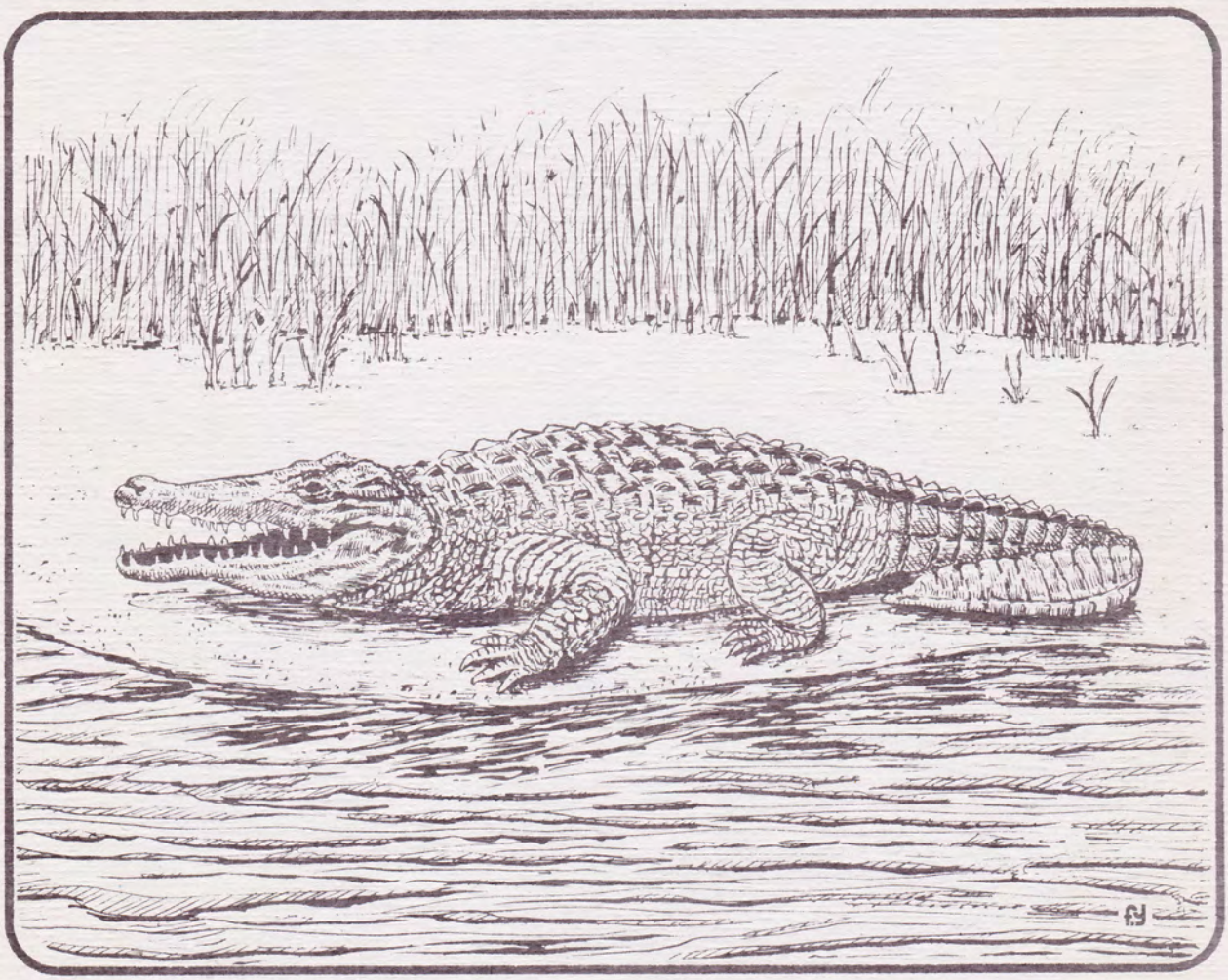
American Crocodile



RECOVERY PLAN

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AMERICAN CROCODILE

(*Crocodylus acutus*)

Prepared by the

American Crocodile Recovery Team

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LITERATURE CITATIONS SHOULD READ AS FOLLOWS:
AMERICAN CROCODILE RECOVERY PLAN, DATED FEBRUARY 12, 1979, PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE IN COOPERATION WITH THE RECOVERY TEAM COMPOSED OF THE FOLLOWING INDIVIDUALS: MR. RICHARD KLUKAS, NATIONAL PARK SERVICE; MR. JOHN C. OGDEN, NATIONAL AUDUBON SOCIETY; MR. TOMMY HINES, FLORIDA GAME AND FRESH WATER FISH COMMISSION; DR. WILLIAM B. ROBERTSON, EVERGLADES NATIONAL PARK; DR. JAMES A. KUSHLAN, EVERGLADES NATIONAL PARK; AND DR. HOWARD W. CAMPBELL, U.S. FISH AND WILDLIFE SERVICE.

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PART I

Narrative Account

Introduction

The American Crocodile *(Crocodylus acutus)* is a tropical, estuarine species that reaches its northern range limit in southern Florida. Elsewhere, this species occurs in Cuba, Jamaica, Hispaniola, Puerto Rico and both coasts of Mexico from Sinaloa and Tamaulipas south through Central America to Ecuador and Columbia. The American crocodile is listed as "endangered" throughout its total range by the International Union for Conservation of Nature and Natural Resources (Honegger 1975). In Florida, the crocodile has only infrequently been the subject of surveys or studies, thus its status and distribution has generally been poorly known. Surveys, and some assessment of nesting success, primarily by National Park Service personnel since the early 1950s (unpublished NPS records, Moore 1953, Ogden 1978) revealed continued declines by the Florida population, to the point where only a few hundred are thought to remain. The Florida population of the American crocodile was placed on the U.S. Department of the Interior's list of Endangered and Threatened Wildlife on 25 September 1975 (Fed. Reg. 40:44149), and critical habitat was designated 24 September 1976 (Fed. Reg. 41:41914-15).

General Life History

The American crocodile in south Florida is generally associated with mangrove-lined creeks and bays, isolated from frequent human intrusion. Crocodiles often are detected in small ponds or creeks with two to five feet of water, which are protected from winds or strong currents, and which are adjacent to larger bodies of water. Crocodiles readily move into

abandoned or little-used canals or flooded quarries in mangroves or coastal hardwoods where similar conditions exist. This species appears to be shy, and may not often be seen even where a few live in close proximity to human dwellings. Crocodiles are generally inactive during the day, and rest on secluded creek or canal banks, in dens or hidden in thickets at the edge of water. They become active at night, moving into creeks, canals or open bays, primarily to feed. Mullet and blue crabs are suspected to be important food items for adult crocodiles (Ogden, pers. comm.).

Crocodiles construct low nest mounds in sand, marl or peat soils, at the heads of small beaches, along high creek banks or on abandoned canal levees through mangrove swamps. A female will return to re-use the same mound for several years, unless human disturbance causes relocation. Eggs are laid in the nest mounds during late April or early May, and hatch during late July or early August. Average clutch size in Florida Bay during the early 1970s was 44 eggs. Adult females are not known to guard nests, but females do open nests to release young, and may carry hatching eggs or young from the mound to the nearby water (Ogden and Singletary 1973). Ogden (1978) reports that adults and newly hatched young apparently move away from the more exposed nesting sites in Florida Bay within a few days after the hatch, possibly going to places that are better for salinity, food and cover. Little is known of American crocodile behavior patterns or daily and seasonal activity patterns and movements of each age-class, although Garrick and Lang (1977) have recently reported that American crocodile courtship is complex and occurs over a 6 week period during February and March.

Crocodiles are approximately 22 cm. long at hatching, while the smallest breeding females seen in Florida Bay during the early 1970s were about 2.5 m long and of unknown age. The largest crocodiles reported from Florida have been about 4.6 m in length.

Historical Florida Range and Numbers

The first certain record of an American crocodile in Florida was in 1869, based on a specimen from the Miami River (Barbour 1923). Succeeding visits to southeastern Florida by naturalists and biologists revealed that crocodiles occurred on the Atlantic coast at Lake Worth, Palm Beach County, in proper habitat along the entire length of Biscayne Bay, Dade County, and south into Florida Bay and the Florida Keys to the Matecumbe Keys (Smith 1896, Hornaday 1904, Dimock 1918). The occurrence of crocodiles in the lower Florida Keys, including Key West (Neill 1971), was poorly documented, and it remains uncertain if the two populations were once contiguous. Crocodiles have been occasionally reported, both historically and recently, along the southwest and western coast of Florida (LeBuff 1957), including an unverified 1953 report of a crocodile hatch in the Ten Thousand Islands region (Campbell pers. comm.). Within this historical range, verified crocodile nesting was observed along the shoreline and on islands of eastern and central Florida Bay (Dimock and Dimock 1908), along the shoreline of Biscayne Bay (Smith, 1896), and at Lake Worth (G. Voss, pers. comm.).

The numbers of crocodiles in south Florida during the late Nineteenth Century is unknown, although it seems likely that it was not a common animal. Crocodiles were regularly seen along the mainland shore between northern Biscayne Bay and central Florida Bay, and were most numerous in a region 10

miles long and 3 miles wide lying west from Card Sound into northeastern Florida Bay (Dimock 1918). A close reading of the accounts of the exploration of this region suggests that no more than 5 to 10 crocodiles were seen in a day in prime habitat. Based on this information, Ogden (1978) estimated that the number of crocodiles in southern Florida near the end of the Nineteenth Century probably was no greater than 5 times the present number, or roughly 1,000 to 2,000 animals. Crocodiles may have been more numerous prior to the late Nineteenth Century, as there is evidence that crocodiles were already fairly extensively hunted by the 1890s (Dimock and Dimock 1908, Hornaday 1904).

Several American crocodiles from Florida are known to be in captivity. A list of these animals and their locations is being prepared.

Recent Florida Range and Numbers

The range of crocodiles in Florida during the early 1970s is based on Ogden (1978) and more recent observations by members of the recovery team (see map). Crocodiles are regularly seen in Everglades National Park along the mainland shoreline of Florida Bay from Terrapin Bay east to Long Sound and on some adjacent islands in the northeastern Bay, and less frequently west to the Cape Sable peninsula. Crocodiles are also on the upper Florida Keys from lower Plantation Key north to the upper end of Key Largo, and along Cross Key to the mainland shoreline of Barnes Sound, Card Sound and southern Biscayne Bay north to Black Point. A disjunct group of crocodiles is in the lower Florida Keys, primarily within the boundaries of the Key Deer and Great White Heron National Wildlife Refuges, on Big Pine, Little Pine, Howe, Johnston and upper Sugarloaf Keys (J. Watson pers. comm.).

Within this range, nesting is known from the mainland shore of Florida Bay, on one island in north-central Florida Bay, in mangrove swamps on the Barnes Sound side of upper Key Largo, and on Little Pine Key. Nesting may also occur on the mainland inland from Mangrove Point, where a newly hatched young was found during September 1976. Comparison of this nesting range with the historical records shows that crocodiles have ceased to nest at Lake Worth in Palm Beach County, along the full length of Biscayne Bay, Dade County, and in most of Florida Bay, Monroe County. Ogden (1978) estimated the number of crocodiles in this region during the 1970s at 100 to 400 animals, including no more than 20 breeding females.

Reasons for Decline

The decline in the south Florida population of the American crocodile has been due to two levels of human activities: (1) habitat alterations and (2) direct human disturbance to crocodiles and their nests. Considering the scarcity of supporting data, the relative importance of the two factors, both historically and presently, is difficult to assess.

Mangrove estuaries have been considerably reduced outside of Everglades National Park, thus crocodiles have been displaced by urbanization at Lake Worth, central and northern Biscayne Bay and along most of the upper Florida keys. Conversely, crocodiles remain in the few regions where habitats are relatively unaltered--Florida Bay, upper Key Largo, spots along the mainland shore between southern Biscayne Bay and Barnes Sound, and in the National Wildlife Refuges in the lower Florida keys. No management action that will benefit crocodiles can be taken where habitats are already lost, thus our serious attention should be directed towards protection of remaining crocodile

habitat, and control of human activities therein.

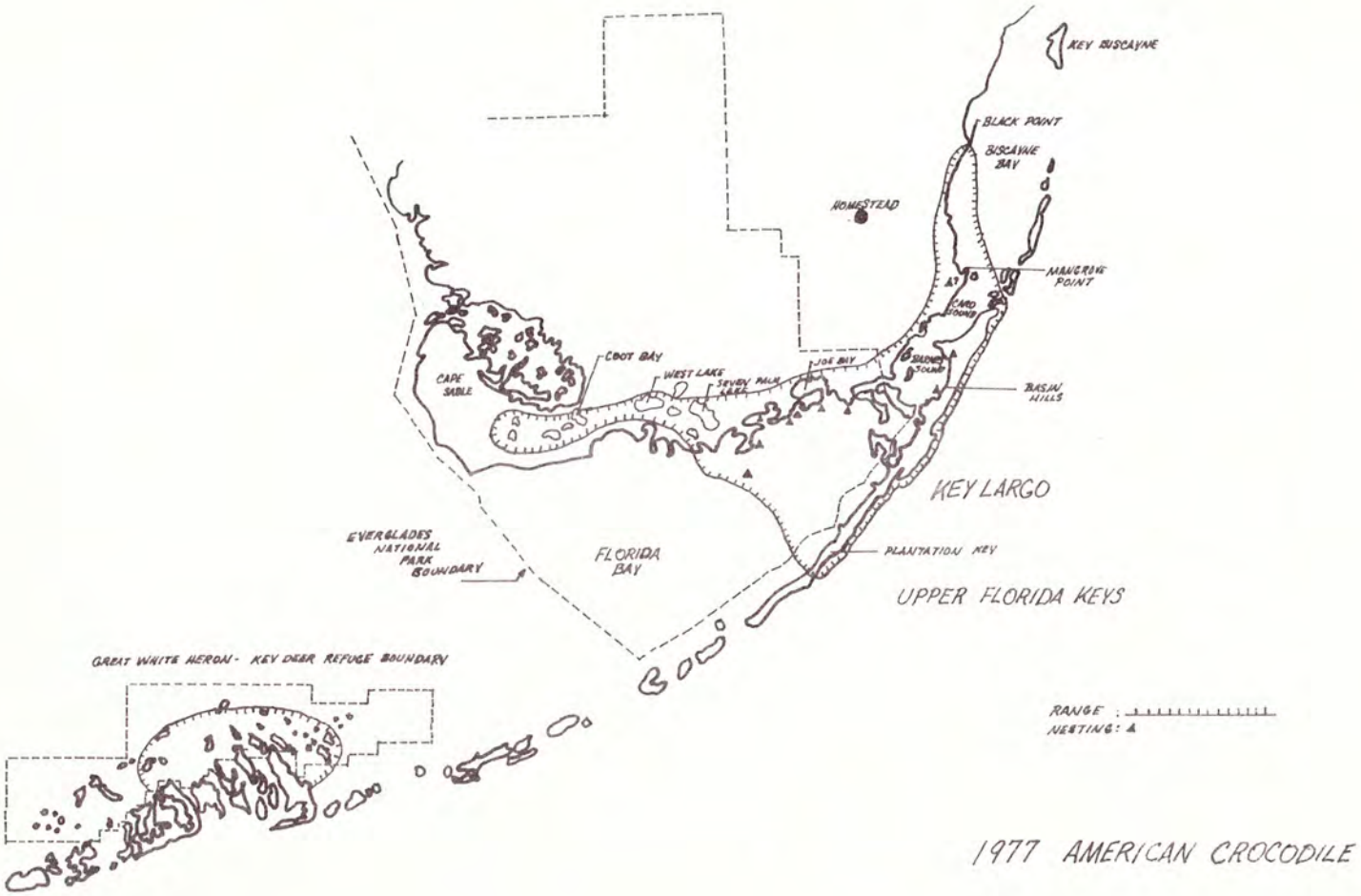
We have learned of direct, human-caused mortality involving 14 crocodiles between 1971 and 1977, 6 by shooting, 7 as highway road kills, and 1 from an unknown cause. Six of these animals died on northern Key Largo, and 5 were reported from the Lake Surprise-Blackwater Sound region of central Key Largo. At least 6 were adults: this rate of human-caused mortality to adult crocodiles on Key Largo may exceed the recruitment of young adults into that segment of the Florida population. Vandalism to active nests does not appear to occur frequently, although the combined effect of vandalism and direct killing likely is adversely affecting crocodile numbers, especially in the Key Largo region. Between 1971 and 1976, we know of 3 crocodile nests that were opened and the eggs removed by unknown people, 2 in Florida Bay and 1 on Key Largo.

Indirect disturbance to crocodiles by people is less measurable, but may be as important a factor in the human regulation of crocodile numbers as are killing and nest molestation. Remaining crocodile nesting sites share a high degree of remoteness, suggesting that crocodiles are less tolerant of human activities than are alligators. Crocodiles may have abandoned some otherwise suitable habitats because of the presence of apparent innocuous human activities such as fishing and boating. Observations made in Florida Bay during the early 1970s (Ogden pers. comm.) suggest that adult female crocodiles may become disturbed by repeated close human presence during the weeks that nests are being built or reworked, and may relocate nests. On northern Key Largo, nests near the Old Card Sound Road in 1971 and at Basin Hills in 1976, were abandoned following increased human activity at these two sites. The need for adult crocodiles

to open nests to release newly hatched young means that the females must make repeated trips to nests during late summer, again creating a situation where human presence near nests can adversely affect crocodile reproductive success. Additionally, disturbance during courtship may be disruptive, as has been suggested for the Nile crocodile (Cott 1968). Crocodile nesting sites on creeks along the north shore of Florida Bay have been seasonally closed to human activities by the National Park Service since the early 1970s, an action that appears to have resulted in increased nesting activity at these sites (Ogden pers. comm.).

The impact that recent levels of raccoon predation on crocodile nests have had on the decline remains unknown. Between 1970 and 1974, 6 of 40 nesting attempts in Florida Bay and the upper Keys were destroyed by raccoons. Although not obviously high, this 15 percent rate of nest predation could be a factor in the failure of Florida Bay crocodiles to recover since that region has been protected by the National Park Service. Radio-tracking of juvenile crocodiles in 1973 (Lang pers. comm.) revealed that newly hatched animals are eaten by raccoons, although the extent of this predation remains unknown.

The effects of commercial and sport fishing on crocodiles are unknown, although mullet fishermen working at night in Florida Bay use gill nets in the same "lakes" and bays where crocodiles are active. Crocodiles have occasionally been caught in the gill nets and, at least in the past, sometimes killed.



1977 AMERICAN CROCODILE

PART II

Annotated Recovery Plan Outline

Ultimate Objective: To assure a self-sustaining population of American crocodiles throughout suitable habitat in the United States.

1. Establish secure habitat for all phases of the life cycle.

   Loss of the habitat to human use has been an important factor in the decline of the crocodile. If the species is to be maintained, adequate habitat for all of its needs must be provided.

   11. Determine habitat needs throughout life cycle. The variety of habitats required for successful courtship and nesting and the specific needs of each age class, especially hatchlings, subadults and adults, must be determined. Both abiotic (temperature, salinity, and so forth) and biotic requirements (food resources, territorial requirements, etc.) need to be analyzed.

   12. Determine habitat distribution and status. The location and legal availability of areas of habitat utilized by crocodiles in the past and the present must be determined.

      121. Conduct surveys to locate areas meeting known needs of crocodiles. The Florida keys from Key Largo south, to especially include Big Pine, Little Pine and adjacent keys and the southwest coast of Florida from Whitewater Bay north to Marco Island should be surveyed to determine the location of suitable habitats. Other areas outside these boundaries should also be surveyed if information indicating past crocodile use is obtained.

      122. Identify ownership and availability of private lands containing adequate crocidile habitat. If adequate habitat is located on private lands a real estate survey should be

conducted to determine if this land could be acquired and at what price.

123. Determine historical distribution of the crocodile in Florida. Historical and archeological records should be searched to develop a more precise documentation of the past distribution of crocodiles.

13. Acquire and/or otherwise protect areas for crocodiles. Once the habitat requirements are documented and distribution of adequate habitat known, the Critical Habitat designation should be reviewed and altered if found inadequate. Private lands of importance to crocodiles should be ranked and protected by acquisition, lease or easement.

14. Manage habitat for specific crocodile needs. All activities affecting areas of crocodile habitat should be evaluated for impacts on the crocodiles and appropriate steps taken to insure that the habitat is maintained in a condition of optimum suitability for crocodiles.

141. Determine impacts of ongoing habitat use and modification on crocodiles. Specific review of the impacts of drainage alteration in the Everglades National Park and adjoining areas, of road construction, of dredging and other habitat modifications, and of human use, especially commercial and sport fishing with nets or long-lines, is urgently needed. The impact of exotic species, both plant and animal, on habitat quality also needs review.

142. Regulate habitat modifications and use where necessary. If detrimental factors are identified, corrective regulations should be imposed.

143. Assure coordinated management authority by inter-agency agreements or other means. Responsibility for the management of the American crocodile is currently divided between the State of Florida (Florida Game and Fresh Water Fish Commission), the U.S. National Park Service, and the U.S. Fish and Wildlife Service. Steps should be taken to insure that the actions of these agencies are coordinated and non-conflicting.

144. Review and comment on proposed habitat modifications. Steps are needed to insure that all actions which alter the habitats utilized by crocodiles are fully evaluated. Many projects of importance are currently unevaluated.

2. Establish self-sustaining populations at natural carrying capacity in appropriate habitats. No quantitative goals can be set for our crocodile population at the present time. Future research may provide a basis for specific recommendations but a specific effort to enhance the present population is needed immediately.

21. Determine present population characteristics. An overview of the present population, both in and out of the Everglades National Park, is needed.

211. Evaluate, develop and apply population census techniques. Available techniques should be evaluated, new ones designated

if necessary, and a standardized census program implemented to establish a baseline and monitor future population trends.

212. Determine present demographic profile. Age-class and sex distribution data within the population are needed additionally to basic population numbers and distribution data.

22. Control man-related mortality and disturbance. No data are available to indicate the severity of natural mortality on the crocodile population. Human-related factors are clearly unnatural, however, and should be controlled. Some specific problems are already identified and others need evaluation.

221. Conduct intensive public education program. Both the native population and tourist population in South Florida need to be informed of the protected, and critical status of the crocodile. A coordinated program utilizing radio, TV, newspapers, and school education, should be developed.

222. Post St. Rd. 905 and U.S. 1 with warning signs. (Crocodiles are periodically hit by cars on these roads and motorists should be alerted to watch for them.) The signs could also serve an educational function.

223. Conduct program to minimize conflicts by public education and translocation. The public should be reassured that smaller crocodiles are no threat. Problem animals should be translocated to areas where conflicts can be avoided, both within and outside of the Everglades National Park.

23. Increase recruitment into selected populations. The present data suggest that natural recruitment of breeding adults into the population is very low. A program to increase recruitment in selected areas by artificial means is recommended for a 5-year period with reevaluation after that time.

    231. Initiate captive hatching-rearing program. Eggs from nests with high hatching failure should be hatched in captivity and reared for ultimate release.

    232. Determine release areas. Suitable areas, specifically areas harboring natural populations of similar age-class crocodiles, should be selected during the population census program.

    233. Release captives after 1 year or when larger than 18 inches in body length. Animals of this size should have little natural mortality through predation, etc., and should have an excellent probability of reaching sexual maturity.

    234. Evaluate success through monitoring. A monitoring program should be instituted to evaluate the success of the release program.

    235. Evaluate captive propagation for production of young. Captive propagation versus rearing of eggs produced in the wild should be evaluated. The availability of wild-produced eggs, the economics of captive propagation versus simple rearing, the availability of a native south Florida breeding stock, all should be reviewed.

236. Develop criteria for identification of crocodiles released or relocated in Florida. Any animals released or relocated should be marked to allow for future recognition. The system used should be coordinated with all such programs both in and outside the Everglades National Park.

24. Reduce natural mortality in nesting and nursery areas for five-year period. The low recruitment of breeding adults suggests that control of natural mortality as well as human-induced mortality is necessary for at least the immediate future.

241. Conduct predator-control or aversion conditioning programs in nesting areas and nursery areas. Reduction in predator pressure on nests and hatchlings should increase survival and, thus, natural recruitment, ultimately reducing the need for an expensive captive propagation or hatching-rearing program.

242. Evaluate nest habitat modification program. Control of predation on nests may be possible through fencing, chemical repellents or other means.

25. Examine past releases-relocations. The genetic status of the present population may have been disturbed by indiscriminate release of animals in various areas of the species' range. The full extent of this misfortune should be evaluated.

26. Monitor demographic, numerical and distributional trends for five years, then reevaluate needs. The continuing status of the population should be regularly monitored through the techniques

developed in 211. This program should be designed to provide a specific check on the effects of the proposed management actions (captive-release, predator control, etc.).

27. Evaluate carrying capacity of habitat. For the ultimate selection of quantitative goals for the recovery program we will need data on the natural carrying capacity of crocodile habitats. This should be approached by reviewing historical information on the south Florida crocodiles and by reference to present and past crocodile populations in foreign areas as available.

28. Determine demographic characteristics of natural self-sustaining crocodile populations. Age-class and sex ratio distribution are possibly as important, or more so than sheer numbers in determining the stability of crocodile populations. Goals for the recovery program should be set using comparative data from foreign populations.

29. Develop criteria for distinguishing Florida from other crocodiles. The status of crocodile populations varies and at this time the Florida population is the only one legally recognized as endangered. Control of international commerce in the species would be benefited if criteria could be developed to specifically identify individuals from the Florida population.

PART III

Implementation Outline

1. Establish secure habitat for all phase of life cycle
   - 1.1. Determine habitat needs throughout life cycle
     - 1.1.1. courtship; seclusion, water depth, temperature, etc.
     - 1.1.2. nesting; seclusion, slope, vegetative cover, salinity, temperature relationships, soil type, etc.
     - 1.1.3. hatchling; vegetation and cover, water depth, salinity, seclusion, food, etc.
     - 1.1.4. subadult; food resources, vegetation and cover, home range, water depth, salinity, etc.
     - 1.1.5. adult; home range, territory size, space, water depths, vegetation and cover, food resources, etc.
   - 1.2 . Determine habitat distribution and status
     - 1.2.1, Conduct surveys to locate areas meeting known needs of crocodiles
       - 1.2.1.1. upper keys
       - 1.2.1.2. lower keys
       - 1.2.1.3. Whitewater Bay north to Sanibel National Wildlife Refuge
       - 1.2.1.4. other areas as identified
     - 1.2.2. Identify ownership and availability of private lands identified as adequate for or supporting crocodiles
     - 1.2.3. Determine past distribution of crocodiles in Florida as indicated by historical and archeological records

1.3. Acquire and/or otherwise protect suitable habitat areas for crocodiles as required.

1.3.1. Assign priority values to privately owned crocodile habitat areas

1.3.2. Designate new or delete established Critical Habitat areas, as indicated.

1.3.3. Protect identified habitats by acquisition, lease, easement, etc.

1.4. Manage habitat for specific crocodile needs.

1.4.1. Determine impacts of ongoing habitat use and modifications on crocodiles.

1.4.1.1. evaluate impacts of habitat modifications, dredging, filling, road construction, etc., on Key Largo and elsewhere as needed.

1.4.1.2. evaluate impacts of habitat use by humans, commercial and sport fishing, camping, boating, etc.

1.4.1.3. evaluate impact of drainage alterations on habitat suitability for crocodiles.

1.4.1.4. evaluate impact of exotic species on crocodile habitat (Caiman, Causarina, etc.).

1.4.1.5. other impacts, as identified.

1.4.2. Regulate habitat modifications and human use of crocodile habitat where detrimental to crocodiles.

1.4.2.1. regulate sport fishing, camping, boating and other public use of nesting areas during nesting season.

1.4.2.2. regulate commercial fishing in high mortality areas if these are identified.

1.4.3. Assure coordinated management authority throughout crocodile habitat by interagency agreements and any other means possible.

1.4.4. Review and comment on impacts of proposed habitat modifications on crocodile use of the habitats.

2. Establish self-sustaining populations at natural carrying capacity in appropriate habitats.

2.1. Determine present population characteristics.

2.1.1. Evaluate, develop and apply population census techniques.

2.1.2. Determine present demographic profile by conducting seasonal day and night surveys, mark-recapture, and radio tracking programs in selected areas.

2.1.2.1. Florida Bay

2.1.2.2. Whitewater Bay north to Sanibel National Wildlife Refuge (selected areas)

2.1.2.3. Key Largo-Card Sound

2.1.2.4. Lower Keys

2.2. Control man-related mortality and disturbance.

2.2.1. Conduct intensive public education program in south Florida to make public aware of protected status of crocodile.

2.2.2. Post St. Rd 905 on Key Largo, U.S. 1 south of Homestead and Everglades National Park roads with crocodile warning signs.

2.2.3. Conduct program to minimize human-crocodile conflicts in developed areas by public education and judicious translocation program.

2.2.3.1. move nuisance animals into secure Everglades National Park habitat as selected by Park officials or into other protected habitat areas if identified during habitat surveys.

2.2.3.2. develop public education programs

2.3. Increase recruitment into selected population segments by artificial means where needed for a five year period, then reevaluate.

2.3.1. Conduct captive hatching-rearing program for 90 eggs (or 3 full nest complements) per year for 5 year period).

2.3.1.1. determine needed rearing salinity

2.3.1.2. determine high-risk nests for selection for captive hatching.

2.3.2. Determine potential release areas using night surveys and other techniques as available (see 2.1.1.).

2.3.3. Release captive-reared hatchlings after 1 year, but at no less than 18", into appropriate areas.

2.3.4. Evaluate success of reintroductions through monitoring program.

2.3.5. Evaluate potential and need of captive propagation program for producing young for restocking.

2.3.6. Develop criteria for marking and identification of individual crocodiles prior to their release or relocation in Florida.

2.4. Reduce natural mortality in nesting and nursery areas for 5 year period, then revaluate need.

2.4.1. Conduct predator control or aversion-conditioning (raccoon and others as indicated) programs where needed during nesting season and in identified nursery areas.

2.4.2. Evaluate utility of nest habitat modification program.

2.5. Compile records of past crocodile releases and relocations in Florida with full available information on source and status of the released animals.

2.6. Monitor population for demographic, distributional, and numerical trends, then reevaluate need after 5 years.

2.7. Evaluate carrying capacity of habitat by comparison with foreign populations and historical data.

2.8. Determine desired demographic characteristics of a healthy, self-sustaining crocodile population by comparison with foreign populations.

2.9. Develop criteria for distinguishing Florida crocodiles from foreign populations.

AMERICAN CROCODILE RECOVERY PLAN IMPLEMENTATION SCHEDULE

Job Description MANAGEMENT ACTIONS	Block Number	Funding and Action Responsibility Lead Agency	Cooperators	Estimated Costs by Fiscal Year 1980	1981	1982	1983	1984
Protect nests in ENP	1.4.2.	USNPS		3,000	3,000	3,000	3,000	3,000
Control predators where needed	2.4.1.	USNPS	FGFC, USFWS	---	7,000	7,000	7,000	7,000
Coordinate management authority	1.4.3.	USFWS	FGFC, USNPS	---	1,000	1,000	1,000	1,000
Review impacts of habitat alteration	1.4.4.	USFWS	FGFC, USNPS	10,000	10,500	11,000	11,500	12,000
Conduct public education program	2.2.1.	USFWS	FGFC, USNPS	10,000	5,000	5,000	5,000	5,000
Erect warning road signs	2.2.2.	USFWS	FGFC, USNPS, FDOT	5,000	1,000	1,500	1,500	1,500
Move problem animals	2.2.3.	FGFC	USFWS, USNPS	1,000	1,000	1,500	1,500	2,000
Head-start rearing program	2.3	FGFC	USFWS, USNPS	15,000	17,000	20,000	23,000	25,000
Captive release and monitoring	2.3.3.	FGFC	USFWS, USNPS	---	5,000	7,000	10,000	25,000

AMERICAN CROCODILE RECOVERY PLAN IMPLEMENTATION SCHEDULE

Job Description / RESEARCH ACTIONS	Block Number	Funding and Action Responsibility Lead Agency	Cooperators	Estimated Costs by Fiscal Year 1980	1981	1982	1983	1984
Determine habitat needs in ENP	1.1.	USNPS		23,600	23,600	11,000	11,000	11,000
Determine habitat needs outside ENP	1.1.	FGFC	USFWS	20,000	20,000	15,000	15,000	15,000
Survey upper keys habitat	1.2.1.1.	FGFC	USFWS	7,500	7,500	---	---	---
Survey lower keys habitat	1.2.1.2.	USFWS	FGFC	5,000	5,000	---	---	---
Survey habitats in ENP	1.2.1.3.	USNPS		6,200	6,200	6,200	6,200	---
Determine land ownership	1.2.2.	USFWS	FGFC	To be determined after 1.2.1.				
Determine historical distribution	1.2.3.	USFWS	FGFC, USNPS	8,500	8,500	---	---	---
Assign land acquisition	1.3.1.	Recovery Team		No additional costs expected				
Review Critical Habitat	1.3.2.	USFWS		No additional costs expected				
Protect habitat	1.3.3.	USFWS						
Evaluate impacts of habitat modifications	1.4.1.1.	USFWS	FGFC, USGS	12,000	12,000	12.000	12,000	12,000
Evaluate impacts of habitat use	1.4.1.2.	USNPS	USFWS, FGFC	9,000	9,000	9,000	9,000	9,000
Evaluate drainage problems	1.4.1.3.	USNPS	USGS, USFWS	3,000	3,000	3,000	3,000	3,000

AMERICAN CROCODILE RECOVERY PLAN IMPLEMENTATION SCHEDULE

Job Description RESEARCH ACTIONS	Block Number	Funding and Action Responsibility Lead Agency	Cooperators	Estimated Costs by Fiscal Year 1980	1981	1982	1983	1984
Evaluate impact of exotics	1.4.1.4.	USNPS	FGFC, USFWS	12,000	12,000	15,000	15,000	15,000
Develop census techniques	2.1.1.	USNPS	USFWS, FGFC	15,000	15,000	15,000	11,000	11,000
Determine demography in ENP	2.1.2.	USNPS		11,000	13,000	13,000	13,000	13,000
Determine demography outside ENP	2.1.2.	FGFC	USFWS	10,500	10,500	11,000	11,000	11,500
Evaluate captive propagation	2.3.5.	USNPS		1,500	---	---	---	---
Develop marking criteria	2.3.6.	USNPS	USFWS, FGFC	1,000	---	---	---	---
Evaluate need for nest modification	2.4.2.	USNPS		1,000	1,000	1,000	1,000	1,000
Record all introductions in ENP	2.5.	USNPS		1,000	---	---	---	---
Monitor population for change in ENP	2.6.	USNPS		13,000	1,300	1,300	1,300	1,300
Monitor population for change outside ENP	2.6.	FGFC	USFWS	1,200	1,500	1,500	1,500	1,500
Evaluate natural carrying capacity	2.7.	USFWS	FGFC, USNPS	19,000	22,000	22,000	---	---
Evaluate natural demography	2.8.	USFWS	FGFC, USNPS	6,000	6,000	6,000	---	---
Evaluate taxonomic problems	2.9.	USFWS		---	4,000	9,000	---	---

Abbreviations used:

FDOT = Florida Department of Transportation

FGFC = Florida Game and Fresh Water Fish Commission

USFWS = U.S. Fish and Wildlife Service

USNPS = U.S. National Park Service

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