

**Recovery Plan for the Distinct Population Segment of the American Crocodile (*Crocodylus acutus*) in Florida.**

**Original Recovery Plan Approved:** May 18, 1999

**Original Recovery Plan Prepared by:** South Florida Ecological Services Field Office

<https://www.fws.gov/verobeach/MSRPPDFs/Croc.pdf>

**AMENDMENT 1**

We have identified best available information that indicates the need to amend recovery criteria for the Distinct Population Segment of the American crocodile (*Crocodylus acutus*) in Florida since the recovery plan was originally completed. In this proposed modification, we synthesize the adequacy of the existing recovery criteria, show amended recovery criteria, and provide the rationale supporting the proposed recovery plan modification, as well as new recovery actions needed to protect the American crocodile. The proposed modification is shown as an addendum that supplements the South Florida Multi-Species Recovery Plan (MSRP; USFWS 1999), specifically the sections entitled Recovery Criteria on page 4-521, Species-level Recovery Actions on pages 4-521 through 4-524 and Habitat-level Recovery Actions on pages 4-524 through 4-527 of the MSRP. Recovery plans are non-regulatory documents that provide guidance on how best to help recover species.

For  
U.S. Fish and Wildlife Service  
Atlanta, Georgia

Approved: \_\_\_\_\_

Acting

Regional Director, U.S. Fish and Wildlife Service

Date: \_\_\_\_\_

11/7/2019

**METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT**

To prepare this amendment, staff from U.S. Fish and Wildlife Service (Service) offices in Vero Beach and Fort Lauderdale, Florida reviewed the most recent recovery plan for the American crocodile in Florida (USFWS 1999). To obtain the most current new information on the status and biology of, and threats to, the American crocodile in Florida (in association with this document and our concurrent species status assessment and five year review for the species), the Service sent emails to those known to have knowledge of the species including researchers, state, Federal or county natural resource and wildlife managers, non-governmental agencies, and other persons with expertise and/or interest in the species. An electronic mail address and call-in phone number with an automated answering system also were established to receive information on the American crocodile in Florida. To date, the Service received one response from a non-governmental organization. We reviewed their response and determined that it did not provide any information relating to the American crocodile in Florida that the Service did not already

have. We also considered comments received during the 30-day public comment period for the draft recovery plan amendment (see Appendix).

## **ADEQUACY OF RECOVERY CRITERIA**

Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires that each recovery plan shall incorporate, to the maximum extent practicable, “objective, measurable criteria, which when met, would result in a determination...that the species be removed from the list.” Legal challenges to recovery plans (see *Fund for Animals v. Babbitt*, 903 F. Supp. 96 (D.D.C. 1995)) and a Government Accountability Audit (GAO 2006) have also affirmed the need to frame recovery criteria in terms of threats assessed under the five threat factors (ESA 4(a)(1)).

### **Recovery Criteria**

The recovery plan only provided reclassification (i.e., downlisting) criteria, found on page 4-521 at <https://www.fws.gov/verobeach/MSRPPDFs/Croc.pdf>. Because the species was reclassified from endangered to threatened (see Synthesis below), the downlisting criteria are no longer applicable.

### **Synthesis**

The MSRP described habitat alteration (Factor A) and human disturbances (Factor E) as the primary threats to the species and efforts undertaken to ameliorate these threats. In the MSRP, a minimum of 60 breeding females was deemed necessary before reclassification could be considered. Because the population appeared stable, all of the threats described in the original listing had been eliminated or reduced, and the number of breeding females consistently exceeded 60 per year (based on the observation of at least 60 crocodile nests per year and one nest per breeding female crocodile per year), the distinct population segment of the American crocodile in Florida was reclassified from endangered to threatened in 2007 (71 FR 23027).

A reduction in American crocodile nesting in a portion of its nesting range has recently been observed. Information obtained after the reclassification of the American crocodile in Florida indicates that nesting within the berms of the Cooling Canal System (CCS) of Florida Power and Light’s (FPL) Turkey Point Power Plant (an important nesting site for crocodiles) decreased significantly starting in 2015. The CCS represents one of the five areas in south Florida where American crocodile nesting is known to occur. The other four areas include North Key Largo (including the Crocodile Lake National Wildlife Refuge), northeast Florida Bay in Everglades National Park (ENP), Flamingo/Cape Sable in ENP, and Other (consisting of lands north of the Turkey Point Power Plant Site, the Florida Keys south of North Key Largo, and along the west Coast of Florida, north of Highland Beach to Sanibel Island). Nesting at the CCS ranged from 8 to 9 nests per year from 2015 through 2017, compared to 15 to 27 nests per year from 2008 through 2014. The decrease in nesting observed within the berms of the CCS is associated with a decrease in the water quality in the CCS that was observed from 2000 - 2009. Decreased water quality also resulted in a significant reduction in body condition of crocodiles, and the total number of crocodiles observed in and around the CCS (Squires et al. 2016). There are likely multiple factors leading to the decline in water quality. Prior to 2010, the CCS operated as a

seagrass-based biological system. This ecosystem helped to maintain good water quality and low nutrient concentrations. Salinity levels have been subject to seasonal variation, peaking at the end of the dry season, and falling at the end of the wet season. Between 2000 and late 2009, the peak seasonal salinities steadily increased. By 2010, seagrasses were dying off and by 2012, few seagrass beds remained. The system-wide seagrass die-off and subsequent decomposition of the seagrasses released a significant volume of previously bound and sequestered nutrients over a multi-year period. The increase of nutrient levels facilitated seasonal algae blooms, resulting in high turbidity and generally degraded water quality. FPL is conducting multiple efforts to improve the environmental conditions in the CCS and in 2018 and 2019 had an increase in nesting numbers, with 14 and 22 successful nests.

The assessment of threats, suggested recovery actions, and life history information pertaining to the American crocodile in Florida included in the MSRP remain largely applicable. However, in addition to reduction in nesting due to poor water quality at FPL's Turkey Point Power Plant CCS, new potential threats to the American crocodile in Florida have emerged, including impacts from sea level rise associated with climate change (Factor E) and the recent establishment of non-native exotic reptiles, the Burmese python (*Python bivittatus*) and the Argentine black and white tegu (*Salvator merianae* = *Tupinambis merianae*) (Factor E), in South Florida. A brief discussion of these threats is provided below in the section entitled "Additional Site Specific Recovery Actions."

## **AMENDED RECOVERY CRITERIA**

Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that the protections afforded by the Act are no longer necessary and the Distinct Population Segment of the American crocodile in Florida may be delisted. Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Downlisting is the reclassification of a species from an endangered species to a threatened species. The term "endangered species" means any species (species, sub-species, or Distinct Population Segment) in danger of extinction throughout all or a significant portion of its range. The term "threatened species" means any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Revisions to the Lists, including delisting or downlisting a species, must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is an endangered species or threatened species (or not) because of threats to the species. Section 4(b) of the Act requires that the determination be made "solely on the basis of the best scientific and commercial data available." Thus, while recovery plans provide important guidance to the Service, States, and other partners on methods of minimizing threats to listed species and measurable objectives to measure progress towards recovery, they are guidance and not regulatory documents.

Recovery criteria should help indicate when we would anticipate that an analysis of the species' status under section 4(a)(1) would result in a determination that the species is no longer an endangered species or threatened species. A decision to revise the status of a species, or remove

it from the Federal Lists of Endangered and Threatened Wildlife and Plants, is ultimately based on an analysis of the best scientific and commercial data then available, regardless of whether that information differs from the recovery plan, that triggers rulemaking. When changing the status of a species, we first propose the action in the *Federal Register* to seek public comment and peer review, followed by a final decision announced in the *Federal Register*.

Below, we provide delisting criteria for the Distinct Population Segment of the American crocodile in Florida.

### **Delisting Recovery Criteria**

The Distinct Population Segment of the American crocodile in Florida will be considered for delisting when:

1. At least three of the five nesting areas defined below show stable or increasing trends in nesting (or other suitable parameters) and natural recruitment.
  - a) FPL's Turkey Point Power Plant Site;
  - b) North Key Largo including the Crocodile Lake National Wildlife Refuge;
  - c) Northeast Florida Bay in ENP;
  - d) Flamingo/Cape Sable in ENP;
  - e) Other (nesting occurring north of the Turkey Point Power Plant Site, within the Florida Keys south of North Key Largo, and along the west Coast of Florida from north of Highland Beach to Sanibel Island).
2. Threats have been addressed and/or managed to the extent that the species will remain viable into the foreseeable future. (Factors A and E)
3. When, in addition to the above criteria, it can be demonstrated that despite sea level rise and other environmental influences, sufficient suitable habitat remains for the American crocodile to be viable in Florida for the foreseeable future. (Factor As and E)

### **Justification**

1. Subpopulations that exhibit a stable or increasing trend in nesting (or other suitable parameters) and natural recruitment demonstrate that the population is secure and will be resilient to stochastic events. For the Distinct Population Segment of the American crocodile in Florida, we find that at least three subpopulations (as defined above by the nesting areas listed in item 1 of the Delisting Recovery Criteria) exhibiting these traits are necessary to provide sufficient redundancy to ensure the Distinct Population Segment of the species will no longer require protection under the Act. The Service defines the baseline period for assessment of trends in nesting (or other suitable parameters) and natural recruitment as the 5-year period from 2013 through 2017.
2. Abatement of the threats within the range of the American crocodile in Florida will allow the subpopulations to become stable or expand, and contribute to the viability of the species. Specifically, ongoing maintenance and enhancement of habitat is necessary

to ensure that sufficient nesting sites with suitable substrate, appropriate incubation environments, and aquatic nursery areas with appropriate salinity and water quality are available to the species. Moreover, efforts to reduce exotic animal species that prey on crocodiles or their eggs, and represent a threat to the American crocodile population in Florida (as described below in the section entitled Additional Site Specific Recovery Actions) should continue. Finally, as the American crocodile population in Florida increases and expands within areas now occupied by humans, anthropogenic sources of crocodile mortality (e.g., vehicle strikes, poaching) will need to be managed, as will other conflicts resulting from interactions of humans and crocodiles.

3. Location of suitable habitat needed for long-term viability of the American crocodile may change with habitat changes and loss projected due to sea level rise.

### **Rationale for Amended Recovery Criteria**

The recovery plan for the American crocodile in Florida ([https://ecos.fws.gov/docs/recovery\\_plan/sfl\\_msrp/SFL\\_MSRP\\_Species.pdf](https://ecos.fws.gov/docs/recovery_plan/sfl_msrp/SFL_MSRP_Species.pdf)) included only downlisting criteria (USFWS 1999; page 4-521). With these proposed amendments, delisting has been clearly defined with measurable, objective criteria in keeping with the recovery strategy and goals outlined in the MSRP. These criteria address what is necessary to ensure resiliency, redundancy, and representation by addressing factors that threaten the species. In achieving these criteria, we expect the American crocodile to have a low probability of extinction for the foreseeable future and have stable populations needed for long-term recovery. We will work together with all appropriate parties to strategically and efficiently implement the new criteria.

### **ADDITIONAL SITE SPECIFIC RECOVERY ACTIONS**

The following recovery actions are recommended in addition to those listed in the most current recovery plan for the American crocodile in Florida:

1. Monitor the effects of climate change and sea-level rise on American crocodile habitat and nesting in South Florida.

Sea-level rise was not discussed in the MSRP as a threat to the American crocodile in Florida. Sea levels in coastal South Florida (Palm Beach, Broward, Miami-Dade and Monroe counties) are expected to rise from 6 to 10 inches by 2030 and 14 to 34 inches by 2060 (Compact 2015). The National Oceanic and Atmospheric Administration estimates that sea level rise will increase by 1 to 8 feet (ft) by the end of the century, with the “business as usual” scenario (i.e., no reductions in greenhouse gases) predicting 6.6 ft of sea level rise (NOAA 2017). Sea level rise of this magnitude could result in the inundation of current nesting areas used by American crocodiles. Crocodiles would likely relocate nesting areas to the newly formed coastal areas in association with sea-level rise, if available. However, relocation of coastal human settlements due to sea level rise could usurp new areas of habitat that crocodiles could use for nesting.

2. Continue to monitor and control exotic animals that pose a threat to the viability of the American crocodiles in Florida.

Two non-native reptile species, the Burmese python and the Argentine black and white tegu recently introduced and established in south Florida, represent a threat to the survival of the American crocodile. The Burmese python has been documented to feed on a variety of animal species in South Florida, including the American alligator (*Alligator mississippiensis*). Although predation of American crocodiles has not yet been documented, Burmese pythons are certainly capable of killing and consuming hatchling, juvenile, and sub-adult crocodiles. The Argentine black and white tegu is known to eat reptile eggs and has been photographed by motion sensitive cameras consuming alligator eggs and loitering at a crocodile nest site (Mazzotti et al. 2014). A campaign to control the Burmese python and the Argentine black and white tegu, that includes surveying, trapping, and hunting, has been implemented by the Florida Fish and Wildlife Conservation Commission, University of Florida, and National Park Service. This effort should be continued and enlarged as needed.

## LITERATURE CITED

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- Squires, M., V. Briggs-Gonzalez, C. Smith, S. K. Cooke, M.S. Cherkiss and F. J. Mazzotti. 2016 Annual Report, American Crocodile Monitoring Program for the Turkey Point Uprate. Report from Florida Power and Light to U.S. Fish and Wildlife Service. 72 pages.
- U.S. Fish and Wildlife Service (USFWS). 1999. South Florida multi-species recovery plan. Atlanta, Georgia. 2172 pp.

## APPENDIX. SUMMARY COMMENTS RECEIVED AND RESPONSES

The Service instituted the following actions to request comments for the draft Amendment to the Recovery Plan for the Distinct Population Segment of the American Crocodile in Florida. We published a notice of availability in the Federal Register on August 6, 2019 (84 FR 38291-38294) to announce that the draft amendment to American Crocodile Recovery Plan was available for public review, and to solicit comments by the Scientific community, State and Federal agencies, Tribal governments, and other interested parties on the general information base, assumptions, and conclusions presented in the draft amendment. An electronic version of the draft amendment was posted on the Service's Species Profile website ([https://ecos.fws.gov/docs/recovery\\_plan/American%20Crocodile%20Recovery%20Plan%20Amendment.pdf](https://ecos.fws.gov/docs/recovery_plan/American%20Crocodile%20Recovery%20Plan%20Amendment.pdf)). We also developed and implemented an outreach plan that included (1) publishing a news release on our national webpage (<https://www.fws.gov/news/>) on August 5, 2019, (2) sending specific notifications to Federal Congressional representatives in Florida, and (3) sending specific notifications to key experts and stakeholders in American crocodile conservation and recovery efforts.

We received two responses in total, one from a non-governmental conservation organization and one from a Federal government agency. We have considered all substantive comments. We thank the reviewers for these comments and to the extent appropriate, we have incorporated the applicable information or suggested changes into the final recovery plan amendment. Below, we provide a summary of comments received and provide responses to the comments. Some of the comments did not pertain to the Distinct Population Segment of the American crocodile in Florida or were made on certain portions of the document that have been subsequently removed from the document based on further editing. As such, we did not provide responses for these comments. We also provided copies of all comments received during the formal public comment period to all relevant Federal agencies for their consideration prior to implementation of the final recovery plan, in accordance with section 4(f)(5) of the Act.

*Comment (1):* Because the Act classifies listed crocodylian species on a population-by-population basis, the amendment to the recovery plan should clearly indicate that it applies only to the population of *Crocodylus acutus* within the United States of America (USA), rather than for the species throughout its range.

*Response:* We have updated the recovery plan amendment to clarify that it applies only to the Distinct Population Segment of the American crocodile (*Crocodylus acutus*) in Florida, USA.

*Comment (2):* The section of document entitled "Justification" implied that the crocodile population should be maintained free of predation from exotic animals such as the black and white tegu. The commenter stated that it may be impossible to eliminate predation on crocodiles and eggs from exotic species of animals. Rather, it would be acceptable to reduce predation from exotic animals to a level that did not substantially threaten the conservation (or survival) of the crocodile population.

*Response:* The Service agrees that in many cases it is difficult to eliminate established exotic species. The language in the document has been revised accordingly.

*Comment (3):* The commenter noted that the phrase “increasing trends in nesting and natural recruitment” – delisting recovery criteria #1, was poorly defined and lacked detail. Specifically, this criterion did not contain a quantitative nesting metric (i.e., number of nests), the time frame over which the trend would be measured, or other performance measures indicating how recovery would be achieved. The commenter also noted that the lack of a quantitative nesting metric was a departure from the downlisting criteria for the American crocodile in Florida provided in the MSRP (USFWS 1999), where at least 60 nests per year over a three year period was defined as the benchmark for downlisting.

*Response:* The Service notes that downlisting criteria listed in the MSRP actually stated that a minimum of 60 breeding females within the crocodile population would be needed before reclassification (i.e., downlisting) could be considered. In addition, a time period was not established in the original downlisting criteria. However, we agree that the documentation of 60 nests within a breeding season demonstrates that 60 breeding females occur in the population.

With respect to the lack of detail in recovery criterion # 1, because nesting is not the only parameter that could be used to measure a stable or increasing population trend for this species, we described the metric in the delisting criteria more broadly. If and when, in the future, we are able to better define those metrics, we will either identify those targets in our recovery implementation strategy or revise the criteria to include more specific numbers for those metrics. We did provide a baseline time period (2013 -2017) from which to assess trends in nesting (or other suitable parameters) and natural recruitment

*Comment (4):* The commenter noted that the document seemed to imply that the Service was advocating the use of spotlight surveys in lieu of nesting surveys to determine the status and trends of the American crocodile population in Florida. The commenter also discussed the limitations associated with the use of spotlight surveys in determining population trends.

*Response:* The language in the criteria did not specify the method by which to evaluate stable or increasing trends, evidenced by natural recruitment and multiple age classes. The Service notes that the available nesting data is the best information currently available to assess the status of the American crocodile population in Florida. The language was changed to “At least three of the five nesting areas defined below show stable or increasing trends in nesting and natural recruitment.”

*Comment (5):* The commenter asked why the assessment of nesting trends for the American crocodile in Florida was limited to the five nesting areas defined in recovery criterion #1, and why other areas were not considered. The commenter noted that factors such climate change and the expansion of the crocodile population are likely to affect the location of crocodile nesting (i.e., crocodiles are likely to increase their range northward along Florida’s east coast).

*Response:* The five nesting areas listed in recovery criterion #1 currently includes four areas where nesting is known to be concentrated (a-d) and one area (e- Other) where nests have occurred. The Other area includes a broad geographic scope extending into the Florida Keys, and up both coasts of Florida into areas that may be more used by crocodiles in response to changes in habitat and environmental conditions associated with sea level rise and climate change.

*Comment (6):* The commenter stated that the recovery plan and the Species Status Assessment for the American crocodile (currently being developed by the Service) should be in close agreement with respect to the most important metrics used to document and understand the recovery of the species.

*Response:* The Service agrees. We note that the Species Status Assessment for the Distinct Population Segment of the American crocodile in Florida is currently under development. If new information pertinent to the recovery criteria is identified during this process, then the amendment to recovery plan can be further amended and updated as appropriate.

*Comment (7):* The commenter asked for clarification regarding when the baseline of the crocodile population would be established, in order to judge if the population is exhibiting a stable or increasing trend in nesting and natural recruitment. Would the baseline for the population be established prior to the date that the amended recovery plan is approved, at the date of approval, or sometime in the future following approval? Also, if nesting and recruitment trends for three of five nesting areas defined in delisting recovery criterion item 1 are currently stable, would recovery be achieved, even if none of the nesting areas are increasing and two are declining?

*Response:* Clarification of the baseline used to determine the trends in nesting and recruitment at the 5 nesting areas (as defined in recovery criterion #1) was added (2013-2017). If nesting and recruitment trends with three of the five nesting areas are determined to be stable, then the species would be considered recovered, even if two of the nesting areas are declining, as long as items 2 and 3 in the delisting recovery criteria are met.

*Comment (8):* The commenter noted that the “Other” area defined in recovery criterion #1, undoubtedly has many more crocodiles currently than in 1999, or even 2007. It is likely not appropriate to combine into one category when so widely separated with respect to geography, habitat type and quality, land ownership/use and; not unimportantly, monitoring effort/efficacy? Further, it is likely that this category, taken as a whole, currently exceeds both the total population and nesting effort found in both North Key Largo including the Crocodile Lake National Wildlife Refuge and FPL’s Turkey Point Power Plant Site. Yet, it is not systematically monitored as the other four nesting areas listed in delisting recovery criterion 1. Therefore, the contribution to the recovery of the species cannot be quantitatively determined with high confidence.

*Response:* We agree that further attention needs to be given to the “Other” area and that it could, in the future, be split into additional subareas. However, at this time we do not have the information to justify this measure. In addition, using observations by the public, land managers, biologists, and FWC is a viable means of collecting the necessary information if the information is collected in a regular and standardized manner. Further implementation of actions listed in the current recovery plan for the American Crocodile (e.g., S1 - Conduct surveys to determine the current distribution and abundance of American crocodiles, and S4.1 - Coordinate monitoring programs and protocols) will help to improve our knowledge of nesting in the “Other” area.