my contribution to the public comment on the question of adding Gopher Tortoises to the Endangered Species List. I say YES to increased protection for the tortoises and NO to allowing developers to entomb them."

Allesandra Medri, 2714 SW 15th Street, Deerfield Beach, FL 33422
Joseph Albers, 2714 SW 15th Street, Deerfield Beach, FL 33422

"This letter is to comment and support the State's proposal to increase the Gopher Tortoise's legal classification to Threatened. The reclassification is a necessary step towards the protection of this beautiful and ancient species. Gopher Tortoises have been around since the Quaternary Period of the Pleistocene Epoch, and they have never been in more danger than now. With the aggressive development seen in Florida, we are racing against time before the habitat and the remaining declining population disappears, bulldozed by the unnecessary need of another shopping center or strip mall.

There is no question that the Gopher Tortoise is a keystone species, and its burrow protects and enhanced [sic] biodiversity. Gophers' burrows are used by 300-400 species of mammals, birds, reptiles, amphibians, and invertebrates (various kinds of insects, spiders and other arthropods). Some of these species are obligate species, like the gopher cricket and aphodius beetle. The latter can only live in the tortoise's burrow. Other species such as the federally protected indigo snake, the Florida mouse, burrowing owl and gopher frog, are common users of the tortoise's burrow.

Protecting the species is not enough. Extended protection must be given to their habitat too if we want to preserve this animal from extinction. I am hoping that by placing the Gopher Tortoise under its rightfully deserved protection as Threatened, a future management plan that considers the habitat issue will also be addressed. Thanks for considering my comments in favor to increase the tortoise's legal classification to Threatened."

Berenice and Robert Perkis, 4701 Lyons Road, Lot 61, Coconut Creek, FL 33073

"We agree with the Commission's raising Gopher Tortoises' status from 'Species of Special Concern' to 'Threatened.'"

Leanne Mahoney, Cape Coral, FL

"I do believe you have a chance to change the Florida legacy from the most Wal-Mart's to the most environmentally friendly state. Please reconsider your position on the Gopher Tortoise and upgrade it to Threatened."

Wendy Coercen and Matthew Novack, 911-A Northeast 8th Avenue, Delray Beach, FL 33483

"I was horrified when I read David Fleshler's story about Gopher Tortoises in the Sun-Sentinel this past weekend. I can't believe they are allowed to bury them alive or kill them or even worse, EAT them! I strongly believe that these tortoises should be reclassified as more than just Threatened, possibly Endangered. They should not be allowed to be killed for any reason whatsoever. Please do what you can to save these precious creatures!"

Lee Hackney, 906 SW 22st, Fort Lauderdale, FL 33315

"I am responding to the very disturbing article I read concerning the Gopher Tortoise. I am dismayed and distraught at the simplicity of these developers, no everyone's, complete indifference to the snuffing out of life not to mention a species. The barbaric act of being able to permit to kill or bury alive a critical members of the Florida eco system is in itself appalling but that no one seems the least bit concerned about the thousands turtles that have been killed in the name of "bigger and better" is equally disheartening. How many species, rainforest, river, lakes and oceans do we have to pick apart? Slowly we are devastating climates, killing total animal and insect populations (no small feat), and polluting to the point of poison. Where is our compassion as the highest member of the food chain? I will do what ever I can to ensure that we pass a proposal reclassifying the tortoise preferably to Endangered."

Susanna Laurenti, 8329 A. Trent Court, Boca Raton, FL 33433

"I was shocked recently when I read in the South Florida Sun-Sentinel that the FWCC allows developers to bury Gopher Tortoises alive. As I'm sure I don't have to tell you, these quickly-disappearing creatures are an important part of this state's native habitat. They create burrows that serve as homes for many other creatures and fill a niche in the food chain. They were here long before we were, and I believe we owe it to them and the rest of Florida's flora and fauna to curb our endless greed just a little so that they may retain a shred of the natural habitat as their own.

This unconscionable practice of allowing the brutal practice of burying Gopher Tortoises alive should be stopped immediately and **the tortoises should be placed on the Endangered Species List**. Considering the blinding speed at which their habitat is disappearing, these animals will no doubt be lost forever unless they are given every possible protection under the law.

Your comment in the Sun-Sentinel article that 'we can't legislate against development' was a gross mischaracterization of this issue. The choice before us [is] not 'no development versus development.' The choice is sensible development versus a greed-driven free-for-all that will leave the delicate habitat of this state in shambles and pave over the green areas that make Florida such a wonderful place to live.

At some point it is perfectly right and reasonable to put our foot down and say 'no' to the endless parade of developers who would love to build gated communities on every square inch of this state. We have to decide whether or not we want to live in a concrete jungle and money cannot be the only consideration in that choice. People who care only about the economic gains associated with increased development in Florida should not live here. There are plenty of

places that are already paved over and filled end-to-end with people where they can go and make their living. I would happily accept a lower annual salary and even a reduction in my standard of living if it meant preserving the natural habitat of this state that I've grown up in.

Please take this letter as my contribution to the public comment on the question of adding Gopher Tortoises to the Endangered Species List. I say YES to increased protection for the tortoises."

PPAW, "People for the Protection of Animal Welfare," 8276 Cassia Terrace, Tamarac, FL 33321

"Please add the Gopher Tortoise to the Endangered Species List. Stop the killing! Protect these peaceful creatures! It was their home first!

Kathy J. Fearnley, 5991 NW 4th Avenue, Boca Raton, FL 33487

"Please help protect the gopher turtles. I know their territory is being developed, but I feel strongly that they should not be killed. There must be a way that they can continue to inhabit an area near by or go to zoos around the world or….left to those who knows best to figure it out.

Tampering with nature never seems to have positive long term results. Developing is short sighted I believe. If the turtles can't be relocated, it means the developers have bought their way regardless of the fact they give money towards buying some preserved land which will one day be developed no doubt."

Diane Marie Anger, 9686 SW First Place, Boca Raton, FL 33428

"Thank you so very much for speaking with me today regarding the unfortunate plight of the Florida Gopher Tortoise. I am glad to know that you have the same sentiments regarding the over-development of the state of Florida and the tragic consequences it has for the Gopher Tortoise, among many other native species. We must all work hard to counteract the evil, greedy developers and the short sighted officials who not only sympathize with them but encourage their practices. If we are not careful, the weight of the development will cause the state of Florida to sink into the Gulf of Mexico and the Atlantic Ocean! After all, the state of Florida is basically a sandbar peninsula jetting out in the open water.

I will continue to seek ways to help the Gopher Tortoise and find the people who are working in this effort and join them. In the meantime, I think that I will really look hard for a piece of property with acreage in which to house Gopher Tortoises as well as my current collection of reptiles. I will look into getting a permit from the Florida Fish and Wildlife Conservation Commission.

I would be much obliged if you would keep this email with my name and contact information so that you can inform me of anything that I can do to help the Gopher Tortoise. If I end up moving from this God forsaken part of Florida I will let you know. Either way, this email address will still be the same as I have the domain name dianeszoo.com. Please feel free to check out my

website although it is not yet completed and as a matter of fact, I am currently redoing the entire site and adding all the animals that I have to it. It will have a much nicer look.

Thank you again for your kind conversation and empathy towards the Gopher Tortoise. We both need to keep working on protecting these most interesting and beautiful creatures."

Grace Sulovsky, 627 West Palm Street, Lantana, FL 33462

"Please help to reclassify the Gopher Tortoise as an endanged [sic] species. Please help protect them and save their lives. PS: Perhaps the Busch Wildlife Sanctuary in Jupiter, Florida could help in rescue efforts of these precious turtles."

Sandra L. Romanik, 12321 NW 26th Street, Plantation, FL 33323

"I read an article recently in the Sun-Sentinel Sunday paper regarding the plight of the Gopher Tortoise and I was appalled. I can't believe those docile and gentle creatures are being killed or buried alive all for the sake of construction. It seems to me that there must be some way to preserve these gentle creatures by relocation and positively identifying them as an Endangered species since their numbers are dwindling. We must not wait until it is too late to save this species. They must be protected now to ensure their survival and to keep the ecosystem in balance."

Kim Gale, 7700 NW 22nd Street, Hollywood, FL 33024

"I think it is horrible what they are doing to the Gopher Tortoises. Yes, we all understand about progress however, sometimes, alternative ways to do things without sacrificing life in such a cruel, inhumane way should be considered. Instead of bringing up children in a world of cement, why don't we leave some of these animals and nature around for them to see. I would be willing to keep one in my yard. Please put the, Gopher Tortoise, on the near extinction list to help save them."

Luke Latham, 11610 NW 56th Drive #108, Coral Springs, FL 33076

"As a new resident to Florida I was greatly saddened to learn of the killing of Gopher Tortoises. I am 24 years old and would like my grandchildren to someday be able to see Gopher Tortoises in their natural environment. Please increase the Gopher Tortoises classification to Threatened."

Brandy Lillie, Rosemary Lillie, Barbara Mader, Gene Gregory, and undecipherable signature (form letters)

"I live in Ft. Lauderdale, FL. I read an article in the Sun-Sentinel newspaper concerning the construction industry killing off our wildlife by burying alive animals such as the Gopher Tortoise and other burrowing animals. I find this very alarming, such a disrespect for our wildlife. I understand the need for housing but there has to be a way to make sure that these animals live the lives they were intended. I read at the end of the article that there is to be a reclassification August 31st. I would like to implore you to use your authority and responsibility to do what is right, even if it is unpopular with the builders, to save our wildlife."

Raji Shareef (8 years old) and Sumayyah Shareef (6 years old), 10232 SW 20th Street, Miramar, FL 33025

"We want to support the idea to reclassify the Gopher Tortoise to 'Threatened.' Because it is not fair to kill them while developers and builders ruin the land, the trees and most the Gopher Tortoises which will not be around for us to enjoy their beauty we must force the developers to care about their future lives. Their burrows hold many animals like the indigo snake, mouse, gopher frog and dung beetle and other animals which end up dead. We need to help them to live on every generation, we have the responsibility to protect and preserve them. They are important to our ecology because tortoise is one of the oldest animals on this planet and they do not harm humans. If they are moved around too many times and would probably die or get killed trying to move or travel back to they original homes. Gopher Tortoise lives are longer than buildings, buildings crumble or are blown away but tortoise continues to live on. Developers need to think twice before considering anything on land inhabited by tortoises. And if the developers are considering the tortoise than let us force them to think of tortoise as 'Threatened.'"

APPENDIX 2. Summary of the biological status of the Gopher Tortoise relative to listing criteria as a Threatened species in Florida.

Criterion/Listing Measure	Data	Criterion Satisfied?	Source	Confidence
A. Population Size Reduction				
≥50% decline over last 60–93 years OR	50–60% decline	Yes	Inferred	High
≥50% decline over next 60–93 years[a] OR	50–60% decline	Yes	Inferred	Moderate
≥50% decline over last 40–62 years and next 20–31 years[a]	50–60% decline	Yes	Inferred	Moderate
B. Occurrence and Occupancy				
Extent of occurrence <2,000 mi^2 OR	51,251 mi^2	No	Estimated	High
Area of occupancy <200 mi^2	5,192 mi^2	No	Estimated	High
C. Population Size and Trend[a]				
<2,500 mature individuals AND ≥20% decline over next 40–62 years	>200,000 mature individuals	No	Estimated	Moderate
D. Number of Mature Individuals				
<250 individuals	>200,000 mature individuals	No	Estimated	Moderate
E. Species' Extinction Probability[a]				
20% probability over next 5 generations or 100 years	< 10% probability over next 100 years	No	Extrapolated from Miller (2001)	Moderate

[a] Future population reductions and extinction probabilities, and confidence in them, are based on past reductions that occurred during periods of little or no management of Gopher Tortoise populations. However, the reductions and probabilities noted assume continued habitat degradation and development at present rates, and no appreciable change in current management activities that might otherwise improve habitat quality or increase population size. Public agencies are strapped for funds to properly manage their lands, such as conducting frequent prescribed burns. Favorable management practices might not result in increases in population size, as evidenced by population declines over a 10-year period at as many as nine of ten protected sites in Florida, where population declines were not strongly connected to declines in habitat quality (McCoy et al. 2006).

APPENDIX 3. Summary of the seven independent scientific reviews of the Biological Status Report. Some comments were slightly edited, but nothing significant was changed or deleted. Responses by the authors of the BSR are denoted by brackets [ ] in a separate paragraph.

Richard A. Seigel, Ph.D.
Professor and Chair, Department of Biological Sciences
Towson University
8000 York Road
Towson, MD 21252-0001

I have carefully reviewed the Biological Status Report for the Gopher Tortoise prepared by the FWC. I have conducted research on the population biology and conservation of turtles since 1975 and have worked extensively with Gopher Tortoises since 1977. I have also spent considerable time conducting research in Florida and am very familiar with the conservation issues surrounding this species.

I found the report to be extremely thorough (both in reviewing the literature and in assessing the current status of the species) and scientifically valid. If anything, I thought that the authors were too conservative in estimating both the historic decline of the Gopher Tortoise as well as the probability of a continued decline in the future. Indeed the only detailed comment I had (p. 6) questioned the alternate (and shorter) generation time used by the authors, which makes the ability of this species to recover too optimistic.

Based on the information contained in this report and the analyses conducted by the authors, there seems little doubt that the Gopher Tortoise qualifies as a Threatened species under the evaluating criteria. The data to support this conclusion are both substantial and reasonable, and the interpretation of those data are well within the bounds of best professional interpretations. Thus, I strongly endorse the conclusions made in this report.

Anders G. J. Rhodin, M.D.
Director, Chelonian Research Foundation; Chair, IUCN/SSC Tortoise and Freshwater Turtle Specialist Group and Turtle Conservation Fund; Editor, Chelonian Conservation and Biology
168 Goodrich Street
Lunenburg, MA 01462

I agree with your assessment and conclusions that the data on extent of tortoise habitat loss support the listing criterion of at least a 50% decline in population size for the Gopher Tortoise in Florida; in fact, your data provide strong support for at least a 65% decline in suitable habitat and population size over the last three tortoise generations (ca. 60 to 90 yrs). Your data would classify the Gopher Tortoise as Endangered by global IUCN Red List standards (assuming a similar decline in populations outside Florida) and satisfy the criteria to list it as Threatened by the State of Florida.

Please pay particular attention to some of the review comments on the draft. I believe you need to provide some more recent references as to current threats and declines (some of your

references are beginning to be outdated). An excellent reference to add would be the recent review chapter on Gopher Tortoises authored by Mushinsky et al. and currently *in press* in Meylan's edited volume on *Biology and Conservation of Florida Turtles* (to be published 2006 in Chelonian Research Monographs).

[Suggested text changes were made in the BSR, and a copy of the *in press* chapter was obtained and is now cited.]

Please also pay particular attention to more adequately explaining the apparent discrepancy between simple GIS analysis of habitat loss versus the more appropriate modified method developed by McCoy et al. (2002) to analyze actual tortoise populations based on habitat suitability and survey methodology. This modified approach to habitat availability analysis is the crux of your assessment and needs to be clarified (see suggested text changes).

[The GIS analysis was intended to identify high-quality, potential Gopher Tortoise habitat, whereas McCoy et al. (2002) conducted ground surveys of occupied habitat, including marginal habitats. A more detailed explanation of the apparent discrepancies is given later in this appendix in response to criticisms by S. Godley.]

I would also strongly suggest modifying your footnoted disclaimer on the Table in Appendix 2; as currently written it seems to imply that if you maintain current management practices Gopher Tortoise populations might not decrease, but this is an unwarranted optimistic view based on the data of historic and present losses you have already documented.

[The footnote has been modified.]

You need to adequately address the reasons for the "underestimate" of the 15.7% loss of tortoise habitat to urbanization. Opponents of this proposal might point at the 15.7% decline in habitat and state that therefore the gopher tortoise is not even a Species of Special Concern.

[We were surprised that only 15.7% of historic Gopher Tortoise habitat showed up as being converted to urban landcover types in the 2003 map, particularly considering the amount of development that has occurred along the Atlantic Coastal Ridge. However, loss of tortoise habitat to urbanization is only one of many factors affecting the amount and quality of remaining tortoise habitat. Agriculture is responsible for 24.1% of the loss of historic tortoise habitat, and ecological succession to unsuitable habitat types and conversion to dense pine plantations are also partially responsible.]

I appreciate the opportunity to participate in this process. The Gopher Tortoise and the people of Florida who appreciate preserving their natural heritage should benefit from the improved protection from uplisting this keystone species.

Peter Paul van Dijk, Ph.D.
Director, Tortoise and Freshwater Turtle Conservation Program; Deputy Chair, IUCN/SSC Tortoise and Freshwater Turtle Specialist Group
Center for Applied Biodiversity Science
Conservation International
1919 M Street NW, Suite 600
Washington, DC 20036

[This reviewer made all his comments and suggested edits in the BSR, and we incorporated his recommendations. However, we could not address his suggestion below regarding the production of three maps showing suitable Gopher Tortoise habitat over the years.]

The separation of habitat loss and habitat degradation is not clear in the preceding sections, which actually document that habitat changes are a dynamic continuum with loss as one temporary or permanent state. These preceding paragraphs would benefit from a critical edit and possible restructuring – there is too much overlap (e.g., pine plantations are featured in both sections. Regardless, habitat loss and degradation are significant factors, and the document would greatly benefit from three GIS maps showing the extent of suitable habitat for Gopher Tortoises in 1910, 1943 and at Present, with a minimum patch size of 10–20 ha or another suitable resolution.

[Satellite imagery does not exist to map suitable habitat for Gopher Tortoises in 1910 and 1943. Davis' map of the "historic" natural vegetation is the best information that we have available, and it is very generalized.]

Earl D. McCoy, Ph.D.
Professor and Associate Chair, Department of Biological Sciences
4202 East Fowler Avenue
University of South Florida
Tampa, FL 33620

I think that the Biological Review Panel used the appropriate methods for applying the IUCN Red List Criteria at the regional level (Gärdenfors et al. 2001, *Conservation Biology* 15: 1206–1212). I also think that the Panel has come to the correct conclusions, based upon these criteria. Under these criteria, the only possible justification for uplisting is Criterion A, population size reduction (pp. 6–10).

To strengthen the case for uplisting under Criterion A, I recommend two actions. The first is to improve clarity of presentation. I suggest that either (1) the descriptions of the four subcriteria of Criterion A be taken verbatim from the Guidelines for Using the IUCN Red List Categories and Criteria (2004, pp. 28–29) and placed at the beginning of each relevant section of the Status Report or (2) the subcriteria be rearranged to match the order in the IUCN Guidelines. As now presented, the references to IUCN standards in the subcriteria are vague. The first option would be particularly helpful in addressing potentially confusing statements elsewhere, such as whether the projected population size reduction in the future is to be calculated from current densities or from historical densities (p. 10).

[Descriptions of subcriteria 1 and 2 were not changed because they were already almost verbatim, but the description of Subcriterion 3 was expanded to include Endangered and Species of Special Concern categories, and the description of the inapplicable Subcriterion 4 was added. The four subcriteria under Criterion A are in the order that they appear in the FWC's definitions of listed species. The IUCN's Subcriterion 1 is the FWC's Subcriterion 4, which means that IUCN's subcriteria 2, 3, and 4 are FWC's subcriteria 1, 2, and 3, respectively.]

The second action is to improve the level of quantification. The exact relationship between amount of habitat reduction and population size reduction that is being employed to document population size reduction is not specified clearly (pp. 6–7). It seems to be a purely proportional relationship, which, I think, needs to be justified. The same is true for habitat degradation and exploitation (pp. 8–9). [Minor Point: A study in which population declines could not be shown to be attributable to declines in habitat quality probably should not be cited in a section on habitat degradation (p. 8).] No relationship at all is presented for pathogens, only some figures for a few die-offs. No relevant data are presented even to show that pathogens have the potential to cause population size reductions (p. 10). Shortcomings such as these mean that the conclusion that a population size reduction of at least 50% has occurred over the past three generations is not based on any transparent calculations (p. 9).

[We present circumstantial evidence for a population size reduction based primarily upon a decline in the amount of potential Gopher Tortoise habitat and in the quality of the remaining habitat. Human exploitation and the effects of pathogens are mentioned as factors contributing to the decline in tortoise populations. Actual estimates of present tortoise population size would not be credible, even if we knew the number of active/inactive burrows present, because of variations in numbers of burrow used among different habitats and different areas. The amount of potential high-quality Gopher Tortoise habitat that remains does not necessarily equate to habitat actually occupied by tortoises, and occupied habitat has varying population densities.]

Other Comments

The scale issue is of great interest to many persons who suggest that the IUCN Guidelines either are too liberal or too conservative when applied at the regional level. The scale issue could be better addressed in the Status Report. For example, why is the geopolitical entity of Florida considered the region of interest de facto? Why are ESU's or some other biologically-based system not used for identifying subpopulations? How such determinations are made most certainly influences the judgment of whether one or more of the criteria for uplisting are met. For example, a much stronger case for severe fragmentation (Criterion B) can be made for some parts of the State than for others, especially as genetic and disease-testing restrictions on translocation effectively isolate many subpopulations.

[Florida is considered the region of interest because this is a proposal to reclassify the status of the Gopher Tortoise in the entire state. Some subpopulations, such as those in South Florida, might warrant Endangered status if these criteria were applied to them, but subpopulations in other regions of the state might not warrant reclassification.]

Some of the biological details (pp. 2–5) could be considered misleading. Among the problems are: (1) the implication (p. 2) that the gopher tortoise is confined to the listed habitats, when the

tortoise only inhabits them ideally, if given a choice, and will make do elsewhere; (2) the implication (p. 3) that the information applies across the range of the tortoise, when it applies only locally; (3) the implication (p. 3) that maturity is a function of age, rather than of size; and (4) the implication that the information presented (p. 3) applies to all individuals of the tortoise, when it applies only to adults.

[Point 1: the list of habitats represents the primary habitats identified in the literature, but tortoises often occur in marginal or suboptimal habitats, including habitats that have been highly modified by man. Point 2: the biological information presented is not intended to be an exhaustive summary of all known information, and it is intentionally targeted towards Florida populations. Point 3: this has been clarified in the text, but age at maturity has to be estimated in order to calculate mean generation time. Point 4: information on juveniles was omitted for the sake of brevity, and because only mature individuals are considered in the listing criteria.]

More care needs to be taken in word choice in the introductory materials (pp. 2–5). Examples include: (1) identification of Cape Sable as an island; (2) using colloquial expressions, such as "rampant urbanization"; (3) failure to distinguish recruitment within a population from outside recruitment; and (4) using expressions that have specific meanings too casually, such as "carry," which has a specific meaning in epidemiology.

[These errors have been rectified in the BSR.]

The potential effect of pathogens (beginning on p. 5 and continuing) is treated with much less rigor than other potential causes of decline. For example, exactly how do we know that an infection is acute (p. 5)? What do the subsequent sentences concerning serology have to do with acute infections? Most of all, I think that it is very bad practice, as well as potentially damaging in the face of challenges, to make use of personal communications as documentation in a Status Report. Most of the section concerning pathogens on p. 9 is redundant.

[The discussion of the potential effect of pathogens has been modified in the BSR.]

The treatment of urbanization could be considered misleading. The implication (p. 7) that all tortoises are lost as a result of urbanization is not correct. Furthermore, the use of the term "urban" (p. 8) may lead to misleading comparisons with census data. As defined by the US Bureau of the Census, urban areas often can support tortoises quite well, and what most persons consider the effects of urbanization can occur well outside of urban areas.

[An attempt was made in the BSR to clarify what is considered "urban" habitat, which is a landcover type that is not derived from human population census data. Although tortoises can survive in some urban habitats, most of these populations will not persist in the long term and are effectively nonreproductive.]

Habitat fragmentation and habitat loss should not be treated as one in the same (p. 7). The consequences of severe fragmentation are part of Criterion B, according to the IUCN Guidelines.

[Habitat fragmentation is now covered in the Decline in Habitat Quality section. Severe fragmentation is not addressed because the Gopher Tortoise does not meet the minimum extent of occurrence or area of occupancy requirements for Criterion B.]

Recent published calculations of minimum area requirements (p. 12) are missing. The use of personal communications in this section also is bad practice.

[We added the Eubanks et al. (2002) citation, and we have now referenced the 100-ha minimum area requirement as Mushinsky et al. (*in press*), where it was cited as an unpublished manuscript by McCoy and Mushinsky. When the BSR was initially prepared, we only knew about this new information via a personal communication from H. Mushinsky.]

It is not clear what definition of "stochastic" is being employed (p. 13). How is the introduction of severe forms of URTD a stochastic event?

[We referred to "stochastic" extinction if juvenile and adult mortality rates increased, such as from the introduction of severe forms of URTD. We did not mean to imply that the introduction of URTD was a stochastic event. *VORTEX*, the simulation software package written for population viability analysis, was used as a mechanism to study the interaction of a number of tortoise life history and population parameters treated stochastically (i.e., randomly) in order to explore which demographic parameters might be the most sensitive to alternative management practices, and to test the effects of selected management scenarios (Miller 2001).]

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GENERAL COMMENT:

It is my opinion that the Biological Status Report supports the uplisting of the Gopher Tortoise as a Threatened species in the state of Florida. The IUCN methodology required by the Commission to determine listing has shortcomings when trying to evaluate a widely distributed species that is long lived but has a very vulnerable reproductive strategy. Therefore, it is virtually impossible to determine what the population was, or is, today, which makes the process open to criticisms from both those that seek uplisting and those that oppose it. The evaluation system does not, and cannot, take into account the historic human growth in this state and the daily catastrophic impacts on this species and all others in the state. We and the FWC seem to be standing still watching our natural heritage swirling down the drain before our blank stares. The rate of loss per day and per month is so great that by the time we mobilize a system to actually measure the loss, we will be reclassifying the species as Endangered.

It is obvious that the writing committee decided or was required to use only published data in lieu of reports and information not yet in press. This document is not one going into a scientific journal but a document that is being presented so that the "lay public" representatives (the Commissioners) can make a determination on this species' future. They chose to ignore Ashton

and Ashton, 2004. *The Gopher Tortoise, A Life History*. Pineapple Press, Sarasota, FL. 67pp. This publication, although written for the general public was reviewed by 11 biologists and is a rendition of our scientific work that is in press. It was designed to educate the "lay public" about the plight of Gopher Tortoises. This publication, a number of in press publications by other authors and current research that is taking place in Florida and in other parts of the tortoise's range are showing pertinent discrepancies in the literature cited and summarized in this Biological Status Report. The importance of using the best information we have over what has been published is that there are particular data that are extremely pertinent to the status of this species and the peril that it is currently facing in this state.

[Unpublished data were not included in the BSR because they are not peer reviewed, and there is no guarantee that the data will ever be published and available for future reference. However, pertinent information from reviewers that appears in this appendix was referenced in the BSR. The Ashton and Ashton (2004) book is now cited in the report.]

Some of the key issues:

Reproductive Age

We cannot age tortoises so we do not know how old they are when they mature. Ehret (in press) and our data currently being collected with Gopher Tortoises which agrees with Germano (1994) working with desert tortoises, that it is not possible to age Gopher Tortoises using rings on scutes. The writing group should have obtained data from David Rostal on growth sizes and ages based on his long-term study of hatched captive Gopher Tortoises. His data includes far more individuals and covers a much longer time than ours. The data are comparable and are very similar to the data provided for desert tortoises by Germano.

Importance: If we cannot tell the age of tortoises in the wild, then we do not know at what age they are reproductive, which is important when determining population dynamics. **NOTE, on page 5 under Biological Status assessment, it states that one cannot determine age of Gopher Tortoises. On page 3 parag. 2, it discusses and refers to age classes.**

[We are aware that it is impossible to accurately age older tortoises by counting rings on scutes, and we have clarified this in the report. On Page 3, we do not refer to age classes but instead to the range of years that different studies have found females to become sexually mature. Inclusion of growth data on captive tortoises is probably inappropriate and unnecessary.]

Forage and Area Required

Based on our research, we have found that tortoise have a highly diverse diet far beyond that quoted in the study. In fact in Florida, more than 400 species are known to be eaten. More important, the annual diet of a tortoise may exceed 180 species within its home range, and 150 species of forage plants may be required to sustain healthy populations. Tortoises may forage on a regular basis more than 2 km from their burrows. The quote of 50 meter ranges for foraging is simply wrong and is an artifact of study methods. In fact, this is only the core foraging area and it is only this small if there is ample grass and primary forage available. Commonly individuals travel out 100 m or more and as far as 2 km for specific forage requirements.

Importance: The statement regarding forage is far too simplified and does not make it clear that the area and diversity of vegetative habitat is quite complex (wiregrass is a minor forage species and is an artifact of fecal studies verses what is actually eaten). Further, some of the studies that have been going on now for some time in Georgia, in Buyer's studies and ours indicate that the size of the area used by tortoises in routine behavior is far greater than summarized. We estimate that individual tortoises average about 2 ha in their routine movements. The report does not comment on the increases in movements required as the canopy and shrub layer covers exceeds 60–70%.

The report does not even discuss the concept of the area required for a "population" of tortoises. This has been commented on by Eubanks et al. (2002), and we have found that tortoises throughout our 100-acre preserve move in and out of an area of approximately 2 square miles over a 5-year period.

Ultimately, these issues are important when considering the overall impact of the reduction in habitat as well as the lack of burning and other management. The issues have been simplified, which could lead to the wrong decisions regarding the conservation needs of the Gopher Tortoise.

[The "Life History and Requirements" section was intended as a brief synopsis of published information, and it is beyond the scope of this report to address details of home range size and forage requirements. Much of the information above has not been published yet.]

Distribution

Current range in South Florida is also been reduced due to the lack of management on publicly owned lands that once contained populations of tortoises and due to agricultural use of some of the higher southern flatwoods. Tortoises are on many islands along both coasts including manmade spoil islands along the east coast.

Threats

The authors comment that agriculture is "to a lesser degree" a threat to tortoise populations. None of the papers cited demonstrate a reason or data in support of this statement and demonstrate ignorance on the part of the authors of the current situation regarding agriculture and the evolution of the land to that which goes into human development. These practices are growing because land values in the state are driving agricultural interests to sell out to developers (see Ashton, 2005. Planning Gopher Tortoise conservation into the future. *In* Meshaka and Babbitt, eds. *Amphibians and Reptiles: Status and Conservation in Florida*. Krieger Press, Melbourne, FL.

1. Agriculture exemptions require certain practices that greatly impact tortoises. Agricultural exemptions are maintained after the rancher or farmer stops farming by planting pine trees at state-mandated densities of 600-300 trees/ acre. Such densities quickly exceed 80% canopy cover, and tortoise forage is lost.

2. Under current state rules, a farmer cannot obtain agricultural exemptions for natural habitats, and if those lands have a house or other infrastructure, they can be taxed at the county's highest levels.

3. Protected species are commonly "scrubbed "by agricultural interests today because it makes a difference in the per-acre costs the land can be sold at. This is done by using best management practices, which makes such actions within state law. Such activities, including certain forms of plowing and rapid rotations, will cause tortoises to leave if not killed on site.

[In the BSR, we have expanded the section on agricultural threats and cited Ashton (2005) and this communication.]

4. "Xeric" is a poor term when talking about tortoises. They are not just in xeric habitats. They are found in flatwoods right to the edge of wetlands. South Florida tortoises are in areas that are more often wet than dry. The issues listed occur in these habitats as well.

5. Fragmentation not only leads to road mortality but also exposes tortoises within the fragmented areas to indirect predation by people that clog burrows, destroy burrows and eggs with ATVs, shoot tortoises for target practice, and increase predation by dogs and outdoor cats. This also leads to increased exposure to human predation for food.

[In the BSR, we have added increased accessibility to tortoise populations because of road development and cited this communication.]

6. The authors left out a very important predation issue, which is particularly important for coastal strand populations. Because of the lack of predators such as bobcats, there has been explosive population increases in raccoons (there are a number of citations for this and for feral cats). Local naturalists in a number of state and county parks indicate they have not found hatchling Gopher Tortoises for years. We have looked at several sites on both coasts without finding one tortoise <200 mm in carapace length. Similarly, crow populations have increased (there are a number of citations on this), possibly related to landfills and urbanization of crows. These prey heavily upon hatchlings.

[Increased raccoon populations were already mentioned as a threat, but we cited this communication regarding both raccoons and crows.]

7. URTD–this is an extremely biased section. Indications are from hunters and rural folks that it has not been uncommon to occasionally find shells of tortoises. Implying die offs started in the 1990s is simply not proper and is misleading. I thought we got over the concept that URTD did not begin with the identification of it by UF scientists but has been around in populations for millennia, as have at least a half a dozen other potentially fatal diseases. The statement about threat is incorrect as well. No one bothered to gather data on the local population, alive or dead. Our surveys of seven of the huge die offs reported early turned up 10's to 20's of shells with wide ranges of decay involved. On the other hand, some places where tortoises have likely been dumped there are large numbers. Again, no data on if they were local animals. I have not seen Brown 2005, but

> I sure am skeptical. There were a number of meetings on URTD and testing, and it was clearly indicated that there is no proof of "chronic" diseases in wild populations. Or, that having disease organisms present in any wild animals does not indicate that a disease is chronic. It was further agreed that testing as it is now being required has no conservation value. NO COMMENT WAS MADE IN THIS PARAGRAPH ABOUT STRESSORS LIKE LACK OF FORAGE DUE TO IMPROPER MANAGEMENT AND FRAGMENTATION; NOT A WORD ABOUT POLLUTANTS IN THE GROUND WATER TABLE.

[The Pathogen section has been revised, and the letter from Brown et al. (2005) has been deleted. The possible role of stressors in disease outbreaks was mentioned later under Criterion 1, but it is now also included in the Life History and Requirements section. However, we have not included groundwater pollution as a possible stressor, although it might be, because this has not been mentioned in the literature.]

8. Human predation has not been reduced but has increased over the past quarter century. The traditional "cracker" predator is still out there. Over the past 5 years, we have taken a poll of the elementary school in Newberry; the number of kids that eat tortoises is still around 30%. More people are taking tortoises in South Florida because of the new cultures represented in the demographics.

[We are unaware of literature corroborating increased human predation in the last 25 years, but we cited this communication in the BSR.]

BIOLOGICAL STATUS ASSESSMENT

General Comments and Agreement

As a reviewer, I am in agreement with the conclusions and recommendation of the writing committee. There is little doubt that the methods required for the uplisting of this species to THREATENED STATUS have been demonstrated. I understand that in the effort to come up with a standardized method to make evaluations for listing, that the IUCN methodology was adopted.

That being said, as the agency responsible for this Species of Special Concern, the FWC should have an ongoing data bank from which "real time" evaluations of the status on all protected species can be evaluated. This methodology is relatively simple and avoids using biological models that are using data, as pointed out here, as either unknown, or our knowledge is in transition, or just slightly presented in a prejudicial mode (URTD) in this report.

As pointed out in this report, the growth and development in the state of Florida, as this issue is being considered, is at a level surpassing any other piece of real estate on the planet. All agencies including the World Bank, UNEP, and others have long warned of growth rates of 6% or over as completely unsustainable economically or environmentally. Florida has long since surpassed this level (see Ashton 2005).

How to Evaluate Real Time Habitat and Population Loss

The only way to keep up with the current rate of habitat loss is to go monthly or quarterly to each county and document the type and amount of each habitat being lost to development. This includes all stages in the development pipeline.

a. Lands opening to development by changes in County or City Comprehensive Plans. (From immediate to 20 years out.)

b. Pre-application actions being taken by developers with state and local agencies.

c. Applications for septic tank applications for properties of 5 acres or more.

d. Tax assessors' offices and requests for or declining of previously granted agricultural exemptions and changes from general agriculture to some form of silviculture.

e. Tax assessor's office to determine changes in the tax assessment status of rural lands as they change from agriculture to some form of development.

f. Determining real habitat loss. The current GIS methods in my opinion are in error because of the assumptions that are made. Under current Dept. of Community Affairs rules in developing County and City Comprehensive Plans, each county is suppose to have mapped natural habitats, distribution of protected species, sensitive lands, recharge areas (sandhills), agricultural lands, etc. Many counties update these maps as part of the planning process. Some also are keeping track because of Conservation Lands programs. These can be used along with state and federal agency data on protected species inventories.

g. Where data are lacking, FWC should provide funding or have staff inventory hot spots.

h. Conservation lands, which are becoming more critical as private lands are disappearing, should be monitored for proper management to sustain Gopher Tortoise populations. Lack of burning and other practices that may reduce habitat available should be tracked as well as proper management. These data can be key elements in determining losses or gains in populations, as should be demonstrated in a measurable species conservation plan.

Compiling these statistics would provide FWC with a clear picture of real habitat loss in the past, present and certainly into the future. A better picture of the distribution of tortoises over the landscape could also be done far more accurately than the methods being used today or under the system being used by the Florida Natural Areas Inventory. This effort will have to be developed if, in fact, any species management plan will work to stabilize the losses of this species.

A key element that is just so hard to comprehend in these deliberations is the rate of loss of habitat and local populations per day in each county. I strongly feel that the report provided by this committee falls far short in estimating the rate of loss and the timeline for functional extinction of the Gopher Tortoises in Florida.

It should be noted that under current FWC permitting and enforcement rules, it is not possible to get any realistic picture of the loss of tortoises or habitat. Simply it appears that the actual number of applications for permits at all levels, except for Developments of Regional Impact or, those that are in counties that require FWC permits to receive their permits.

[The preceding comments are things to consider when developing the statewide management plan for the Gopher Tortoise, particularly in deciding how to monitor tortoise population trends/distribution and to assess the effectiveness of the plan in achieving conservation goals.]

List of Recommendations

The authors left out a very important issue–the lack of management for biodiversity–on state-owned and operated lands, including Florida Forever, state parks, water management district lands, and state forests. According to DOF, the priorities related to the management of state lands, no matter for what agency, frequently have conflicting management goals (Goethe Forest, 2004 Biological Oversight Advisory Committee). Florida Forever and CARL Lands Management Guidelines and Rules conflict with DOF management goals for timber production. These rules are in direct conflict in many cases, such as on FWC/DOF joint tortoise mitigation lands. Whenever there is a conflict, the staffs are instructed to and are evaluated on increased silviculture productivity and not biodiversity management. **This is extremely disconcerting in that the taxpayers have been led to believe that these lands are being protected and managed for protected species and other wildlife when, in fact, they are not.** No measurement of habitat loss has been done, even though we requested this in 2004 as part of the Habitat Management Plans for Watermelon Pond CARL Project.

[This is not pertinent information to include in the BSR.]

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A Biological Review Panel (BRP) with expertise in the Gopher Tortoise has preliminarily concluded that the species warrants uplisting to Threatened status in Florida under the imperilment criteria found in Rule 68A-1.004, F.A.C. In the draft Biological Status Report (BSR), the BRP stated that the Gopher Tortoise (GT) met Population Size Reduction Subcriterion A1 ("…a population size reduction of ≥50% can be inferred for the Gopher Tortoise in Florida in the past three generation (60–93 years) based on (3) a decline in area of occupancy or quality of habitat, human exploitation, and pathogens", p. 9), Subcriterion A2 ("…based on a projected ≥50% population size reduction in the next three generations because of (3) a decline in the area of occupancy or quality of habitat and possibly (5) the effects of pathogens", p. 10), and Subcriterion A3 ("Based on preceding calculations and considering the time period encompassed by the past two generations and the next one generation of tortoises (i.e., 1963–2023 or 1941–2034), we suspect that Gopher Tortoise populations will have declined ≥50%. These past and future population declines are attributed to (3) a decline in the area of occupancy

or quality of habitat, (4) actual levels of exploitation, and possibly (5) the effects of pathogens", p. 10). The BRP placed a high degree of confidence in their positive findings for Subcriterion A1, but only a moderate degree of confidence on A2 and A3 (Appendix 2). Finally, the BRP concluded that the GT did not warrant any listing status (i.e., it could be delisted) under Criterion B (Extent of Occurrence and/or Area of Occupancy), C (Population Size and Trend), D (Number of Mature Individuals) and E (Quantitative Analysis).

As an independent scientific peer reviewer, I agree with the BRP conclusions regarding Criteria B, C, D and E. However, I cannot confirm that the analysis conducted to date is adequate to support the determination that GTs have declined by more than 50% in the past three generations (Subcriterion A1); consequently, for the reasons discussed below, I do not believe that GTs will decline by that amount projected into the future under Subcriterion A2 or A3. Also, in making these determinations the BRP did not appropriately follow some important recommendations in the *Guidelines for Using the IUCN Red List Categories and Criteria* (IUCN 2004), as required by Rule 68A-1.004, F.A.C.

The proposed uplisting of the GT to Threatened status is largely based on a ≥50% population size reduction inferred from GIS modeling estimates of habitat loss conducted by Beth Stys of the FWC (hereafter, FWC GIS Model). I obtained all of the relevant GIS files and underlying metadata (where available) from Ms. Stys to evaluate the conclusions of the BRP with technical assistance from Matt Palavido, Director of GIS Services at Biological Research Associates (BRA).

Below, I summarize the major problems with the analysis conducted under Subcriterion A1, followed by recommendations to correct these issues.

1. Contrary to the Red List Guidelines (IUCN 2004), the BSR provides no evaluation or documentation of measurement error in any of its estimates of the extent of historic or current Gopher Tortoise habitat, habitat degradation, past exploitation or pathogens (see particularly the recommendations in Sections 3.2 and 5.8 of IUCN [2004]). Furthermore, as described below, the analyses used to support the conclusions in the BSR are poorly documented.

   Recommendation: Explicitly state all model assumptions and the likely source(s) and extent of measurement errors in all estimated parameters to document the conclusions.

2. McCoy, Stys and Mushinsky (2002) provide the only available statistical basis to evaluate the correlation (measurement error) between the FWC GIS Model of current GT habitat in Florida and actual field surveys of 44 conservation areas in Florida conducted by McCoy and Mushinsky. Contrary to expectations, the FWS GIS Model of *potential* GT habitat on these sites underestimated the total minimum known extent of *occupied* GT habitat by 12%. Although a log/log transformation of the data yielded a highly significant relationship and the FWS GIS Model accounted for 45% of the variance (R-squared value) in field estimates (see attached plots), individual site comparisons suggest that the GIS model is a relatively poor predictor of occupied GT habitat [see Table 1 of McCoy et al. (2002)]. Direct comparisons are possible on 32 of the 44 sites (11 sites had no GTs by both methods and one site, University of South Florida ERA, was not

evaluated by Stys). Of the remaining 32 sites, the FWC GIS Model was within 50% of the surveyed estimate of occupied GT habitat in 12 of 32 sites (38%), within 25% in only six of 32 sites (19%) and within 10% in only three of 32 sites (9%). As expected, the error rates were highest on the largest sites (e.g., the FWC GIS model under-estimated current GT habitat in Apalachicola NF by 91%. Please note that these 32 sites represent only 4% of the FWC GIS Model estimate of current occupied habitat, none of which is improved pasture (see Item 4 below).

Recommendation: The FWC GIS Model should be evaluated by independent biostatisticians to: 1) confirm the variance (confidence limits) in model estimates of GT potential habitat relative to field surveys, and 2) calibrate the model using field survey results. For example, to date BRA has developed two GIS models to estimate the extent of occupied GT habitat for permitting purposes (Walt Disney World, 29,000 ac; IMC Phosphates Company, 51,670 ac). In both cases, the models were built in a step-wise fashion, using field data to test the primary stated assumptions, adding variables to reduce error estimates, and statistically quantifying the confidence limits in the final model estimates. None of these steps appears to have been taken in the FWC GIS Model. In addition to the dataset found in McCoy et al. (2002), the FWC has an enormous GT database collected from all habitats throughout Florida in the form of relocation and incidental take permits issued for approximately 141,000 GTs (J. Diemer, pers. commun.), which could be used to refine and validate the FWC GIS Model.

[The FWC's GIS mapping was intended to identify **potential** Gopher Tortoise habitat; no estimates of population density or of habitat occupancy were provided with the GIS analysis. In McCoy et al. (2002), ground survey data (using different density estimates) were compared to the GIS analysis of potential habitat, and it was found that the GIS method produced reasonable estimates of Gopher Tortoise habitat assumed to be of high quality. Although part of the intent of this paper was to compare GIS analysis vs. ground surveys, GIS analysis is not intended to act as an indicator of population density, nor even of habitat occupancy by Gopher Tortoises. In McCoy et al. (2002), different assumptions and methods were used to calculate numbers of individuals from GIS analysis and ground-survey data. Comparing habitat that has the potential to support Gopher Tortoise populations to habitat that is actually occupied by tortoises often does not work well. GIS analysis will over or under represent certain habitat types, and habitats within certain regions of the state. For example, the potential habitat map for the Panhandle will overestimate Gopher Tortoise occupancy/density, but it may accurately depict the potential habitat. Also, GIS analysis attempts to identify the "best" of the potential habitat present in areas, where conditions are more likely to be suitable for the long-term survival of Gopher Tortoise populations. This is why some of the more ruderal habitat types, such as improved pastures, were excluded as potential Gopher Tortoise habitat.]

[The Gopher Tortoise permits that are issued for areas prior to development are not in a GIS format. Although these permits are tracked by the FWC, parcel information is not contained in a GIS database. The actual extent of habitat that is "lost" per development site is not tracked.]

3. The natural extent of GT habitat in Florida before European settlement was estimated to be 4,388,978 ha (10,845,015 ac) based on the Davis (1967) map. We confirmed with Ms. Stys via e-mail that the original GIS files to make this calculation no longer exist; however, Ms. Stys reconstructed a GIS file that came within 157 ha of the BSR estimate.

   Recommendation: The BSR needs to explicitly document the various statistical manipulations of the Davis (1967) map to obtain this acreage, including the deletion of water bodies and wetlands, and inclusion of xeric cover types outside of xeric areas mapped by Davis (1967), none of which is mentioned in the text.

[This has now been addressed in the text.]

4. The FWC GIS Model assumes that *all* of the 1,199,463 ha (2,963,904 ac) of Landsat (2003) imagery of interpreted improved pasture in Florida is unoccupied GT habitat. This is simply not true, particularly on pastures with xeric soil types. The magnitude of this error potentially is huge, given that the FWC GIS Model only predicts 1,344,630 ha (3,322, 526 ac) of occupied GT habitat remains in Florida.

   Recommendation: Provide an estimate of occupied improved pasture habitat with confidence limits.

[Although Gopher Tortoises occur in some improved pastures, this landcover type was excluded from the GIS analysis because it was considered as a transitional cover type. Improved pastures would most likely not provide long-term suitable habitat for Gopher Tortoises because of either land use or habitat fragmentation.]

5. Although the BSR frequently quotes Auffenburg and Franz (1982) to support claims of past habitat loss and exploitation of GTs for food (I agree both are significant factors), no attempt is made to explain why the FWC GIS Model of historic GT habitat in Florida (4,388,978 ha) is 28% higher than Auffenburg and Franz's (1982, p. 108) estimate of 3,430,716 ha.

   Recommendation: Reconcile the difference.

[Auffenberg and Franz (1982) included only xeric habitats as suitable Gopher Tortoise habitat: xeric hammock, sand pine–scrub oak, and long pine–oak uplands. We now realize that tortoises commonly occupy more poorly drained habitats, such as dry prairies and pine flatwoods (Deimer 1987, Breininger et al. 1994), and some additional habitat types were included as potential Gopher Tortoise habitat when conducting the GIS analysis.]

6. Many of the numbers and statistics cited on pages 6–7 of the BSR appear to be contradictory and/or cannot be directly related to declines in GT populations. For example, the top of page 7 states that urban land area in Florida was 2 million ha in 1997, but the third paragraph on page 7 states that high impact urban cover types covered 1.258 million ha in 2003. Which is it? The BSR seems to imply that the reported increases in human population growth and length of roads in Florida are directly related to GT declines, but the relationship probably is non-linear, which could lead to over- or under-

estimating the effects. For example, despite the tremendous human population growth since the 1970s, we have seen dramatic, quantifiable increases in such species as the bald eagle, Florida panther, American crocodile and wood stork. In addition, the pattern of future human population growth in Florida likely will be different from the past, with less urban sprawl and more compact "smart growth."

Recommendation: Revise the BSR in accordance with Section 5.7 of the Red List Guidelines (IUCN 2002).

[We do not claim that there is a linear relationship between human population growth and length of roads and Gopher Tortoise population declines. This information is included from various references as supporting documentation of the impacts of humans on the Florida landscape. The crux of our argument for Gopher Tortoise declines is GIS analysis that shows the dramatic loss of high-quality habitat with the potential to sustain viable Gopher Tortoise populations in the long term. The discrepancy between coverage of urban lands is because different definitions of urban land were used, with the 1.258 million ha representing the most intensive urban land-use cover type used in GIS analysis. Other "developed" landcover types in the 2003 landcover map are low impact urban and extractive (and to some extent, bare soil). The four wildlife species whose populations have increased do not inhabit the xeric upland habitats that are prime areas for human development.]

7. The BSR states (p. 7) that the FWC GIS Model underestimates the actual loss of GTs and their habitat because much of the land clearing for single-family residences "…goes undetected, particularly because landowners often do not apply for permits to take five or fewer tortoises (see R. E. Ashton, Jr., Appendix 1)." Two problems seem apparent: 1) the Landsat imagery would detect land clearing at that scale (or interpret the home site as improved pasture, see Item 4 above), and 2) R. Ashton provides no data to support his claims.

   Recommendation: Verify or delete this statement.

[This statement has been slightly modified, but R. Ashton bases this communication on personal research and visits to county permit offices. If land clearing of larger lots occurs only for house construction, Landsat imagery would not necessarily detect this habitat alteration.]

In summary, the above analysis suggests that the decision to uplist the GT to Threatened status is based largely on population declines inferred from GIS models that are poorly documented with many unstated assumptions, lack confidence limits, and are not calibrated to field surveys. In my opinion, the appropriate field data and statistical modeling tools are available to the FWC to correct these problems (see above recommendations), and these steps must be taken before a listing decision is made. Species rarely become threatened for a single reason, and the symptoms of imperilment usually are multi-faceted. The fact that the GT did not even come close to warranting listing as a SSC under Criterion B (Extent of Occurrence and/or Area of Occupancy), C (Population Size and Trend), D (Number of Mature Individuals), or E (Quantitative Analysis) further suggests that caution and additional analyses are warranted before making any revision to its listing status.

Finally, I recommend that the BRP consider the above comments and re-evaluate their opinion regarding Subcriterion A2 and A3. In any case, the text under Subcriterion A2 and A3 should explicitly state that these conclusions assume no future change to GT permitting or management in Florida. In reality, I see a much brighter future for the Gopher Tortoise that will require new partnerships, compromise and forward thinking on the part of the FWC, developers, conservation groups, animal rights activists, conservation land managers, private landowners and local governments. The decline in GT populations in Florida (but not habitat) could be virtually eliminated by three actions:

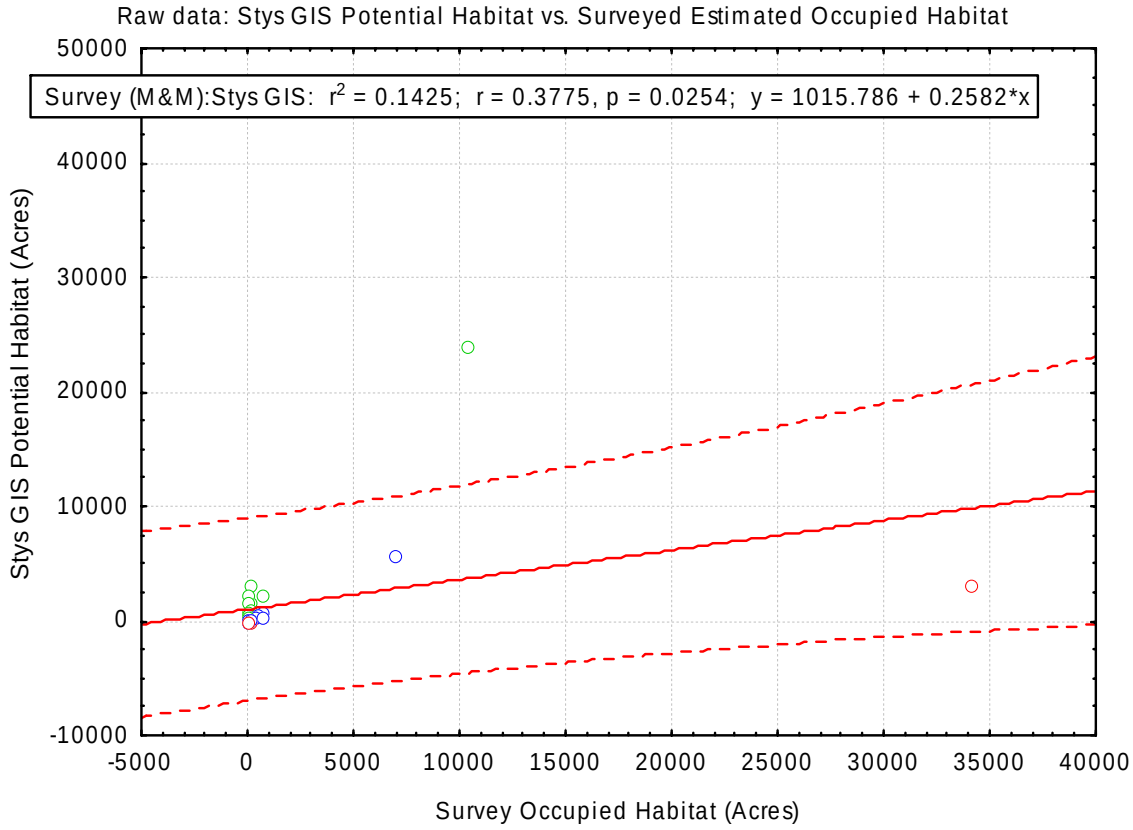
1. The FWC diverts a portion of the GT incidental take mitigation fund (to date $47 million) to help manage existing public lands with tortoises and to develop financial incentives for private owners to protect habitat. As noted in the draft BSR, public conservation lands support over 40% of the GTs in Florida, yet an equal percentage of this prime habitat is severely under-stocked because of historic legal and illegal harvesting for food, and populations are declining on much of the remainder due to a lack of funding and management priorities (e.g., controlled burns).

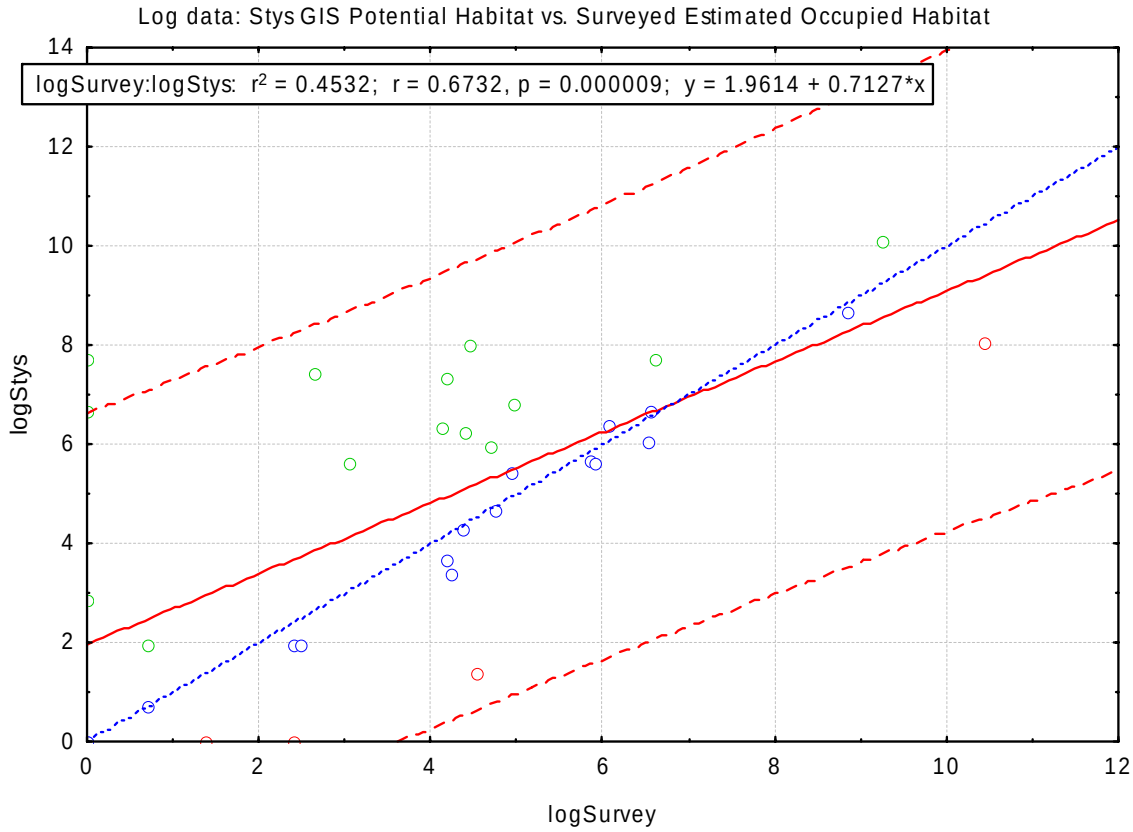
2. Require that all GTs on development sites be captured and transported to secure restocking sites, using the "soft release" techniques that are now available, perhaps with appropriate financial incentives for the cost of such relocations.

3. Open up federal, state, county and private lands with depleted tortoise populations to restock GTs with appropriate safeguards for disease transmission, the integrity of genetically distinct subpopulations, and assurances of long-term habitat management.

If these actions are implemented through a statewide GT management plan, we can achieve the biological goal of downlisting and eventually delisting the Gopher Tortoise in Florida.

[If habitat preservation and proper management of Gopher Tortoise populations result in a decreased rate of population decline in the future, the species can be reclassified. However, present data indicate that the species warrants Threatened status. Because of slow maturation and low reproductive rates, Gopher Tortoise populations will take a long time to respond to favorable management practices.]


Raw data: Stys GIS Potential Habitat vs. Surveyed Estimated Occupied Habitat
Survey (M&M):Stys GIS: r² = 0.1425; r = 0.3775, p = 0.0254; y = 1015.786 + 0.2582*x
Stys GIS Potential Habitat (Acres)
Survey Occupied Habitat (Acres)
50000
40000
30000
20000
10000
0
-10000
-5000
0
5000
10000
15000
20000
25000
30000
35000
40000


Log data: Stys GIS Potential Habitat vs. Surveyed Estimated Occupied Habitat
logSurvey:logStys: r² = 0.4532; r = 0.6732, p = 0.000009; y = 1.9614 + 0.7127*x
logSys
logSurvey
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12

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I have reviewed the draft status report on Gopher Tortoises, and following is my assessment of it. First, it is important to note that the authors of the report include two people, Joan Berish and Henry Mushinsky, who are among the foremost researchers in tortoise biology and conservation. Their participation in the project assures that the content of the report is thorough and up to date.

The report reviews the pertinent literature describing the biology of Gopher Tortoises relative to factors important to understanding conservation of the species. The report then reviews current levels of conservation status within the state of Florida and the requirements for achieving each rank. Three variables are identified for establishing conservation status: long-term reduction in population size ($\geq$80 % reduction for Endangered status; $\geq$50 % for Threatened status; $\geq$30 % for status as a Species of Special Concern), decline in extent of occurrence or area of occupancy, reduction in population size for species with few remaining individuals, unbalanced age structure of species with few remaining individuals, and population projection models that predict a high likelihood of extinction. Each of these criteria is examined carefully relative to Gopher Tortoise biology. The report concludes that, over recent years, Gopher Tortoise populations have declined at least by 50% in Florida and, therefore, that Threatened status is warranted for the species.

We always want more data than are at hand. However, I note that the data used to reach the conclusion that Gopher Tortoises should be listed as Threatened in Florida are relatively extensive. The key factors that the authors used to assess long-term trends are complete and evaluated in an appropriately conservative fashion. For these reasons, I find the conclusion reached by the authors to be compelling. I concur that the Gopher Tortoise reaches the criteria outlined for Threatened status. It is also clear from the data (especially the trends in growth of the human population) that a significant conservation effort will be required to assure that this relatively widespread taxon does not reach Endangered status.