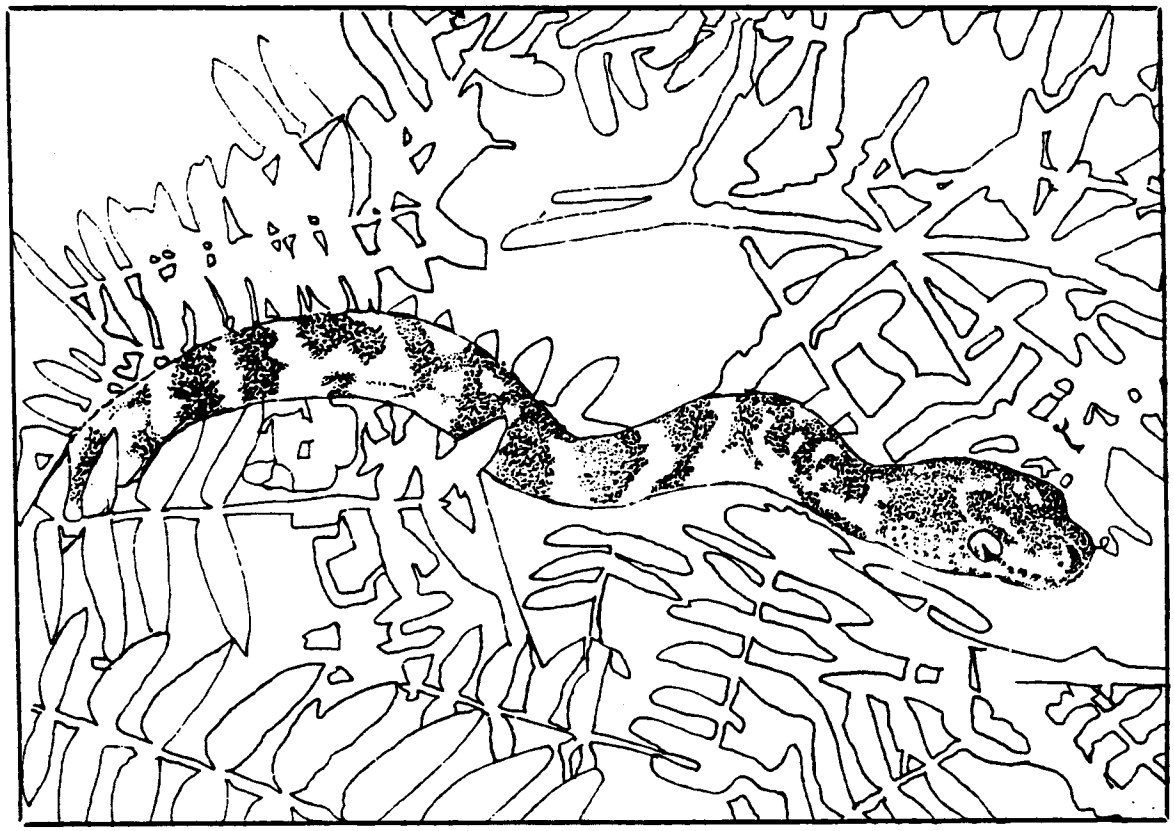
Virgin Islands Tree Boa



Recovery Plan

RECOVERY PLAN FOR THE VIRGIN ISLANDS TREE BOA

(EPICRATES MONENSIS GRANTI)

Prepared by

David W. Nellis
Virgin Islands Division of Fish and Wildlife
St. Thomas, Virgin Islands

Peter J. Tolson
Toledo Zoo
Toledo, Ohio

Robert L. Norton
Virgin Islands Division of Fish and Wildlife
St. Thomas, Virgin Islands

For the

U.S. Fish and Wildlife Service
Atlanta, Georgia

Approved: Acting
Regional Director, Southeast Region

Date: March 27, 1986

DISCLAIMER

THIS IS THE COMPLETED VIRGIN ISLANDS TREE BOA RECOVERY PLAN. IT HAS BEEN APPROVED BY THE U.S. FISH AND WILDLIFE SERVICE. IT DOES NOT NECESSARILY REPRESENT OFFICIAL POSITIONS OR APPROVALS OF COOPERATING AGENCIES, AND IT DOES NOT NECESSARILY REPRESENT THE VIEWS OF ALL INDIVIDUALS WHO PLAYED A ROLE IN PREPARING THIS PLAN. THIS PLAN IS SUBJECT TO MODIFICATION AS DICTATED BY NEW FINDINGS, CHANGES IN SPECIES STATUS, AND COMPLETION OF TASKS DESCRIBED IN THE PLAN. GOALS AND OBJECTIVES WILL BE ATTAINED AND FUNDS EXPENDED CONTINGENT UPON APPROPRIATIONS, PRIORITIES, AND OTHER CONSTRAINTS.

LITERATURE CITATIONS SHOULD READ AS FOLLOWS:

U.S. Fish and Wildlife Service. 1986. Virgin Islands Tree Boa Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia. 26 pp.

ADDITIONAL COPIES ARE FOR SALE FROM:

Fish and Wildlife Reference Service
6011 Executive Boulevard
Rockville, Maryland 20852

301/770-3000 or
1-800-582-3421

TABLE OF CONTENTS

INTRODUCTION

Description and distribution

Since its original description by Stull (1933), the Virgin Islands tree boa, Epicrates monensis granti, has been rarely encountered by scientists, and only 13 specimens are recorded in the literature (Nellis et al. 1983). The holotype was collected by Chapman Grant on Tortola, British Virgin Islands in May, 1932 (Grant, 1932b, 1932c).

The Virgin Islands tree boa is not easily confused with other snakes within its range. The adult body color is light plumbeous brown with darker brown blotches partially edged with black. The dorsal blotches are angulate and frequently reach the ventral scales. The dorsal surface has a general blue-purple iridescence. The ventral surface is greyish-brown speckled with darker spots. In contrast to the adult coloration, neonate E. m. granti dorsal ground color is light grey punctuated with black blotches. An ontogenetic color change is common to most members of the genus Epicrates.

The slender, non-venomous Virgin Islands tree boa grows to slightly less than a meter in snout-vent length (SVL). The maximum recorded SVL, from a female measured on Cayo Diablo, Puerto Rico (Tolson and Pinero, 1985) is 792 mm. The total length (TL) of the nominate subspecies, E. m. monensis, was reported to reach

1010 mm (Meerwarth, 1901) and more recently 1039 mm (Rivero et al., 1982). It is probable that larger specimens will be discovered.

Scale counts and blotch counts, as reported by Sheplan and Schwartz (1974), are as follows: a) scale counts - ventrals 261-265; subcaudals 81-84; and mid-body scale rows 41-47 and b) blotch counts - body 61-73 and tail 20-21. Further specimens studied in St. Thomas increased the range of variation of scale counts (Nellis et. al., 1983)

The Virgin Islands tree boa belongs to the Family Boidae of the Suborder Serpentes. The genus Epicrates is distributed throughout Central America, northern South America, and the Greater Antilles. This taxon was erroneously thought to be a subspecies of Puerto Rican boa, Epicrates inornatus, (Stull, 1933) until Sheplan and Schwartz (1974) demonstrated its affinities with Epicrates monensis. Thus, Epicrates monensis exhibits a disjunct range, with one subspecies (monensis) endemic to Isla de Mona and the other (granti) distributed on several islands of the Puerto Rico Bank east of Puerto Rico (including Cayo Diablo, Eastern St. Thomas, Tortola, Guana, Greater Camanoe, Necker Cay, and Virgin Gorda [Nellis et al., 1983]). The species' absence from Puerto Rico is best explained by widespread extinctions of xeric-adapted herpetofauna on Puerto Rico during the Pleistocene (Pregill and Olson, 1981). Intensive surveys on other islands in this area with apparently suitable habitat may reveal additional populations.

Activity Patterns

The Virgin Islands tree boa, like all other species of Epicrates, is decidedly nocturnal or crepuscular (Nellis et al., 1983). Active captive specimens rapidly seek cover when exposed to light. In the field, active snakes were observed as early as 1920 hours or as late as 0515 hours, usually crawling in vegetation. Gravid females, however, apparently thermoregulate during later stages of gestation and are sometimes found crawling to or away from basking sites during daylight hours (Tolson and Pinero, 1985). Activity patterns for the Mona boa were noted by Perez-Rivera and Velez (1978) and Rivero et al. (1982).

Feeding Habits

The bulk of the diet seems to consist of Anolis cristatellus. Limited observations indicate that E. m. granti feeds by gliding slowly along small branches seeking sleeping lizards. On Cayo Diablo, a small boa pursued an Anolis 3 m up in a Coccoloba tree (Nellis, pers. obs.). Schmidt (1928) reported finding the tail of an Anolis cristatellus (= A. monensis) in the stomach of a preserved specimen of E. m. monensis. Tolson and Pinero (1985) found the

greatest concentration of E. m. granti capture sites in areas where Anolis cristatellus populations are most dense. Captive specimens refused to eat dead mice but consumed Sphaerodactylus macrolepis and Anolis cristatellus (Nellis et al., 1983). Sheplan and Schwartz (1974) reported taking a house mouse (Mus musculus) from the stomach of a preserved specimen (WPM 1569) captured on St. Thomas. Epicrates monensis granti, like other species of Epicrates probably opportunistically consumes nestlings of smaller bird species.

Habitat

On St. Thomas, the Virgin Islands tree boa is found in xeric forest habitat characterized by steep slopes with poor rocky soils (Nellis et al., 1983). Vegetation is second growth open woodland with Bursera simaruba and Pisonia subcordata being the largest trees. Also common are Bourreria succulenta, Tabebuia heterophylla, Leucaena leucocephala, Acacia macracantha, and Delonix regia (the last three being introduced species). Near the sea, Cocos nucifera (also introduced) and Coccoloba uvifera are abundant. Grant (1932b) remarked that the boa "Inhabits rocky cliffs on Tortola and Guana Island."

The boa is also found on low profile islets. Cayo Diablo is a cemented dune (fossilized sand dune) islet with a maximum elevation of 15 m and an extremely simple vegetational profile. The tallest vegetation is an open stand of sea grape, Coccoloba uvifera, which

borders the northwest corner of the island. The grove reaches a height of approximately 5 m in the densest sections. Snakes are most abundant in Coccoloba stands, but are also found in every type of vegetation except very low succulent cover close to high tide line. For example, boas were observed on terminal branches of small Mimosa 1 m above ground; prowling in tangled vines 1-1.5 m off the ground; in stands of Opuntia repens less than 1 m above ground; and in low aromatic shrubs like Tournefortia gnaphalodes, Suriana maritima, and Thespesia populnea just above the high tide mark on the perimeter of the island. Fishermen in Las Croabas area refer to the boa as the "Culebron de la Samana" because it seems limited to dry savannah-like habitats on islets off the eastern coast of Puerto Rico.

During the day, snakes seek concealment, often on the ground. Construction activities have revealed boas under rocks and logs on St. Thomas. On Cayo Diablo, leaf axils of Cocos nucifera, sheets of cardboard and loose sections of termite nests are common refuge sites.

Reproduction

In the genus Epicrates, courtship and copulation usually take place from February through May, with parturition in late August through October (Tolson, 1984). Epicrates monensis granti follows this pattern of reproductive timing on Cayo Diablo (Tolson and Pinero, 1985). Most species of Epicrates (with the exception of

E. cenchria) are thought to reproduce biennially (Huff, 1977). The discovery that every adult female E. m. granti encountered on Cayo Diablo during the 1980 reproductive season was gravid indicates that this species may reproduce every year.

Epicrates monensis over 500 mm SVL and 30 g in weight are thought to be sexually mature, since the sister species (E. fordii) is sexually mature at this size (Tolson, in press). Fecundity of E. monensis is thought to be similar to that of E. fordii (Rivero et al., 1982; Tolson, 1984). The four main size classes of E. monensis on Cayo Diablo indicated to Tolson and Pinero (1985) that the species may reach reproductive maturity in as little as three years.

Status of the Species

Since the genus Epicrates has high longevity (Bowler, 1977), life spans in excess of ten years are expected for E. monensis granti. The presence of several very large individuals with faded patterns on Cayo Diablo demonstrates the considerable longevity of this species. The majority of the presumably adult animals found at Cayo Diablo, however, fell within the 400-600 mm size class, indicating that a significant number of animals fail to reach maximum adult size. The age structure of the Cayo Diablo population suggests that it is presently thriving. The recent count of 58 boas on Cayo Diablo indicates potential for high population densities on small

islands in the absence of Indian mongooses (Herpestes auropunctatus) and other introduced mammals.

The situation is very different on St. Thomas, where there are abundant populations of mongooses as well as feral housecats. Mongooses are a major threat to snakes (Westermann 1953, Nellis and Everard 1983). Their nocturnal arboreal activity and occupation of relatively mongoose-immune refugia by day apparently allows the snake to survive on St. Thomas in the presence of a large mongoose population. The increasing number of boas discovered on St. Thomas correlates with the increase of habitat disturbance by construction activity. In addition to the seven specimens reported by Nellis et al. (1983), two additional road kills and four additional live specimens were found on St. Thomas.

The known distribution of E. monensis suggests that this species was once more widespread on the Puerto Rican Bank. It is likely that the boa was found in the lowlands of Greater Puerto Rico during the Pleistocene interpluvial low sea stands. Presently, its range is restricted due to more mesic conditions and the fragmentation of Greater Puerto Rico into many islands which allows for the possibility of local decline and extinction (Nellis, et al. 1983).

A population estimate is not presently feasible due to lack of data. However, a status survey is to be conducted during 1986 by the U. S. Virgin Islands Department of Conservation and Cultural Affairs.

History of Research

Aside from the original description by Stull (1933), very little research, other than taxonomic and zoogeographic studies, have been conducted on E. monensis, due in large part to its rarity. Grant (1932a; 1932b) recorded distributions as did Lazell (1980), Meerwarth (1901), Pregill & Olson (1981), Schmidt (1926; 1928) and Sheplan and Schwartz (1974). Sheplan and Schwartz's (1974) theories on the taxonomic position of the Virgin Islandstree boa are currently accepted.

The only ecological data collected on this taxon were published by Nellis et al. (1983) and Tolson and Pinero (1985). Food habits of the Mona Island boa were noted in Schmidt (1928), and Campbell and Thompson (1978).

Causes of Decline

Population trends cannot be reliably determined because of lack of data. Mongoose introductions in the late 19th century had a devastating influence on endemic reptiles (Westermann, 1953). High mongoose densities on St. Thomas, St. John, Tortola and Jost Van Dyke

probably contributed to population decline of E. m. granti. The introduced rats, Rattus rattus and R. norvegicus, are also potential predators of young boas. Wiley (pers. comm.) has observed R. rattus feeding on young Puerto Rican boas (E. inornatus). Increased habitat disturbance and increased human, dog, and housecat populations are also thought to have adversely influenced boa population.

The boas disjunct distribution indicates that several populations became extinct since the Pleistocene. Some of these population extinctions may be due to climatological shifts of the Puerto Rican Bank. These shifts apparently resulted in extinction of xeric-adapted Puerto Rican herpetofauna (Pregill, 1981; Pregill and Olson, 1981). Others may have disappeared due to local population perturbations, natural population fluctuations or natural disasters (i.e., hurricanes).

Conservation Efforts

There have been no direct local conservation efforts to protect the Virgin Islands tree boa in the U.S. Virgin Islands. Live specimens captured by the public are released by Division of Fish and Wildlife staff in areas within its known range and distant from houses

and roads. Informal educational activities continue to increase public awareness of the presence and the endangered status of the boa on St. Thomas.

In 1985, the entire species, E. monensis, was listed as threatened under Puerto Rico's Regulation to Govern the Management of Threatened and Endangered Species in the Commonwealth of Puerto Rico.

The Virgin Islands tree boa was designated an Endangered Species throughout its range in 1979 (Federal Register 12/7/79). All subspecies of E. monensis are listed on Appendix I of the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES).

RECOVERY

A. RECOVERY OBJECTIVE

The general recovery objective is to reduce the status of the Virgin Islands tree boa from Endangered to Threatened within a 10 year period. Lack of available information on this secretive nocturnal snake precludes formulation of a quantitative recovery level. Therefore, it is suggested that a comprehensive population survey and ecological study of the species be conducted prior to defining a recovery level for the boa. In the interim, we suggest that recovery be defined in terms of: a) maintenance of a stable or growing population (quantitative level to be defined later using results from population surveys) of Virgin Islands tree boa at selected major locations during a 5 to 10 year period, b) introduction as necessary of the Virgin Islands tree boa to mongoose-free uninhabited islands within its theorized historical range, and c) the effective control or eradication of feral mammals found to be a threat to the Virgin Islands tree boa.

B. STEP-DOWN OUTLINE

1. Determine status of present population

1.1. Survey small islands of eastern Puerto Rico, U.S. Virgin Islands, and British Virgin Islands to determine presence or absence of boa.

1.2. Survey the known populations to determine density and distribution.

1.3. Perform periodic surveys to determine population trends.

2. Characterize boa's natural history
   2.1. Determine habitat requirements.
   2.2. Determine feeding ecology.
   2.3. Document movements and behavior.
   2.4. Document reproductive ecology.
3. Protect known population.
   3.1. Develop public education program.
      3.1.1. Programs/classes in public schools.
      3.1.2. Conservation programs by broadcast media.
      3.1.3. Distribute news releases to the press.
      3.1.4. Schedule appearances at public service meetings.
   3.2. Develop cohesive recovery plan with local jurisdictions
   3.3. Control threats from introduced mammals.
      3.3.1. Determine effect of cats and mongoose on boa habitat and populations
      3.3.2. Control or eradicate feral mammals as necessary and feasible.
   3.4. Law enforcement activities
4. Establish new populations within historical range of species
   4.1. Evaluate populations to determine which could provide specimens for transplant activities
   4.2. Evaluate and secure adequate sites for release
      4.2.1. Determine potential sites for re-introduction

through habitat inspection

4.2.2. Acquire use of secure sites where adequate protection can be maintained

4.3. Establish captive breeding program

4.3.1. Determine methodology of captive breeding

4.3.2. Implement program of breeding and introductions

C. NARRATIVE

1. It is essential for an operational recovery plan that the distribution and abundance of the population be determined.

1.1. The known range of the boa is separated and non-contiguous. A thorough survey of islands with suitable habitat is needed to provide more reliable information on its distribution.

1.2. A survey of known populations is needed to develop an estimate of the total Virgin Islands tree boa population. Population density can be determined by a mark and resighting study. Distribution can be determined by extensive night searches and examination of likely daytime refugia. Combined results of these two studies can be used to estimate total population.

1.3. Periodic surveys of the same habitat are needed to determine population trends. Increasing populations could yield animals for

introduction to unoccupied habitat. Decreasing numbers would alert managers to correct adverse circumstances in the environment.

2. Basic natural history information on the boa is lacking and is needed for effective management.

2.1. Habitat requirements should be determined by intensive quantitative studies of areas supporting moderate and high populations of boas.

2.2. Feeding ecology should be determined by direct observation using night vision devices supplemented by quantitative studies of prey availability.

2.3. Home range, daily movement patterns, and general behavior should be determined by radiotelemetry and observation of marked animals.

2.4. Reproductive ecology should be determined by examination of free living snakes to determine seasonal presence and habitat preference of gravid females in the population. Road kills should be examined for reproductive state and productivity.

3. Known populations should be protected from introduced predators and from human disturbance through protective legislation.

3.1. Within the range of the Virgin Islands tree boa, a frequent response to sighting a snake is to kill it. The public should be made aware of the harmless nature and endangered status of the boa. A sequence of information/education efforts acquainting the public with the appearance of the boa, its habits, and endangered status will result in reduced human induced mortality and increased reporting of incidental encounters.

3.2. A cohesive recovery plan with the three local political jurisdictions should be developed to coordinate conservation efforts.

3.3. Threats from introduced mammalian predators should be determined and the predators eliminated or controlled in areas with known boa populations.

3.3.1. The influence of feral cats and mongooses on the boa and its preferred habitat should be determined by establishing predator free zones in areas presently occupied by boas, mongooses, and cats.

3.3.2. On small islands with boa populations, mongooses and cats should be eliminated using grids of live traps and other appropriate methods. Areas of essential habitat on larger islands should have predator populations reduced by local control measures. Areas should be monitored for continued absence of these predators.

3.4. Monitoring of populations and enforcement of protective legislation should be conducted by Puerto Rico Department of Natural Resources and, should protective legislation be enacted in the Virgin Islands, by their Bureau of Environmental Enforcement.

4. The known distribution of the Virgin Islands tree boa is extremely limited. Population founder groups should be introduced to suitable, predator-free islands within its range.

4.1. Natural populations of boas should be studied and evaluated to determine which could provide breeding stock without endangering parent populations.

4.2. A priority list of sites suitable for release should be developed.

4.2.1. Ecological surveys of islands free of mammalian predators should be conducted to establish a list of potential release sites with adequate habitat and prey abundance.

4.2.2. Cooperative agreements should be developed with local jurisdictions and private landholders for the use of islands where introduced boa populations can be assured protection.

4.3. A captive breeding program should be established by an experienced herpetologist. This will require adequate facilities needed to maintain a colony of boas.

4.3.1. The methodology of captive breeding should be developed for optimum conditions.

4.3.2. In establishment of captive populations, care should be taken to insure that deme integrity be maintained.

D. LITERATURE CITED

Bowler, K. 1977. Longevity of reptile and amphibians in North American collections. S.S.A.R. Herpetological Cir. 6: 1-32.

Cambell, H. W. and F. G. Thompson. 1978. Observations on a captive Mona Island boa, Epicrates monensis monensis Zenneck. Bull. Md. Herp. Soc. 14: 98-99.

Grant, C. 1932a. Notes on the boas of Puerto Rico and Mona. J. Dept. Agr. Puerto Rico 16: 327-329.

_____. 1932b. Herpetology of Tortola; notes on Anegada and Virgin Gorda, British Virgin Islands. J. Dept. Agr. Puerto Rico 16:339-346.

_____. 1932c. Unpublished collecting log for the years 1930-32.

Huff, T. A. 1977. Captive propagation and husbandry of Epicrates at the Reptile Breeding Foundation. Proc. 2nd. Ann. Reptile Symp. pp. 103-112. Thurmont, Md.

Lazell, J. D. 1980. Report: British Virgin Islands, 1980. Published privately. 105pp.

Meerwarth, H. 1901. Die Westindien Reptilien und Batracher des Naturhistorischen Museums in Hamburg. Mitt. Naturn. Mus. Hamburg. 18: 1-41.

Nellis, D. W., Norton, R. L., and W. P. Maclean. 1983. On the Biogeography of the Virgin Islands Boa, Epicrates monensis granti. J. Herpetology, 17(4): 413-417.

_____, and C.O.R. Everard. 1983. The Biology of the Mongoose in the Caribbean. Found. Sci. Res. in Surinam and Neth. Antilles LXIV. 162pp.

Perez-Rivera, R. A. and M. J. Velez. 1978. Notas sobre algunas culebras de Puerto Rico. Science-Ciencia 6: 68-73.

Pregill, G. K., and S. L. Olson. 1981. Zoogeography of West Indian land vertebrates in relation to Pleistocene climatic cycles. Ann.Rev. Ecol. Syst. 12: 75-98.

Rivero, J. A., R. Joglar, and I. Vasquez. 1982. Cinco nuevos ejemplares del culebron de La Mona Epicrates m. monensis (Ophidia: Boidae). Carib. J. Sci. 17(1-4): 7-13.

Schmidt, K. P. 1926. The amphibians and reptiles of Mona Island, West Indies. Field Mus. Nat. Hist. Pub., 12(12): 149-163.

_____. 1928. Amphibians and land reptiles of Puerto Rico, with a list of those reported from the Virgin Islands. N. Y. Acad. Sci. 10: 1-160.

Sheplan, B. R. and A. Schwartz. 1974. Hispaniolan boas of the genus Epicrates and their Antillean relationships. Ann. Carnegie Mus., 45(5): 57-143.

Stull, O. G. 1933. Two new subspecies of the family boidae. Occ. Pap. Mus. Zool. Univ. Michigan 267:P 1-4.

Tolson, P. J. 1984. Ecology of the boid snake genus Epicrates in the West Indies. Universidad del Turabo Symposio Ecologia, Caguas, Puerto Rico

_____. In Press. Phylogenetics of the boid snake genus Epicrates and Caribbean vicariance theory.

_____ and J. L. Pinero. 1985. A field report on the status of the Virgin Islands boa, Epicrates monensis granti, on Cayo Diablo, Puerto Rico. Unpublished report to Departmento de Recursos Naturales, Puerto Rico.

Westermann, J. H. 1953. Nature preservation in the Caribbean. Found Sci. Res. in Surinam and Neth. Antilles. 9, 106pp.

Virgin Islands Tree Boa

Part III Implementation Schedule

Gen Cat	Plan Task	Task Number	Priority	Task Duration	Responsible Agency FWS Region	Program	Other	Estimated Fiscal Year Costs FY 1	FY 2	FY 3
R-1	Survey small uninhabited islands.	1.1	2	2 yrs	4	FA/SE*	DNR/ DFW	20,000	20,000	
R-1	Survey known populations to determine density and distribution	1.2	2	3 yrs	4	FA/SE*	DFW/ DNR	20,000	20,000	20,000
R-1	Perform periodic surveys to determine population trends	1.3	2	Cont	4	FA/SE*	DFW/ DNR			
R-3,6 7,8	Life history studies	2.	2	3 yrs	4	*SE/RES	DFW/ DNR	30,000	30,000	30,000
O-1	Develop public education programs	3.1	2	Cont	4	FA/SE*	DFW	10,000	5,000	5,000
M-7	Develop cohesive recovery plans with local jurisdictions	3.2	2	2 yrs	4	FA/SE	DFW/ DNR			
R-9	Determine effects of feral cats and mongooses on habitat & populations	3.3.1	2	2 yrs	4	*SE/RES	DFW	30,000	30,000	
M-4	Control or eradicate feral animals	3.3.2	2	Cont	4	FA/SE*	DFW	10,000	6,000	
O-2	Law enforcement activities	3.4	2	Cont	4	FA/SE*	BEE/ DNR*			

Virgin Islands Tree Boa Part III Implementation Schedule (page 2)

Gen Cat	Plan Task	Task Number	Priority	Task Duration	Responsible Agency FWS Region	Program	Other	Estimated Fiscal Year Costs FY 1	FY 2	FY 3
R-4	Evaluate populations for removal of boas for transplant	4.1	3	3 yrs	4	FA/SE*	DNR/ DFW	see task 1.2		
R-13	Determine potential re-introduction sites	4.2.1	3	2 yrs	4	*SE/RES	DFW			
A-7	Acquire use of sites	4.2.2	3	2 yrs	4	FA/SE*	DFW	@		
R-7	Determine captive breeding methodology	4.3.1	3	2 yrs	4	*SE/RES	DFW	30,000	50,000	
R-7	Implement captive breeding and introduction of boas.	4.3.2	3	4 yrs	4	*SE/RES	DFW	see task 4.3.1		60,000

BEE = Virgin Islands Bureau of Environmental Enforcement
DFW = Virgin Islands Division of Fish and Wildlife
DNR = Puerto Rico Department of Natural Resources

*Asterisks indicate primary funding source either present or anticipated.

@Types of acquisitions to be determined from future surveys.

KEY TO IMPLEMENTATION SCHEDULE COLUMNS 1 & 4

General Category (Column 1):

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Priority (Column 4):

1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

2 - An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.

3 - All other actions necessary to provide for full recovery of the species.

APPENDIX

List of Reviewers for the
Virgin Islands Tree Boa Recovery Plan - Technical/Agency Draft

Dr. James D. Lazzell, Jr.
The Conservation Agency
6 Swinburne Street
Conanicut Island
Rhode Island 02835

Dr. Frank Wadsworth
Institute of Tropical Forestry
P.O. Box AQ
Rio Piedras, Puerto Rico 00928

Mr. Sean Furniss
Caribbean Islands NWR
P.O. Box 510
Boqueron, Puerto Rico 00622

Dr. Jim Wiley
Fish & Wildlife Service
P.O. Box 21
Palmer, Puerto Rico 00901

Mr. Ricardo Cotte
Fish & Wildlife Service
P.O. Box 3188 - Marina Station
Mayaguez, Puerto Rico 00709

Mr. John A. Yntema
Division of Fish and Wildlife
P.O. Box 1878
Frederiksted, St. Croix
Virgin Islands 00840

Dr. Wayne King
Florida State Museum
University of Florida
Gainesville, Florida 32611

Dr. John Ogden
West Indies Laboratory
Teague Bay, St. Croix
Virgin Islands 00840

Dr. Kenneth Dodd
U.S. Fish and Wildlife Service
Department of the Interior
18th and C Streets, NW.
Washington, DC 20240

Dr. Jay Gouge
National Park Service
Department of the Interior
Richard B. Russell Building
75 Spring Street, SW.
Atlanta, Georgia 30303

Mr. Noel Pachta
Virgin Islands National Park
P.O. Box 7789
St. Thomas, Virgin Islands 00801

Dr. William MacLean
Division of Science
College of the Virgin Islands
St. Thomas, Virgin Islands 00801

Dr. Richard Philibosian
1385 Capinero Drive
Pasadena, California 91105

Dr. Juan Rivero
Biology Department
University of Puerto Rico
Mayaguez, Puerto Rico 00708

Dr. Richard Thomas/& A. Gaa
Biology Department
University of Puerto Rico
Rio Piedras, Puerto Rico 00931

Dr. Edward Towle
Island Resources Foundation
P.O. Box 4187
St. Thomas, Virgin Islands 00801

Virgin Islands Conservation Society
P.O. Box 4187
St. Thomas, Virgin Islands 00801

Director
Division of Fish & Widlife
Department of Conservation and
Cultural Affairs
101 Estate Nazareth
St. Thomas, Virgin Islands 00801