Sunset on the west coast of Egmont Key: The box turtle was not placed in the photo, but was found naturally on the beach.

Dilemma of the Common Species: Florida Box Turtles

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The Eastern Box Turtle, *Terrapene carolina*, one of four forms that may be found in Florida, is familiar to both residents and visitors. Box turtles are known to occur in virtually all counties plus offshore islands in the Gulf of Mexico, where they presumably dispersed over water by floating during floods. Although often considered to be "common," box turtles are not evenly distributed within the state and statements of abundance are misleading in the absence of empirical demographic data, and probably result from a variety of misperceptions. At the same time, knowledge is lacking concerning the status of *T. carolina*, which may impede conservation efforts, even on so-called "protected" lands.

Adult Florida Box Turtle (*Terrapene carolina bauri*) on Egmont Key, Florida.

Plastron of a Florida Box Turtle; plastra vary from yellow to dark brown, and many have colorful patterns.

Juvenile Florida Box Turtle: Juveniles comprise >20% of Egmont Key's box turtle population.

Hatchling Florida Box Turtle: Hatchlings are found occasionally in the leaf litter under a dense overhead canopy.

Florida Box Turtle buried under cover: Turtles seek refuge in deep leaf litter during drought, cold, and heat.

The large influx of people into Florida, especially in the latter half of the 20th century, has resulted in the shrinkage and isolation of box turtle habitats to the point where turtle survival may depend on the presence of public lands. This is especially true in the southern and central parts of the state, areas that historically were known to contain large populations. State, federal, and privately held conservation-based lands may still contain sizable populations.

Box turtles are ecological generalists, a niche that has made them successful for millions of years. In Florida, they are usually terrestrial, although they like to soak in water, especially after dry periods. They are omnivorous, eating a wide variety of both animal and vegetable matter, and Florida populations are active throughout the year to varying degrees, depending on temperature. Home ranges are generally small and individuals frequent the same areas from one season to the next. Box turtles are very aware of their environments, such as the location of food sources, hiding places, nesting sites, and retreats from cold and drought. However, a few turtles are wanderers and never seem to remain in one place. Although not generally considered social animals, they are tolerant of conspecifics and may recognize neighbors. Populations may be dense (14–16 or more turtles per hectare) and large, given favorable habitat and environmental conditions.

The Legal Basis for Conserving Box Turtles in Florida

No statutory regulations in Florida are specifically designed for the protection of box turtles in native habitats. However, commercial collecting is banned, and state law limits possession to two individuals per person without a permit. Box turtles gain some protection on certain federal and state lands, such as national and state parks, since removing any fauna from such lands is illegal without special permits.

Internationally, all *Terrapene* are protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Florida Box Turtles (*T. carolina bauri*) are listed in Appendix II. Trade in Appendix II species must be monitored, lest these species become threatened as a result of commercial exploitation.

Constraints on Conservation

The biological constraints on conservation are those characteristics of a species that relate to its behavior, physiology, population structure, reproduction, and longevity, among others, that are not amenable to change as a result of human management. The life-history characteristics of a population of box turtles reflect a fine balance resulting from natural selection over a long period of time. Thus, the constraints imposed by the species'

Dense habitat formed by Brazilian Pepper (*Schinus terebinthifolius*): The exotic Pepper provides cover, leaf litter, shade, and helps retain high humidity.

physiological, demographic, or other life-history requirements set the biological limits within which researchers and natural resource managers must fashion conservation programs.

As a result of many natural history studies (see Dodd 2001), box turtles are categorized as long-lived, somewhat slow-maturing, iteroparous (i.e., with overlapping generations) reptiles with a high rate of adult survivorship, high mortality among eggs, hatchlings, and juveniles, and a relatively low reproductive output. This suite of life history characteristics, together with their needs for space and a proper biophysical environment, form the boundaries within which options for long-term survival must be framed. These same traits make them vulnerable to habitat change and exploitation because animals with such life history traits take a long time to rebound from perturbations, whether natural or as the direct result of human activity (Seigel and Dodd 2000, Dodd 2001).

Human constraints on conservation include the need for a legal or administrative mandate to protect or conserve a species; the funds, equipment, and personnel (both in the short and long term) to carry out management programs; the time and logistics necessary to conduct preliminary research or other management activity; and a determination whether public support or opposition is present. The diverse types of public lands also have many diverse types of management mandates. The adoption of an "ecosystem approach" to land management by many natural resource agencies (e.g., the U.S. Fish and Wildlife Service, USFWS) may even result in ignoring so-called "single species" problems, except where legal mandate or traditional agency focus dictates otherwise. Therefore, the designation of "public" does not mean that the land and its ecosystems are protected or managed for biological diversity or for the long-term benefit of its natural resources.

Case Study: The Box Turtles of Egmont Key

Egmont Key (27º 36' N, 82º 45' W) is a small (ca. 180 hectares) continental island precariously situated at the junction between Tampa Bay and the Gulf of Mexico. The island has a long history of human occupancy, and little was known of its flora and

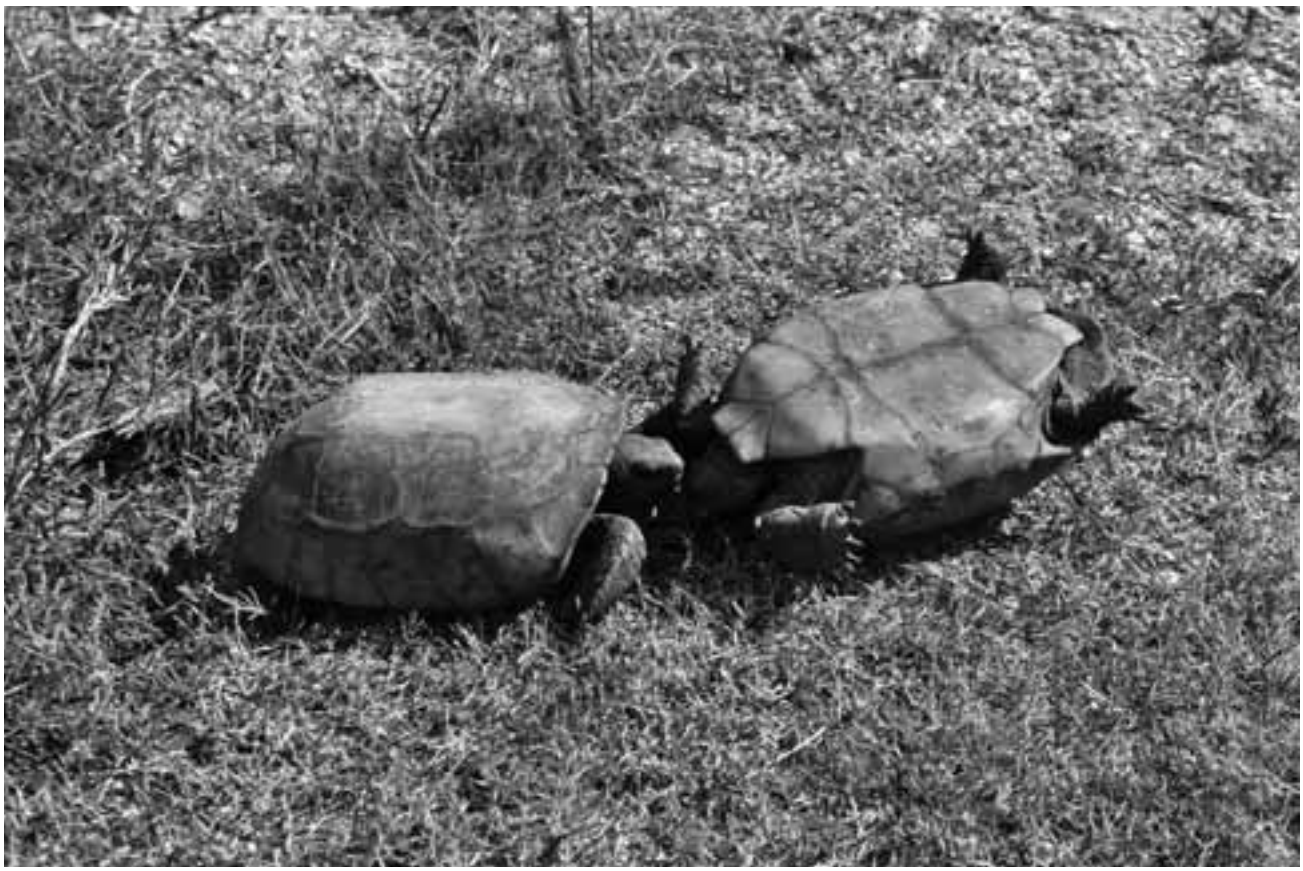
An aerial view of the island looking to the southwest from the lighthouse toward Fort Dade: At one time, the island was nearly twice the size of its present configuration.

fauna prior to extensive modifications made in connection with lighthouse construction and military use beginning in the middle 1800s. Herpetological collections made in 1869–70 and 1904 did not mention box turtles and, indeed, not until the early 1990s did biologists become aware of the large population of Florida Box Turtles (*Terrapene carolina bauri*) on the island (Franz et al. 1992). The origin of the population and the length of time that box turtles have been on the island are unknown, although box turtles are frequent residents on the barrier islands of the southeastern Atlantic Coast and Gulf of Mexico.

Adult Gopher Tortoise (*Gopherus polyphemus*): Gopher Tortoises are common on Egmont Key, with estimates of >1500 tortoises on the island.

Because of their large population size, their relative freedom from overabundant human-associated predators (especially raccoons and other mammals), and their physical isolation from current anthropogenic activities that threaten turtle populations everywhere (e.g., massive habitat destruction and alteration, disturbance, and collection; see Klemens 2000), the box turtles on Egmont Key do not represent just another population, but a unique natural resource that cannot be replicated elsewhere. The large numbers of conspicuous individuals form a dense population that may provide a glimpse of what box turtle populations were like prior to human colonization. Although human activities have severely changed the environment of Egmont Key through past land clearing and the introduction of non-indigenous plants, habitat conditions favorable to turtles (box turtles, Gopher Tortoises, *Gopherus polyphemus*, and nesting Loggerhead Sea Turtles, *Caretta caretta*) have created a unique phenomenon in North America, "l'Île des Tortues" (the island of turtles; Devaux 1993).

Since 1991, scientists from the U.S. Geological Survey, Florida Integrated Science Center (USGS/FISC), have marked more than 2400 box turtles and recorded more than 5200 individual recaptures in a long-term USGS study of the life history of this declining species. Project goals include: (1) Gathering biological data that will provide immediate assistance in habitat management; (2) monitoring box turtle population dynamics during restoration efforts; (3) documenting effects of increased human activity on box turtle population dynamics; (4) determining spatial and temporal aspects of habitat use by box tur-



Fighting Gopher Tortoises: Behavior not normally witnessed is routinely observed on Egmont Key. These were both females!

tles, their activity patterns, population structure and size, and reproductive activities; and (5) determining characteristics of life-history, such as survivorship, growth, disease, and the biology of all age classes.

One might expect that the occurrence of large populations of turtles seemingly unaffected and undaunted by humans on a National Wildlife Refuge/State Park would ensure their protection — but this may not be the case for box turtles. No plan guides resource management and the development of the island,

The author's wife, Marian Griffey, removing box turtles from an abandoned Gopher Tortoise burrow. Florida Box Turtles sometimes use these burrows to escape drought, heat, cold, and sudden decreases in humidity — but never if a tortoise is present.

MARIAN GRIFFEY

The author measuring a box turtle.

Mellon Battery at Fort Dade: Gopher Tortoises prefer the open areas afforded by the restoration of the buildings of the Spanish American-era fort.

This sign alerts visitors to the presence of box turtles on the island. Visitors flock to Egmont's beaches and to historical remnants of Fort Dade (1898–1924).

Eastern Diamondback Rattlesnake (*Crotalus adamanteus*) on Egmont Key: Although now extirpated, this was one of the last observed specimens on the island. Soldiers serving at Fort Dade in the early part of the 20th Century complained about rattlesnakes, mosquitos, and boredom.

Black Racers (*Coluber constrictor*) are common on the island; they more closely resemble specimens in the distant Florida Keys both morphologically and in coloration than those on the nearby mainland.

although many ongoing activities have profound effects on box turtles and other non-protected species. The northern third of the island has had extensive amounts of vegetation removed in order to expose historic sections of Fort Dade for visitors and to stabilize remaining structures; a visitor center is being established using Fort Dade's renovated guard house; tour boats discharge an increasing number of day visitors, and thousands of people may visit, especially on holiday weekends.

Visitors to the island can assist endeavors to protect and conserve all of Egmont Key's natural resources by: (1) Avoiding restricted areas, (2) Maintaining a NO LITTER policy, (3) Leaving plants and wildlife alone, (4) Taking from the island nothing but photographs and memories, and (5) Leaving behind nothing but temporary footprints in the island's glittering sands.

Perceptions and the Future

In effect, Florida Box Turtles have been labeled as common in public parlance, without the benefit of supporting data. So labeled, they face the "dilemma of the common species," that is, if a species is perceived as common, no incentive, legislatively or financially, exists to promote studies and monitoring. This is especially true when critical resources are limited by public priorities that do not regard the environment or natural resources as matters of high importance.

Threats certainly affect box turtles in Florida, as is apparent from the rapid landscape changes that have occurred within the last 60 years. With hundreds of thousands of people moving to Florida annually, native terrestrial habitats and marshy wetlands are being converted to housing and other forms of urban development. Between 1936 and 1995, forests in Florida declined by 22% and herbaceous wetlands by 51%, whereas agricultural lands increased by 60% and urban lands by 632% (Kautz 1998). Certain Florida habitats known at one time to contain sizeable box turtle populations have nearly disappeared and all trends point to a continued loss of habitat diversity within the state (Kautz et al. 1993). Increasing numbers of people in Florida will bring more transportation corridors (leading to mortality), isolate populations, increase contacts with people (who will collect them) and domestic pets (that will kill them), and increase susceptibility to disease through contact with infected captives or other species of chelonians. Commercial collecting is the only threat to box turtles that has been addressed thus far by resource agencies in Florida.

In order to maintain an ecosystem, the functional biodiversity of that ecosystem, including the role of common species,

This is the only specimen of Mole Skink (*Eumeces egregius*) observed on the island; its coloration resembles none of the other described subspecies of *E. egregius*.

must be understood before the common species decline to the point that their existence is jeopardized. Ironically, the somewhat vague concept of ecosystem management (see Goldstein 1999), an idea with many interpretations and practical applications (Yaffee 1999), should be used as a basis for not taking the abundance and biomass of common species into special consideration during natural resource planning, and thereby perhaps even to jeopardize the "commonness" of these species. Certain places should be maintained where presently common species can be appreciated and protected in their sheer numbers and diversity, and where abundance can be left alone or managed as a national asset, rather than be seen as a reason to do nothing (or very little) or as an excuse for exploitation. Only on public lands is this likely to be feasible in Florida's future, especially for box turtles and other reptiles and amphibians. Scientists, resource managers, and concerned citizens must work together to ensure that scientific principles and careful deliberation guide natural resource decisions on public lands, perhaps through the development of a formal, independent, scientific review of management options (Meffee et al. 1998). Box turtles (particularly unique populations such as that on Egmont Key) and other perceptively common species should not be forgotten or subsumed in the decision-making process, especially when valid concerns suggest that they too might join the ever-increasing ranks of imperiled species in Florida.

Open forest of Sabal Palms (*Sabal palmetto*): This is ideal habitat for box turtles on Egmont Key.

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