

Lower Keys Populations of Peninsula Ribbonsnake, Red Rat Snake, Striped Mud Turtle *Thamnophis saurita sackenii, Pantherophis guttatus, Kinosternon baurii*



Photographs (left to right): peninsula ribbonsnake, red rat snake (Miami phase), and striped mud turtle.
Photos by Jonathan Mays, FWC.

Species Overview

Status: Removed from Florida’s Endangered and Threatened Species List

Current Protections

- 68A-4.001, F.A.C., General Prohibitions and Requirement – Prohibits the take, transport, sale, and possession of wildlife.
- 68A-1.004, F.A.C., Take – The term take shall include taking, attempting to take, pursuing, hunting, molesting, capturing, or killing any wildlife or freshwater fish, or their nests or eggs by any means whether or not such actions result in obtaining possession of such wildlife or freshwater fish or their nests or eggs.
- 68A-25.002(6), F.A.C., Prohibits the take, transport, and possession of striped mud turtles, along with other species of freshwater turtles
- 68A-25.002(10), F.A.C., Prohibits take and possession of peninsula ribbonsnakes and red rat snakes from the Lower Keys populations.

Biological Background

This section describes the biological background for Lower Keys populations of the peninsula ribbonsnake (*Thamnophis saurita*), red rat snake (*Pantherophis guttatus*; also commonly called corn snake), and striped mud turtle (*Kinosternon bauri*), hereafter referred to as delisted Keys reptiles, and provides context for the following sections. It focuses on the habitats that support delisted Keys reptiles and the threats faced by these populations.

The delisted Keys reptiles are found in the Lower Keys; while additional populations of these species occur elsewhere, only the populations in the lower Keys were previously listed. The Lower Keys are the islands occurring to the west of Boot and Vaca Keys, beginning with Molasses and East Bahia Honda Keys, and ending with the Marquesas Keys. Big Pine Key and No Name Key are the first large Keys accessible from Route 1 when traveling from the Middle Keys. The Lower Keys are separated from the Middle Keys by Seven Mile Bridge. Populations of these same species extend outside of the Lower Keys into the Upper Keys, peninsular Florida, and beyond. The peninsula ribbonsnake ranges northward into southern South Carolina (FWC 2013a); red rat snakes occur throughout most of the Eastern U.S., as far north as New Jersey (FWC 2013b); striped mud turtle populations are found northward into Virginia (FWC 2013c). As with many widespread species, taxonomic and morphological investigations help determine whether populations like these are distinct enough to warrant special consideration. Previous assessments determined that none of the delisted

Keys reptiles are distinct from those populations found elsewhere (FWC 2011a, FWC 2011b, FWC 2011c). These determinations were based on morphological and genetic analyses for the striped mud turtle (Iverson 1978, Lamb and Lovich 1990, Karl and Wilson 2001), but only morphological analyses for the red rat snake (Duellman and Schwartz 1958, Thomas 1974, Mitchell 1977, Christman 1980) and peninsula ribbonsnake (Christman 1980) have been completed.

Each of the delisted Keys herp species has some degree of isolation from mainland populations, yielding distinct coloration among some individuals than those found outside of the Lower Keys; these morphological differences can, in some cases, make them more coveted in the pet industry. The peninsula ribbonsnake population in the Lower Florida Keys has a tan to brown dorsum with a buff to tan-colored middorsal stripe



Pine rockland habitat. Photograph by Brooke Talley, FWC.

that can be indistinct or completely absent. Additionally, the middorsal stripe in these populations is yellow, orange, or tan bordered on each side by a narrow black stripe (Weaver et al. 1992). Striped mud turtles typically have 3 light longitudinal stripes on the carapace, which runs from tan to black in color (for photographs, see Wilson et al. 2006); however, the stripes are usually inconspicuous in turtles from Florida's Lower Keys, as well as more northerly areas of the species' range. These populations do, however, retain normal colorations on the head (a pair of yellow to cream facial stripes on each side of the head) and plastron (brown to dark yellow).

All three delisted Keys reptiles rely on intact freshwater sources to some degree, typically found within pine rockland, rockland hammock, and mangrove swamp habitats. They are known to utilize wetlands with freshwater lenses. Specifically, the peninsula ribbonsnake preys on fish and frogs associated with wetlands, while the red rat snake forages and shelters in grassy and shrubby vegetation among freshwater habitats, including marshes. These snakes can tolerate some salinity, inhabiting mangrove systems and other brackish habitats in the Lower Keys, and a variety of disturbed habitats (FWC 2013a, FWC 2013b, Love 1978, Lazell 1989, Mays and Enge 2016, Weaver et al. 1992). Similarly, the striped mud turtle inhabits small, ephemeral, freshwater and brackish ponds with salinities below 17 ppt (Dunson 1992). Mays and Enge (2016) detected turtles in ponds that ranged from 1 to 10 ppt. These turtles are also detected in manmade mosquito-control ditches (Dunson 1981, Dunson 1992, Mays and Enge 2016). They require intact uplands to nest, migrate between ponds, and escape drying brackish ponds if they become too saline (Dunson 1992).

Further background information pertaining to the delisted Keys reptiles may be found in the following resources:

- [Florida \(Peninsula\) Ribbon Snake Biological Status Review Report](#) (FWC 2011a),
- [A Species Action Plan for the Lower Keys Population of the Peninsula Ribbon Snake](#) (FWC 2013a),
- [Red Rat Snake Biological Status Review Report](#) (FWC 2011b),
- [A Species Action Plan for the Lower Keys Population of the Red Rat Snake](#) (FWC 2013b),
- [Striped Mud Turtle \(Lower Keys Population\) Biological Status Review Report](#) (FWC 2011c),
- and [A Species Action Plan for the Lower Keys Population of the Striped Mud Turtle](#) (FWC 2013c).



Striped mud turtle habitat in the Lower Keys showing upland habitat connected to a drying brackish pond. Photograph by Jonathan Mays, FWC.

Threats

A series of Biological Status Reviews (BSRs) found that lower Keys populations of the Florida (peninsula) ribbonsnake, red rat snake, and striped mud turtle did not meet criteria for state listing in Florida (FWC 2011a, FWC2011b, FWC2011c). However, threats to these populations do exist. Principal threats to the delisted Keys reptiles are habitat loss and degradation, saltwater intrusion, incompatible land management practices (e.g., filling mosquito ditches), and climate change impacts (e.g., sea level rise, increased hurricane frequency and strength, exacerbated drought regimes, etc.). Additionally, these populations are threatened



Striped mud turtle (above) and red rat snake (below) crossing roads in the Lower Keys. Photograph by Jonathan Mays, FWC.

by other poignant but unpredictable events like illegal harvest for the pet trade, severe pollution events (e.g., oil spills), road mortality, and impacts from non-native species.

Activities that further fragment and/or degrade hardwood hammock, pine rockland, and freshwater sources are forms of habitat alteration that could negatively impact delisted Keys reptiles. Habitat loss and hurricane impacts have already been realized for Florida Keys reptiles and amphibians; some of the historical distributional records in the Keys from more than 30 years ago (e.g., Lazell 1989) are from locations that no longer represent suitable habitat (Mays and Enge 2016). On Big Pine Key for example, most remaining pine rockland habitat occurs in small, disjunct parcels that are challenging to manage with prescribed fire (e.g., small habitat parcels in residential areas; Mays and Enge 2016). Storm surges from Hurricane Wilma in 2005 overwashed many of the Keys; the effects of saltwater on freshwater wetlands, vegetation, and prey may have eliminated or severely reduced reptile populations, particularly on low-lying keys (Mays and Enge 2016). The impacts of climate change, including the frequency and strength of hurricanes, is predicted to increase over time.

The Lower Keys reptiles are subject to overcollection from the wild because of individual unique coloration and pattern that may be present among individuals (FWC 2013a, FWC 2013b). For example, Christman (1980) considered the Lower Keys population of the red rat snake to be noteworthy for its lighter dorsal coloration and other features. Although the striped mud turtle is not currently known to be coveted in the pet trade, illegal harvest of the species in other areas of Florida has been recently documented (Major Grant Burton, FWC Division of Law Enforcement, personal communication). Turtle extirpations from overharvest have been extensively documented (Turtle Extinction Working Group 2015). Therefore, delisted Keys reptiles may be vulnerable to overcollection.



Lower Keys tropical hardwood hammock habitat. Photograph by Jonathan Mays, FWC.

Roads present risk to delisted Keys reptiles because of vehicle-caused mortality and fragmentation of otherwise suitable habitats (Mays and Enge 2016). This type of fragmentation can make reptiles more vulnerable to extinction through reduction of genetic diversity (e.g., snakes; Jochimsen et al. 2004). Reptiles are generally more likely to be struck by vehicles during and after rain events, and during the mating season(s), because animals are more likely to move across roadways during these periods.

Distribution and Survey Methodology

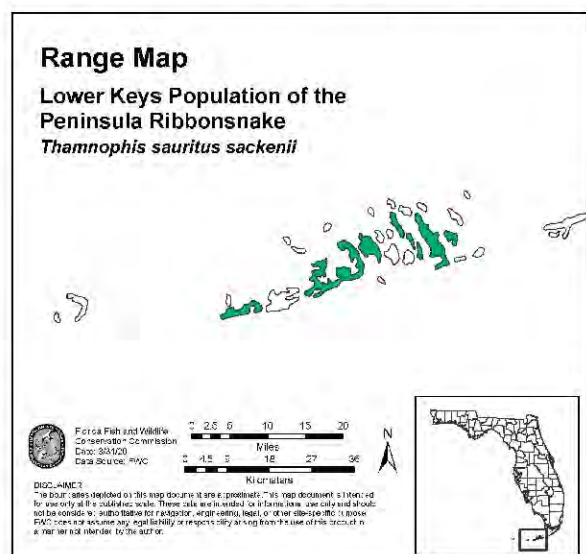
The range maps (below and on next page) represent the principal geographic range of the delisted Keys reptiles, including intervening areas of undocumented habitat. These maps are for information purposes only and not for regulatory use.

County: Monroe

Recommended Survey Methodology

Surveys, though not required, can be used to determine if delisted Keys reptiles are present in an area; although these reptiles are difficult to detect even under the best conditions. The following guidance allows for increased likelihood of detection based on species life history, biological requirements, and recent survey efforts by Florida Fish and Wildlife Conservation Commission (FWC). Given that the goal of surveys is to detect the species, once target species are detected, there is no need to continue surveys. If target species or any state-Threatened species are found, the applicant should coordinate with FWC. Surveys conducted in accordance with the methodology described below may not detect these species

The delisted Keys reptiles are more readily detected in wet and/or cool conditions. Mays and Enge (2016) found the most striped mud turtles August – January, red rat snakes September – January, and ribbonsnakes April – September. The detection timeframes yielded



in Mays and Enge (2016) emphasize that the target species may be more dependent on daily rain and temperature conditions than on typical wet and dry seasons. Typically, the rainy season in the Keys occurs May – October but is not easily defined and fluctuates.

The two snake species are best detected during pedestrian walking surveys and driving surveys; striped mud turtles are best detected by using similar pedestrian walking and driving surveys, and baited trapping (Mays and Enge 2016). See details below for recommended survey methodologies.

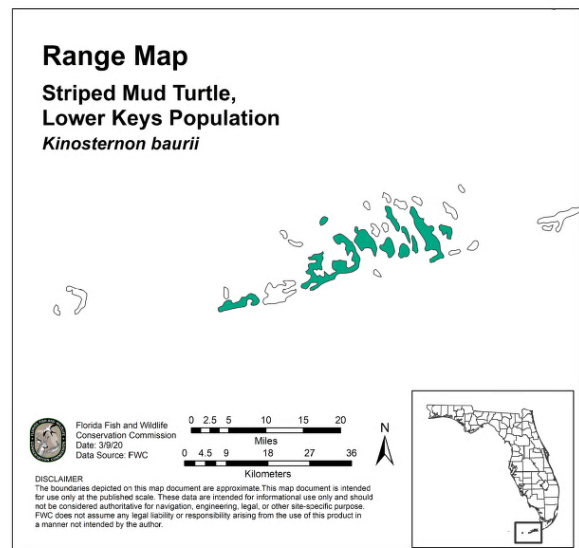
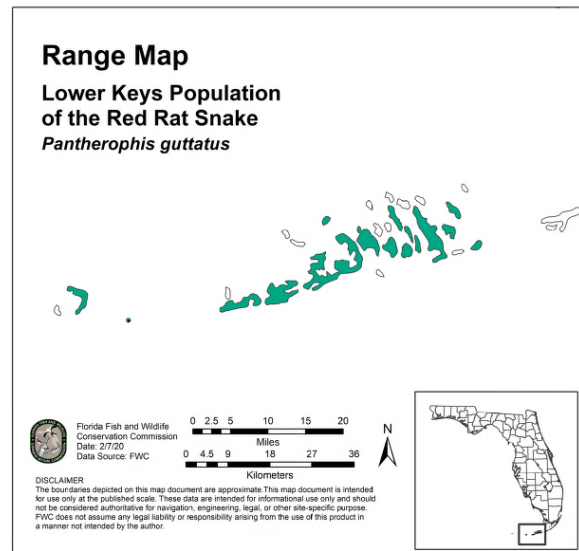
Pedestrian and Driving Surveys (i.e., road cruising):

- Pedestrian and driving surveys do not require a Scientific Collecting permit if the animals are not touched.
- Surveys should be conducted after heavy rain events.
- Surveys should occur outside of the hottest time of the day since animals will retreat underground during those hours (Mays and Enge 2016).
- Mays and Enge (2016) found more peninsula ribbonsnakes during day-time searches, and red rat snakes around sunset (approx. 60 minutes before and after sunset); most of the living turtles they found on roads were after nightfall, and deceased turtles on roads were found both day and night.
- Both species may be encountered in pine rockland, rockland hammock, mangrove swamp, disturbed habitats, and on roads.
- Driving surveys can be used to document deceased individuals on roadways, and also live animals as they thermoregulate on pavement and gravel or as they are crossing the roadway.
- Groundcover searches can be part of pedestrian walking surveys for snakes when the habitat is suitable. These searches can be completed by methodically turning over cover objects (e.g., rocks, logs, manmade objects) and gently raking through leaf litter. However, these snakes are only occasionally found beneath cover objects (Mays and Enge 2016).

Although it is possible to detect these species with coverboards, it is not an efficient methodology compared to pedestrian walking and driving surveys (Mays and Enge 2016). Therefore, we do not recommend coverboard surveys for detection of delisted Keys reptiles.

Baited trapping for striped mud turtles: Lower Keys populations of striped mud turtles are most reliably detected by using baited traps (Mays and Enge 2016).

- Baited trap surveys should be designed in coordination with FWC; see [Permits for Justifiable Purposes and Scientific Collecting](#).



- Use an array of standard traps (e.g., Promar brand, 36" x 12" with dual 5" entrances) in appropriate aquatic habitat. The number of traps that should be employed in the water depends upon the space available in the marsh or ditch, but traps can typically be set approx. 5 m (16.4 ft) apart from one another.
- Traps should be set with sufficient space to allow trapped turtles to surface for air even during the heaviest rain events that cause rising waters.
- Set traps overnight and check during morning hours. A minimum of 5 trap nights typically results in turtle detection in occupied wetlands (Mays and Enge 2016).
- Ensure that traps are set securely by tying them to the bank or other similar structure so that the traps are less likely to be moved by large predators interested in the bait.
- Bait each trap with 1 tin of sardines (in oil) or other similar bait to attract turtles.



Striped mud turtles captured in baited traps from the Lower Keys. Photograph by Jonathan Mays, FWC.

Recommended Conservation Practices

Recommended Conservation Practices are general measures that could benefit the delisted Keys reptiles but are not required. No FWC permit is required to conduct these activities.

- Minimize/reduce soil compaction during construction activities, particularly during the rainy season when the delisted Keys reptiles are likely most active.
- Leave leaf litter and woody debris in place as microhabitat.
- Avoid placement of impermeable surfaces, such as roads or parking lots in and adjacent to intact pine rockland, tropical hardwood hammocks, and freshwater ponds and marshes unless such surfaces are used to maintain intact habitat on one side (e.g., placement of a road between two waterbodies allows for a freshwater lens to be present on one side while the other is hyper-saline).
- Refrain from clearing or fragmenting important habitats (intact pine rockland, intact tropical hardwood hammock, freshwater wetlands).
- Design projects to minimize loss of pine rockland, tropical hardwood hammock, and freshwater habitat.
- Adhere to provisions in the Monroe County Comprehensive Plan regarding protection of tropical hard-wood hammocks and other native habitats (Monroe County 2016).
- Adhere to Land Planning Regulations for the Florida Keys Area of Critical State Concern – Monroe County (Rule Chapter 28-20) and Sections 118-7, 118-10(1), and 118-10(4) of the Monroe County Land Development Code regarding designing development away from natural areas and sensitive habitats, restrictions to developing tropical hardwood hammock, and maintenance of native trees (State of Florida 2014).
- Develop a prescribed fire regime that minimizes woody encroachment into wetlands and uplands.
- Remove and control nonnative exotic species that may directly or indirectly impact delisted Keys reptiles (e.g., outdoor housecats).

- Avoid or minimize fertilizer, herbicide, and pesticide runoff into wetlands.
 - Prior to using herbicides or pesticides in or around suitable or occupied habitat, review labels for potential effects on non-target organisms.
 - Use only herbicides that are labeled for aquatic use and check that any adjuvants are aquatic compatible.
- Maintain or enhance water quality and quantity in all freshwater and slightly brackish wetlands in the Lower Keys.
 - If activities (e.g., mosquito control) require that waterbodies be drained, ensure that adequate water is available onsite or nearby for the striped mud turtle to survive.
- To prevent the establishment and spread of invasive and non-native plants, avoid or minimize disturbance of the soil in areas where delisted Keys reptiles are believed to occur.
- Avoid building road crossings through suitable or occupied habitat.
- If road crossings are needed, use techniques to reduce sedimentation entering habitat (e.g., bridges, bank stabilization). Guidelines for minimizing erosion and runoff from roadways can be found in the [State of Florida Best Management Practices \(BMPs\) for stormwater runoff](#).
- Report trespass and illegal dumping to local authorities. If these activities occur on FWC-managed property, report those activities directly to FWC (Wildlife Alert 1-888-404-3922).
- Report illegal collection of delisted Keys reptiles to FWC (Wildlife Alert 1-888-404-3922).

Prohibitions and Permitting

Delisted Keys reptiles are protected by the general prohibitions outlined in Rule 68A-4.001, F.A.C.: no wildlife or freshwater fish or their nests, eggs, young, homes, or dens shall be taken, transported, stored, served, bought, sold or possessed in any manner or quantity at any time except as specifically permitted by these rules nor shall anyone take, poison, store, buy, sell, possess or wantonly or willfully waste the same except as specifically permitted these rules. Take is defined in Rule 68A-1.004, F.A.C., as pursuing, hunting, molesting, capturing, or killing (or attempting to do those things). A permit is required for any activity that involves the possession, capture, sell, purchase, transport, hunting or killing of delisted Keys reptiles. These permits are issued for justifiable purposes as outlined in Rule 68A-9.002, F.A.C. Justifiable purposes are scientific, educational, exhibition, propagation, management or other justifiable purposes. Collection (taking) of reptiles is controlled by Rule 68A-25.002, F.A.C., which specify take and possession limits and methods, transport, and sale for reptiles; take and possession of delisted Keys reptiles is prohibited except as authorized by permit from the executive director as provided in Rule 68A-9.002, F.A.C; collection of freshwater turtle eggs and sale of wild caught turtles is prohibited by Rule 68A-25.002, F.A.C.

No Permit Needed

The following activities could cause take, but are authorized to be conducted without an FWC-issued permit:

- Water management actions for human health and safety, such as flood control.
- For mosquito control measures, FWC recommends following guidelines described by the Florida Keys Mosquito Control District (2016) which limit direct and indirect effects on non-target vertebrates.
- Vegetation removal or trimming in the linear right of way for power restoration. This applies only in cases where there is an immediate danger to the public's health and/or safety (including imminent or existing power outages that threaten public safety, or in direct response to an official declaration of a state of emergency by the Governor of Florida or a local government entity), and only to non-routine removal or trimming of vegetation within the linear right of way, in accordance with a vegetation management plan that meets applicable federal and state standards. If conducted under these circumstances, no FWC take permit is required.

Permits for Justifiable Purposes - Scientific Collecting and Educational Use

Scientific collecting permits may be issued for the delisted Keys reptiles. Activities requiring a permit include any research that involves capturing, handling, or marking wildlife; conducting biological sampling, including collecting tissue samples or genetic material for taxonomic analyses; or other research that may cause take. Visual encounter surveys that do not involve handling animals do not require a permit. A scientific collecting permit is required to use delisted Keys reptiles for education and outreach events; a scientific collecting permit will not be issued for the sole purpose of removing a delisted Keys herp from the wild to use as an educational or outreach animal. Delisted Keys reptiles permitted for educational and outreach purposes should be used for a minimum of 12 educational engagements equating to a minimum of 48 hours of contact time.

- Applicants can apply for scientific collecting permits on the FWC's [online permitting site](#). Scientific collecting permit applications should include a justification, objectives, and scope of the project.
- Applications should include detailed description of project methods, including duration, sample size, disposition of individuals, and capture/handling procedures (including measures taken to reduce the risk of injury or death).
- The application should also include a thorough description of the project's methods, timeframe, and final disposition of all individuals. Permit amendment and renewal applications must be "stand-alone" (i.e., include all relevant information on objectives and methods).
- Permits may be issued to display a specimen if the specimen was obtained via rehabilitation facility or was encountered dead.
- Permits may be issued for possession (removal from the wild) if an individual is non-releasable.
- Capturing and handling protocols, and a justification of methods, must be included in the permit application and should identify measures to lessen stress for captured snakes and turtles.
- Methodologies for any procedures should be clearly described, including measures taken to reduce stress and injury to snakes and turtles.
- Methodologies for any collection of tissues (such as blood) should be clearly spelled out, including measures taken to reduce stress and injury to snakes and turtles.
- Disposition involving captive possession for any period must include a full explanation of whether the facility has appropriate resources for accomplishing the project objectives and for maintaining the animals in a safe and humane manner.
- Any mortality should be reported immediately to FWC at the contact information below. FWC will provide guidance on proper disposition of specimens.
- Geographical or visual data gathered must be provided to FWC as specified in the permit conditions.
- A final report should be provided to FWC in the format specified in the permit conditions.

Other Permits

For any other justifiable purpose permit that does not fall under scientific collecting or educational use, please submit your request to WildlifePermits@myfwc.com.

Additional Information

Information on Economic Assessment of this guideline can be found at <http://myfwc.com/wildlifehabitats/imperiled/management-plans/>

Contact

For more species-specific information or related permitting questions, contact FWC at (850) 921-5990 or WildlifePermits@myfwc.com. For regional information, visit <http://myfwc.com/contact>.

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