

Species Conservation Plan for the St. Vincent Parrot *Amazona guildingii*



**MINISTRY OF
AGRICULTURE
AND FISHERIES
ST. VINCENT
AND THE
GRENADINES**

**Prepared by:
Lystra Culzac-Wilson
Conservation Biologist
St. Vincent and the Grenadines**



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Loro Parque Fundación
Avda Loro Parque
38400 Puerto de la Cruz
Tenerife
Spain
Tel: +34 922 374081 Fax: +34 922 373110
Email: dir.general@loroparque-fundacion.org

Intellectual property rights: Lystra Culzac-Wilson

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INTRODUCTION

This Species Conservation Plan is the first of its kind for the endemic St. Vincent Parrot *Amazona guildingii*. The plan is presented in two main parts. Firstly, historical and current data on the species are reviewed and to a great extent used to help inform the conservation approaches proposed. The second part of the document focuses mainly on the requirements for the future conservation of the species by stating conservation objectives and outlining several action plans for a holistic approach in conserving the species.

The Plan is designed for five (5) years, with the first three years seen as the main period, during which most of the Plan's activities are expected to be implemented. Regular monitoring and assessment of the actions proposed will be the responsibility of the Conservation Plan Team. It is expected that the Team will meet annually to review progress and facilitate Plan adjustments where necessary. Collaboration between the St. Vincent Parrot Conservation Consortium and the Forestry Department will be crucial for the successful implementation of this Conservation Plan. Ultimately, access to funding and other resources both locally and externally will be pivotal to the success of this Plan.

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Lystra Culzac-Wilson

SUMMARY

Current species status

The St. Vincent Parrot (*Amazona guildingii*) is listed under Appendix 1 of the Convention for the International Trade in Endangered Species of Flora and Fauna (CITES) and as ‘Vulnerable’ on the IUCN Red Data List. These listings have been primarily due to the bird’s small population, limited island range, the ever-present threat of hurricane and volcanic activities which have in the past proved to be detrimental to the population, and the threats of continued loss and fragmentation of habitat and ongoing trade in the species. Although biennial population censuses show that the population is relatively stable, with between 500 and 600 individuals in the wild, these issues mean that the population may always be considered vulnerable.

Habitat requirements and population threats

The St. Vincent Parrot is confined to the 133 sq. mile Caribbean island of St. Vincent, located at 13° 15 N, 61° 12 W. It occupies chiefly humid forests in and at the periphery of the island’s central mountains between 125 – 1000 m, particularly in ridge and valley areas at lower elevations where there are large, mature growth trees suitable for nesting (Lack *et al.*, 1973; Andrle & Andrle, 1975; Butler, 1988; Collar *et al.*, 1992; BirdLife International, 2000).

Threats to the St. Vincent Parrot are generally categorized under anthropogenic or those due to natural factors. Anthropogenic factors by far collectively pose the greatest threats to the survival of the species. Hunting, poaching for the illegal pet trade and habitat destruction and degradation have over the years impacted to varying degrees on the birds. The natural threats to the parrot could be minor, particularly during the last twenty years with no volcanic eruption or major hurricanes affecting the country. However, from studies of other islands there is no doubt that a direct major hurricane strike could reduce the population by 60%, as happened to the Imperial Parrot *A. imperialis* in 1934 and 1980. There is strong anecdotal evidence that this happened on St Vincent during one hurricane in the late 19th century, and very suggestive anecdotal findings that during the last volcanic eruption on St Vincent many birds (as well as some domestic animals) died from the gas. The last volcanic eruption did not destroy significant tracts of forest except the immediate slopes of Soufriere. The forest being intact, the parrot population, even if damaged in certain northern areas, apparently was able to rebound

in a few years. Other natural threats due to predation, competition and disease have not been widely studied but are thought to be negligible.

The survival of the St Vincent Parrot into the future is integrally connected to the long term development of this species, as the national bird, and the forest as a financial resource for the country and the Forestry Department.

RECOVERY PLAN OBJECTIVES

Overall objectives

1. To achieve measurable improvement in quality and quantity of habitat available, and direct protection of free-living birds, to result in a sustainable maximum wild population which ensures that *A. guildingii* is removed from the IUCN Red List
2. To achieve a healthy minimum viable captive population that is strategically located within facilities in and outside of St. Vincent and the Grenadines.
3. To ensure that the St Vincent Parrot is enshrined in national legislation and culture in such a way as to render its conservation needs inviolable with reference to national development.

Specific objectives

1. To enhance habitat and species conservation and management programmes for the St. Vincent Parrot.
2. To review and improve the legal and institutional framework governing species' conservation.
3. To develop and implement species monitoring programmes and research.
4. To increase public awareness and involvement through development and implementation of public education and sustainable resource use programmes.
5. To increase the capacity of the St. Vincent Government staff and other persons to implement species conservation strategies.
6. To improve the captive management programme for the St. Vincent Parrot.
7. To establish effective monitoring and review of the conservation plan.
8. To identify possible alternative sources of income for the Forestry Department of the Government of St Vincent & The Grenadines to conserve the St. Vincent Parrot.

Conservation criteria

1. All priority habitat areas outside the St. Vincent Parrot Reserve have been identified and have or need protection status designated under the Wildlife Protection Act.
2. Forest management strategies are implemented to quantitatively and qualitatively improve key habitats for the species.

3. Legislation is reviewed and legal and institutional measures are implemented to protect habitat and species with conservation threats reduced to negligible levels.
4. Research conducted to determine population viability, trends and distribution; derive greater understanding of the bird's ecology and natural and anthropogenic threats impacting upon the species.
5. Public education programme is conducted to improve conservation awareness levels among the populace and provide positive conservation attitude towards the species.
6. Training is obtained for Forestry Department and other support personnel in conservation of the species.
7. Minimum captive viable population is achieved, and captive population managed according to captive management standards and guidelines.
8. Functional conservation plan review body with monitoring and review of plan is achieved.

Actions needed

- Action 1: Enhance habitat and species conservation.
- Action 2: Review and improve legal and institutional framework governing species conservation
- Action 3: Develop and implement rigorous species monitoring programmes, in particular an annual census, and research, especially concerning the extent the parrots depend on fruit and trees in different seasons of the year, and to what extent parrots depend upon feeding areas outside the parrot reserve.
- Action 4: Increase public awareness and involvement.
- Action 5: Build capacity for improved management and implementation of conservation strategies.
- Action 6: Improve captive management programme.
- Action 7: Establish a functional conservation plan monitoring and review body.
- Action 8: Assess and prioritise possible alternative sources of income for the Forestry Department to conserve the St. Vincent Parrot.

1.0 BACKGROUND OF ST. VINCENT

1.1 Location

St. Vincent and the Grenadines ($13^{\circ} 15' N$, $61^{\circ} 12' W$) consists of an archipelago of thirty-four (34) islands and islets that are located in the Eastern Caribbean. The mainland, St. Vincent (Figure 1), is 133 sq. miles (344 km^2), while the Grenadines which extend for forty (40) miles to its south constitute a total of 17 sq. miles (44 km^2). St. Vincent is located 24 miles (39 km) south of St. Lucia, 75 miles (121 km) north of Grenada and 100 miles (161 km) west of Barbados.

Figure 1: Map of St. Vincent



Source: Adapted from Simmons & Associates, 2000.

1.2 Geology and Geomorphology

St. Vincent is very rugged and mountainous in nature and is dominated by a series of volcanic mountain ranges and peaks, with a roughly even distribution of lava flows and pyroclastics (Rowley 1978a). Its highest point is La Soufrière which rises to over 4048 ft (1233.8 m), which is separated by the remaining mountain massif by a deep trough that bisects the island (Butler, 1988). Other dominant peaks include Richmond to the north-west (3,523 ft, 1073.8 m), Mount Brisbane (3,058 ft, 932.1 m), Grand Bonhomme (3,181 ft, 969.6 m) and Mount St. Andrew (2,413 ft, 735.5 m). Rowley (1978b) estimated that 55% of the island was mantled by well-bedded, pyroclastic fall deposits, produced by eruptions of La Soufrière during the late Pleistocene period.

The island is aligned along a north-south axis. The Windward (eastern) side of the island is more gently sloping than the Leeward (western) portions. The island has been divided by Robertson (2003) into four major geologic regions: the South-East Volcanics, and the Grand Bonhomme, Morne Garu and Soufrière Volcanic Centres; based on examination of the topography, field geology, geochemistry and previous work undertaken on the island. Nearly 60% of the land surface lies below the 1,000-foot contour, with 1% above 3,000 feet. Approximately 27% lies between 1,000 and 2,000 feet and 13% between 2,000 and 3,000 feet (Butler, 1988).

1.3 Climate of St. Vincent

St Vincent's climate is tropical in nature and is influenced by the North East Trade Winds between the months of January and June. Approximate annual rainfall on the mainland island ranges from 1700 mm on the dry coast to 7000 mm in the wet central mountains. In contrast, the Grenadines may experience as little as 460mm per annum (Simmons & Associates, *Inc.*, 2000). The average yearly temperature is 27° C (80° F) with the coolest months occurring between November and February. The island has two main seasons annually; the wet (rainy) and dry seasons. The wet season runs from June through November, while the dry occurs between December and May.

2.0 DESCRIPTION AND TAXONOMY OF *AMAZONA GUILDINGII*

The St. Vincent parrot *Amazona guildingii* belongs to the family Psittacidae within the Order of Psittaciformes. It is one of the four remaining Amazon parrots in the Lesser Antilles, the others being *A. versicolor* of St. Lucia and *A. arausiaca* and *A. imperialis*, both of Dominica.

The *A. guildingii* was originally described and named by N.A. Vigors in 1836 (Proceedings of the Zoological Society, London, 1937) after Reverend Landsdown Guilding of St. Vincent (Butler, 1988), from whom he obtained the specimen used in the description of the species (Nichols, 1981). The bird has been described by Butler (1988) as being arguably the most beautiful of the four remaining Lesser Antillean Amazons because, although the bird has been recognised by many as having two distinct morphs (Nichols and Nichols, 1973; Laidler & Laidler, 1977; Butler, 1988; Butler & Charles, 1992; Juniper & Parr, 1998; Raffaele *et al.*, 1998), plumage colouration within these two morphs is variable and virtually no two birds are alike (Butler, 1988). Prior to its classification as *A. guildingii*, the St. Vincent parrot was classified as *Psittacus guildingii*, then *Chrysotis guildingii*, after which it was reclassified to the present (Butler, 1988).

The St. Vincent parrot ranges in size from 41 – 46 cm (16 – 18 inches) with both sexes being similar in size. Wing length ranges from 253 – 275 mm and bill from 32 – 39 mm (Juniper & Parr, 1998). Normal weight for adult wild birds is considered to be 580 – 700 g (Sweeney, und.). Plumage is not sexually dimorphic which makes differentiation between males and females difficult. Adult plumage is variable but can be placed within two distinct colour morphs: the ‘yellow-brown’ morph and the ‘green’ morph (Nichols and Nichols, 1973; Laidler & Laidler, 1977; Butler, 1988; Butler & Charles, 1992; Juniper & Parr, 1998; Raffaele *et al.*, 1998). The following descriptions have been taken from Forshaw (1989).

The ‘yellow-brown’ morph

The plumage is variable. The bird’s forehead, fore-crown, lores and periophthalmic regions are creamy white, merging into orange on its hind crown, anterior of cheeks and throat. Its ear coverts and posterior of cheeks are violet-blue with the long feathers of the nape and hind-neck being olive-green tinged with dull blue and distinctly tipped with black. The fore-neck is orange. Feathers of the underparts are bronze-brown narrowly tipped with dusky black. The abdomen is suffused with green while the under tail-coverts are greenish-yellow. The mantle,

scapulars, back and upper tail-coverts are bronze-brown, the last being narrowly tipped with green. Upper tertials are dark green and tinged with brown, while the lower tertials are dark green tinged with violet-blue and sometimes faintly tipped with yellow. Its carpal edge is orange, and primaries are black with conspicuous orange-yellow bases and are centrally tinged with violet-blue. The outer secondaries are violet-blue with orange bases and centrally banded with green, while inner secondaries are dark green becoming violet-blue toward the tips. Secondary coverts are orange-brown with concealed green bases, and median and lesser wing coverts are light bronze-brown. The bird's lesser and under wing-coverts are bronze-brown edged with green and sometimes tinged with pale blue, while the greater under wing-coverts and undersides of flight feathers are yellow. The tail feathers are orange at the base with a wide central band of dark violet-blue and broadly tipped with orange-yellow. The bird's bill is horn-coloured tinged with olive-green and marked with grey at the base. The iris is orange and its legs are pale grey.

The 'green' morph

The 'green' morph is similar, but differs by having the upper parts predominantly dusky-green. Instead of orange-yellow, the bases of the primaries are green and the under wing-coverts and undersides of the flight feathers are green.

Immatures

Immature birds are similar to adults. The brighter colours of adults, particularly on the head are noticeably subdued in immature birds. Unlike the adults, the iris is brown. There is no transition from 'green' juveniles to 'yellow-brown' adults.

Butler (1990) produced a comprehensive description of the colour morphs. Of the two distinct morphs, based on museum skins the commoner is the yellow-brown (Juniper & Parr, 1998). Nichols (1974) surmised that about 85% of St. Vincent parrots are predominantly yellow-brown; the remaining being more typically of the 'green' morph. However, an assessment of the relative proportions of the morphs in the wild population should be repeated.

Nichols (1980) is convinced of polymorphism within the St. Vincent parrot and has identified four morphs described as *yellow-orange*, *yellow-amber*, *green-brown* and *green-green*. The following

further describes these morphs. Capitalized colours refer to those described by Smithe (1974 & 1975):

- (i) *Yellow-orange*: proximal primaries are Spectrum Yellow and body largely Spectrum Orange, with green lacking from the distal part of the feathers but having Brown barring.
- (ii) *Yellow-amber*: proximal portion of the primaries are Spectrum Yellow and the general body colour resembles Amber, with the abdomen and often the breast feathers being Amber proximally. This bird is distally Apple Green to pale Spectrum Green and then edged with dusty Brown or Black.
- (iii) *Green-brown*: proximal portion of the primaries are Parrot Green to light Olive Yellow, with the breast and the abdomen usually dark Cinnamon-Brown. The back is deep Olive-Brown with some Apple Green feathers, and more greenish wing-coverts, approximately Greenish-Olive.
- (iv) *Green-green*: proximal portion of the primaries is Green, with essentially no Brown on the body.

3.0 DISTRIBUTION AND HABITAT

3.1 DISTRIBUTION

The St. Vincent Parrot (*Amazona guildingii*) is confined to the Caribbean island of St. Vincent. It occupies chiefly humid forests in and at the periphery of the island's central mountains between 125 – 1000 m, particularly in ridge and valley areas at lower elevations where there are large, mature growth trees suitable for nesting (Lister, 1880; Lack *et al.*, 1973; Andrle & Andrle, 1975; Butler, 1988; Collar *et al.*, 1992; Birdlife International, 2000). Occasionally, parrots may wander from forests to visit cultivated areas and even gardens (Lowe, 1909; Andrle & Andrle, 1975; Christian, 1993; Juniper & Parr, 1998) but clearly the species remains directly allied to the island's forest habitat (Collar *et al.*, 1992).

3.1.1 Historical distribution

The historical writings of Lister (1880) provide an indication of the extent of forest cover and habitat which existed in the late 1800s. According to him, during the 1870s, forest covered peaks and on the western side, reached almost to sea level. Bond (1928) also reported the St. Vincent parrot as being most numerous in the north of the island and Andrle and Andrle (1975) refers to the species present (for feeding, not nesting) on the dominant northern Mount Soufrière. Since the 1979 volcanic eruption, the population of parrots was greatly reduced and believed to be totally absent from that area, and certainly feeding trees would have been destroyed. Since that eruption in 1979, parrots were not recorded on La Soufrière until the mid-1990s (pers. obs.; F. Springer, pers. comm.). Some authors such as Gochfeld (1974), Laidler (1977), Lambert (1983) suggest however that the bird might have been absent from the area even before the 1979 eruption. Nichols (1980) quotes Andrle & Andrle as having seen them on the south-east slope of Soufriere, and H. Nichols as having seen 2 on the south-east slopes of Soufriere in 1977. Clearly they have used Soufriere as a secondary forest feeding source, as trees there do not get old enough to nest in because of eruptions. Andrle and Andrle (1975) estimated the total potential breeding area in 1975 for the St. Vincent parrot as encompassing up to 30 km² in disjunct districts, mainly in ridge and valley locations between 300m and 700 m.

3.1.2 Current distribution

The St. Vincent Parrot is currently most populous in the heads of Buccament, Cumberland, Colonaire, Congo-Jennings-Perseverance and Richmond valleys where much of the native forest is now

concentrated (Juniper & Parr, 1998; see also Forestry Department biennial censuses 1988 to 2002). It is also found elsewhere in small numbers (Collar *et al.*, 1992; Forestry Department - St. Vincent). These locations include the slopes of La Soufrière in the north and the Fenton Valley in the south (G. Gaymes, pers. comm.; see also Appendix 1 for locations of St. Vincent parrot populations outside of the St. Vincent Parrot Reserve).

3.1.3 Geographical variation

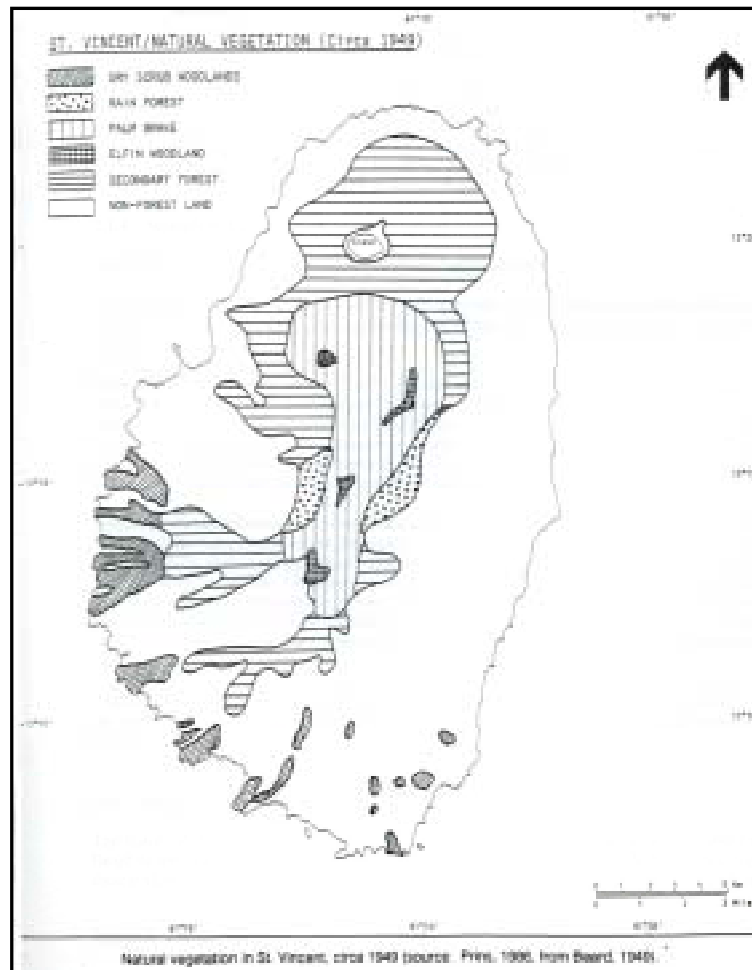
Parrots found on the eastern side of St. Vincent are possibly genetically isolated from those found on the western side; the small population of eastern birds (approximately only about 80 birds) reportedly show a higher proportion of 'green' individuals and have higher-pitched voices than their counterparts in the west (Lambert, 1983; see also Juniper & Parr, 1998). However, this appears to be very speculative and based on weak anecdotal information. It would not require much isolation to see the development of distinct vocalisations. It would require much more isolation to develop a higher proportion of given morphs. The parrots range widely to feed, and have been seen in small numbers fly over the main ridge of the island. Thus it is unlikely that they are genetically isolated groups. However, some hard DNA evidence is required to elucidate this question.

3.2 HABITAT

3.2.1 Introduction

The forests of St. Vincent are of the *Dacryodes-Sloanea* association, displaying great species diversity with some 250 species of trees and scrubs having been recorded (Butler, 1998). The 1949 classification by Beard of the climax vegetation of St. Vincent and the Grenadines is still being used today. Some seven (7) classes were defined and include Rainforest, Elfin Woodland, Littoral Woodland, Mangrove Forest, Palm Brake, Secondary Rainforest and Dry Scrub Woodland (Figure 2). Of these seven classes, only two appear to be important to the St. Vincent parrot today i.e. Rainforest (Moist Montane forest) and Secondary Rainforest. Though parrots have been observed flying over Palm Brake, it is doubtful that these habitats are actually utilized by these birds (see Lambert, 1983). It is possible that parrots instead fed in the transition belt of vegetation between Palm Brake and Rainforest (Lack, 1973; Lambert, 1983). However, the report (Clark, 1905) of a pair actually nesting in Kingstown is suggestive that in the past the parrots utilised a much larger area than rainforest and secondary rainforest, especially for feeding. This would be consistent with what is known about the other species of amazons, being opportunist and able to forage over large areas for feeding. T. Nichols reports (*in litt.*) that around the year 1900 the parrots would fly right down to Buccament Bay at certain times of the year to feed on certain trees (*Manilkara* sp) that grew there at that time.

Figure 2: Map showing natural vegetation of St. Vincent



Source: Adapted from Simmons & Associates (2000) – in need of revision and up-date.

3.2.2 Rainforest (Moist Montane forest)

These forests occur in areas of high rainfall and with very short dry periods. These forests occupy small areas between 300 m (1,150 ft) and 500 m (1,640 ft) in elevation, mainly in the middle to upper watershed basins of the Wallibou (Lambert, 1983), Colonaire, Cumberland and Buccament Valleys. The forest averages about 100 ft in height, is closed and dense, has two strata of trees, and is somewhat patchy due to recurrent hurricane damage and topography (Butler, 1988). Windward and Leeward forests are similar in composition, except for *Prestoea montana* which forms about 35% of the stems in the Windward but is virtually absent on the Leeward side. Other canopy dominant species include *Dacryodes excelsa*, *Lauraceae* spp., *Meliosma herbertii*, *Micropholis chrysophylloides* and *Sloanea caribaea* (Butler, 1988; Simmons & Associates, 2000). Species such as *Licania ternatensis*, *Ormosia monosperma*, *Sloanea massoni*, *Talauma dodecapetala*, *Rubiaceae*, *Actinostemen caribeus*, *Symplocos martinicensis*, *Micropholis chrysophylloides*, *Miconia virescens*, *Pithecellobium jupunda*, *Simaruba amara*, *Erythroxylon squamatum*, *Cassipourea guianensis*, *Ixora ferrea*, *Canella winterana*, *Eugenia sintenisii*, and *Meliosma herbertii* also constitute this habitat (Beard, 1949).

According to the National Inventory Report of 1993, there is approximately 4308 hectares of Primary Rainforest remaining on St. Vincent (Dardoin, 1993 in Simmons and Associates. 2000).

3.2.3 Secondary Rainforest

These are forest lands that have had some major intervention (natural or man-made). They are generally located above areas of permanent cultivation and below Primary Rainforest. Secondary forests are generally characterized by the presence of fast-growing tree species such as *Cecropia peltata*, tree ferns *Cyathea* spp. and stands of *Heliconia*. Several areas are partially cultivated by subsistence farmers (Butler, 1988) and generally contain secondary tree species such as *Chimarrhis cymosa*, *Sapium caribaeum*, *Inga ingoides*, *Cecropia peltata*, *Freziera hirsuta*, *Ochroma pyramidale*, *Cordia sulcata* and *Lauraceae* spp. These forests are normally denser than primary forest, with smaller tree diameters. However, the more advanced succession stage has a higher number of rainforest species (Simmons & Associates, 2000).

Other Secondary Forest-associated species include *Artocarpus communis* (Lambert, 1983), *Artocarpus altilis*, *Inga vera*, *Eugenia sintenisii*, *Prestoea montana*, *Ficus citrifolia*, *Dacryodes excelsa*, *Chimarrhis cymosa*, *Ficus obtusifolia*, *Guarea guidonia*, *Tabebuia pallida*, *Cordia sulcata*, *Meliosma herbertii*, *Sterculia caribaea*, *Andira inermis*, *Rubiaceae*, *Nectandra coriacea*, *Citharexylum*

fruticosum, *Faramaea occidentalis*, *Phoebe elongate* and *Freziera hirsuta* (Beard, 1949; Birdsey *et al.*, 1984).

Lambert (1983) highlighted the similarity in use between rainforest and secondary rainforest habitat when he stated that it was often difficult to distinguish between mature Secondary forest and Primary forest in terms of usage by parrots.

Patches of forest plantation are also found in the parrots habitats. These are located principally at Vermont, Coffee, Stream 24, Hermitage, and the headwaters of Colonaire River (Butler, 1988) and include *Hibiscus elatus*, *Cordia alliodora*, *Pinus caribaea*, *Swietenia macrophylla*, *Gmelina arborea*, *Calophyllum antillanum* and *Leucaena leucocephala* (Beard, 1949; Birdsey *et al.*, 1984). Although no research has been specifically conducted on the impacts of these plantations on the St. Vincent parrot, recent research has indicated that parrots are now utilizing some of these species, particularly *Hibiscus elatus*, *Calophyllum antillanum* and *Leucaena leucocephala* as food plants (Culzac-Wilson, 2004). The short and long term impacts of such activity is yet to be determined. Section 5.1 however illustrates the importance of several of the above-listed Primary and Secondary rainforest species in the diets and nest site selection of St. Vincent parrots.

Little work has been carried out on the herbaceous plants associated with these primary and secondary habitat or to determine the extent of endemism in the flora (Butler, 1988). Additionally, no work has been conducted on the importance of these plants on the St. Vincent parrot.

Primary and Secondary rainforests are also rich in fauna which share the parrot's habitat. These include other endemic and sub-endemic species of animals such as the Whistling Warbler *Catharopeza bishopi* (endemic), Rufous-throated Solitaire *Myadestes genibarbis* (endemic subspecies – Chow, 1993), St. Vincent House Wren *Troglodytes aedon* (endemic subspecies – Chow, 1993), Hooded Tanager *Tangara cucullata* (regional endemic shared with the neighbouring island of Grenada), Black Snake *Chironius vincenti* (endemic), the Congo Snake *Mastigodryas bruesi* (regional endemic – Simmons & Associates, 2000) and the Piping Frog *Eleutherodactylus shrevei* (endemic). Other wildlife found in this habitat include birds: *Columba squamosa*, *Buteo platypterus*, *Buteogallus anthracinus*, *Coccyzus minor*, *Orthorhynchus cristatus*, *Eulampis jugularis*, *Eulampis holosericeus*, *Elaenia martinica*, *Elaenia flavogaster*, *Cinclocerthia ruficauda*, *Margarops fuscus*, *Vireo altiloquus*,

Loxigilla violacea, *Coereba flaveola*, *Turdus fumigatus* and *T. nudigenis*: and introduced mammals *Dasyprocta agouti*, *Didelphis marsupialis* and *Dasypus novemcinctus*.

3.2.4 Human land use practices in the rainforest

Although all lands above the 1000 ft mark was established since 1912 as Crown Land, poor enforcement of this legislation has resulted in continued habitat loss and fragmentation. During colonial times substantial vegetation was cleared for monoculture agricultural purposes, and as a source of building materials, charcoal and fuel wood. These activities continue to threaten the forest habitat of the St. Vincent parrot. Lambert (1983) reports that the population of St. Vincent parrots recorded in the Mesopotamia region some four years earlier in 1978 (Nichols, 1980) had disappeared due to clearing of land for agriculture. A further increasing threat is now the expansion of squatting in environmentally sensitive areas and clearing of interior, relatively inaccessible lands for illegal Marijuana cultivation (Simmons & Associates, 2000, Woolcock, 2000). Koester (2001) estimated that there were some 1500 marijuana farmers occupying 3000 acres (1200 ha) of land. This activity occurs within patches of prime rainforest and destroys old-growth trees which provide food and nest sites for parrots and may further expose birds to poachers and predators (AvianEyes, 2003). The expansion of agriculture, squatting and marijuana cultivation into previously undisturbed areas are believed to be primarily as a result of the high levels of poverty being experienced in the country, lack of enforcement of laws and destructive use of forest and watershed. St. Vincent and the Grenadines has been identified as having the highest levels of poverty in the Organization of Eastern Caribbean States (OECS), set at 37.5% (Thomas, 2001).

4.0 STATUS OF THE *AMAZONA GUILDINGII* POPULATION

4.1 Introduction

The St. Vincent parrot is listed under Appendix 1 of the Convention for the International Trade in Endangered Species of Flora and Fauna (CITES) and as ‘Vulnerable’ on the IUCN Red Data List. These listings have been primarily due to the bird’s small population, limited island range, the ever-present threat of hurricane and volcanic activities which have in the past proved to be detrimental to the population, and the threats of continued loss and fragmentation of habitat and ongoing trade in the species.

Habitat conservation, education campaigns and legal measures are said to have all helped the steady recovery of the population from its state of decline during the early part of the 20th Century (Woolcock, 2001). However, excluding temporary dips in the population following hurricanes and volcanic eruptions, the evidence that the population has ever been lower than it is now is flimsy.

4.2 Wild population

Due to the lack of historical data on the parrot prior to the 1800s, it is difficult to surmise much about its population prior to that period. However, based on associated data on Caribbean Psittacines, it is quite possible that the St. Vincent parrot would have occurred in much larger numbers prior to the purported discovery of the West Indies by Christopher Columbus. Snyder *et al.* (1987), summarized that since the discovery of the Caribbean, 27 species (55%) of the original Psittacines in existence at that time have become extinct, largely as a result of hunting for food. This activity also occurred within the St. Vincent parrot’s range and continued until about three decades ago. However, given other factors such as natural disasters and other threats (Section 7.0), and being an island endemic, with an always relatively small population (Butler, 1988), the species is fundamentally predisposed to a relatively high extinction probability (MacArthur & Wilson, 1967).

Population assessments over the last century have been varied, and in many cases contradictory, but according to Juniper and Parr (1998) the species evidently declined substantially by 1950. The following gives an overview of the relative abundance from the late 1800s to present, and is based on earlier accounts (adapted from Collar *et al.*, 1992) and later, more scientific attempts to survey and quantify the population during the latter half of the 20th century.

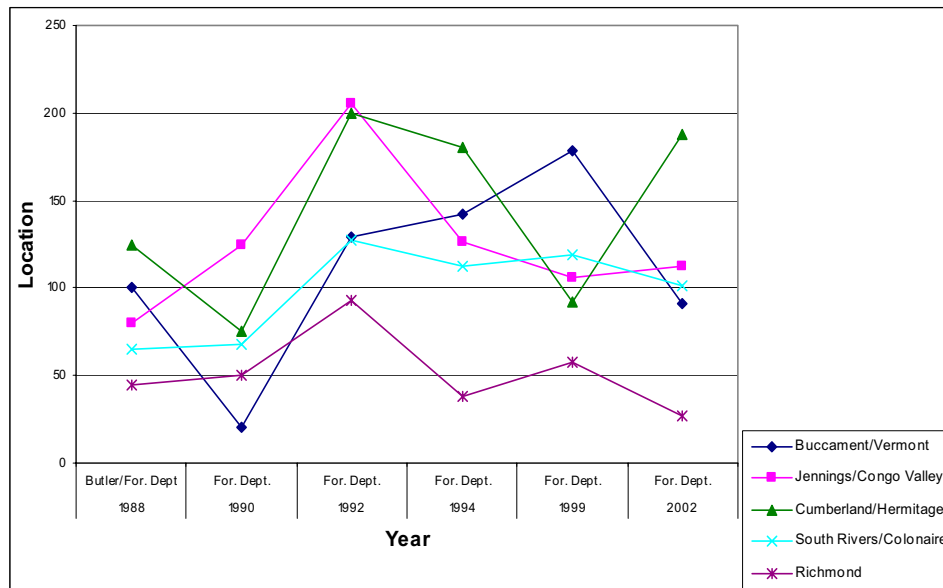
The earliest appraisal of the population is obtained from a local Vincentian who, in an attempt in the early 1870s to obtain a specimen for the London Zoo considered it “*now scarce*” and was only able to obtain a specimen “after many enquiries” (Proc. Zool. Soc. London 1874). In 1898, the bird was considered “*formerly very numerous, and ... still common at the time of the great hurricane*”. After the 1898 hurricane and volcanic eruption of 1902, the bird was said to be “*not at all abundant*” and “*now decidedly rare*” (Anon., 1904; Clark, 1905). On the contrary however, Thompson (1900) claimed that the population had recovered by 1900 and were seen “*in their usual numbers in their usual haunts*”. By 1905, the population was again said to be reduced, to the point that it was “*almost extinct*” (Rothchild, 1905), but on what evidence we do not know. Three years later, Lowe (1909) stated that in 1908 the birds were seen “*in sufficient numbers ... to make its preservation a matter of certainty if proper care is exercised*”, with several large flocks known and the impact of the eruption being thought “*moderate*”. Almost twenty (20) years later, again with questionable evidence, Knobel (1926) considered the bird “*exceedingly rare*”, and was supported by Phillips (1929) who reported at second hand that “*only one or two flocks left*” in 1924, though Bond (1928) found it “*not as rare as expected*” and guessed that several hundred still existed. By the late 1950 (Frost, 1959) reported that by the 1950s it was “*becoming less and less*”, such that without protection it would be extinct before the Imperial Amazon *Amazona imperialis*. A decade later, but on very limited data, Andrie and Andrie (1975) estimated the population at approximately 200 birds.

Between 1975 and 1988, more scientific approaches were taken to estimate the population through a number of surveys by several individuals and research teams, including Laidler and Laidler (1977), Nichols (1975, 1976, 1978 and 1981), Lambert (1983) and Butler (1988). Overall estimates of the population during this period fluctuated around 450 – 500 birds and ranged from 400 birds (Nichols, 1975) to 525 ± 75 (Nichols, 1978). It must be noted though that population estimates based on surveys carried out by Laidler and Laidler in 1975 and 1976 were of “*several hundred to a thousand*” or of “*a few thousand*” (Laidler & Laidler, 1977). This figure was however later disputed by Nichols (1981) who stated that these results were based on extrapolation from estimates of numbers from an area already known for its unusually high density.

In 1988, the population was estimated at 440 – 500 birds (Butler, 1988). This census was conducted with the assistance of RARE Centre for Tropical Bird Conservation and Paul Butler, and was the beginning of the biennial censusing of the local parrot population, by the Forestry Department of St.

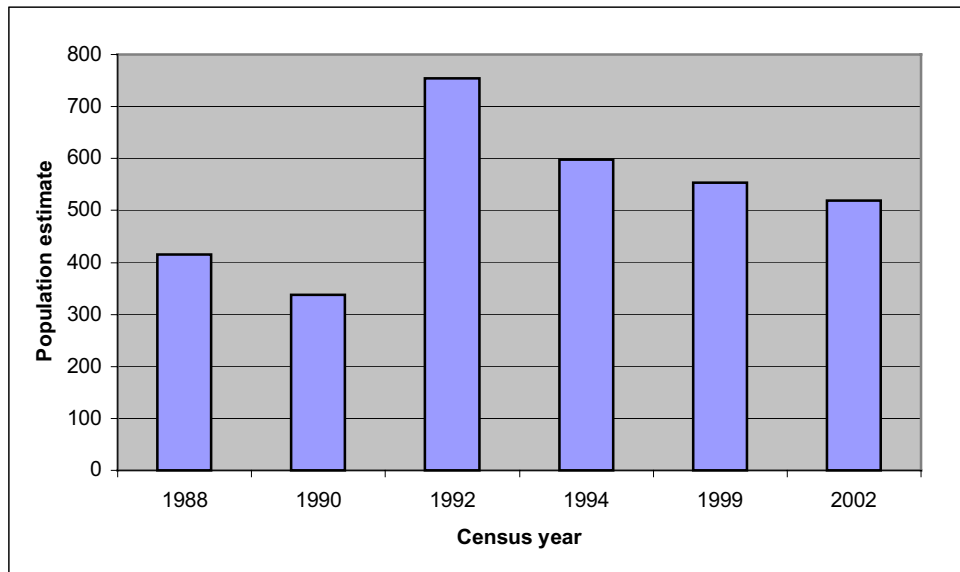
Vincent and the Grenadines. Although it is difficult (to almost impossible) to obtain an absolute total, the methodology utilized is repeatable and will detect population trends (Collar *et al.* 1992). Obtaining a ‘true’ estimate of the population is affected by many valleys, difficult terrain, the nature of forest cover and movement of the birds throughout localized areas. Figures 3 and 4 show biennial population estimates based on censuses conducted by the Forestry Department since 1988. So far, eight censuses have been conducted between 1988 and 2002 (note: two censuses were done in 1988), with another recently completed in 2004. It must be noted that the population estimate of 800 in 1992 is now being considered an over-estimate because, unlike the other years, the results of gap watches were included in this estimate. No census was carried out during the years 1994 to 2000 due to lack of funding and staffing levels (Woolcock, 2000). According to the results of the biennial censuses conducted by the Forestry Department, there was a decline in the population between 1992 and 2002 (Figure 4). The population is however currently considered stable and estimated at between 500 and 600 birds.

Figure 3: Sector estimates for the St. Vincent parrot population from 1998 to 2002



Source: Forestry Department, St. Vincent and the Grenadines

Figure 4: Population census of wild St. Vincent parrots from 1988 to 2002



Source: Forestry Department, St. Vincent and the Grenadines

4.3 Status of the captive population

St. Vincent parrots have always been of interest as pets and thus it is a prized captive species both locally and internationally. King (1981) reported that in 1973 there was a total of 76 St. Vincent parrots in captivity. Of these 28 were located in St. Vincent and the Grenadines, 16 in Barbados, and 28 in the United States and Europe. Laidler and Laidler (1977) estimated that there were 31 captive birds in St. Vincent and 11 being held in Barbados. At the time of this survey, 7 parrots were located at the Jersey Wildlife Preservation Trust (on breeding loan), 1 in Bermuda Museum and Zoo (actually reported dead in the 1960's – T. Nichols *in litt.*), 1 in England (Jeggo, 1980), 1 in the Brookfield Zoo in Chicago (actually reported dead in the 1973 – T. Nichols *in litt.*), 1 with the New York Zoological Society, 1 with the National Zoo in Washington, D.C. and 1 at the Houston Zoo (Christian, 1993).

In 1980, the International Captive Breeding Consortium for the St. Vincent parrot was started by the Jersey Wildlife Preservation Trust. The Consortium's objective was to encourage greater cooperation

between persons holding or owning parrots outside of St. Vincent, with an attempt to better utilize the resources available to enhance the prospects of breeding this species in captivity (Jeggo, 1990).

Two years later, Lambert's 1983 assessment of the population found approximately 23 birds captive on the island of St. Vincent. During that same year, 8 birds were being held in Barbados and some 27-29 birds were registered with the Consortium. The Consortium further knew of single pet birds held in captivity in New York and Ireland (Lambert, 1983). In 1984, Jeggo indicated that there were some 40 parrots existing outside St. Vincent with an at least equal number kept as pets on the island.

As part of the Government of St. Vincent's effort to halt the illegal trade in St. Vincent parrots, a census was conducted of pet St. Vincent parrots within the state in 1988. Eighty-one (81) birds emerged for registration and banding, while there were an additional 17 being housed at the Nicholls Wildlife Complex (Stone, 1989 *in* Noegel *et al.*, 1990), making the total captive population on St. Vincent and the Grenadines in 1988 ninety-nine (99) birds. Two years later, Jeggo (1990) estimated the population outside St. Vincent at 50 birds.

The most recent update of the St. Vincent Parrot International Studbook (Woolcock, 2001) indicates a total of 205 birds being registered in captivity between 1960 and 2001. During this period, some sixty-eight birds have died. The current population (as of the end of March 2001) shows that there are some 137 birds (57 males, 53 females and 27 of unknown sex) distributed among 23 institutions. Of these birds, approximately 22 are registered with the St. Vincent Parrot Conservation Consortium. There are currently 59 captive birds in St. Vincent and the Grenadines with 31 being housed at the Nicholls Wildlife Complex and the others held by registered custodians throughout the state. Since the ban placed on the harvesting of wild St. Vincent parrots, the captive stock in St. Vincent has remained relatively stable. It is more difficult however to monitor those on the international arena, particularly due to the ongoing illegal pet trade.

The 75+ birds being held outside of St. Vincent are distributed among 15 holders around the world. According to the Consortium (in its letter to holders of St. Vincent Parrots), this number of birds, if deployed with the necessary expertise and goodwill, is enough to create a satisfactory and growing 'insurance population' of St. Vincent parrots, capable of forming the basis of a re-introduction programme if it should be required. This, the Consortium further states, requires improved co-operation between holders.

Since its formation in 1980 however, this co-operation has not been forthcoming and the Consortium has had difficulties in getting holders of St. Vincent Parrots outside of St. Vincent to become members; primarily due to the issue of ownership, and to a lesser extent, issues of trust within the organization. To become a member of the Consortium, holders are required to recognize (and where necessary return) legal ownership of their parrots and offspring as that of the Government of St. Vincent and the Grenadines. They must also recognize their obligation to move birds between members in order to maximize breeding potential. These actions, the Consortium hopes, will remove financial value from the birds and increase their conservation value.

Conversely, while many holders who are non-members of the Consortium agree to a moral obligation to assist the Government of St. Vincent in the conservation and long term management of the species, it is their opinion that, in the case where ownership of St. Vincent parrots was made legal via permits issued by the St. Vincent Government, this ownership has already been determined and accepted. For many holders therefore, becoming a member to the Consortium brings them no additional benefit, particularly in cases where they have enough birds within their possession for breeding purposes, and additional members to the Consortium are most likely to come from holders of individual birds who wish to find mates for their birds. It thus means that the population of external birds within the Consortium are insufficient to maintain a viable ex-situ stock, and that while the Consortium should continue its drive for increased membership, more novel ways of obtaining additional genetic contributors may have to be sought. This may include forming partnerships with reputable non-Consortium members with legal title to birds in which off-springs become the title of the Consortium.

To date, the International Studbook has recorded over 90 birds born into captivity worldwide, with another 33 birds of unknown origin. Approximately 24 of these were born in St. Vincent. Other institutions recording successes in captive breeding the St. Vincent parrot include the Graeme Hall Bird Sanctuary in Barbados (formerly Oughteson Zoo); Houston Zoological Society, Texas, USA; Dominican Republic; Life Fellowship Bird Sanctuary, Florida, USA; and Paradise Park, Hayle, UK.

5.0 ECOLOGY OF THE *AMAZONA GUILDINGII*

With the exception of the joint research done between the Forestry Department and Lystra Culzac-Wilson in 2003, very little work has been conducted in recent times on the ecology of the St. Vincent parrot, and thus the majority of the available information is based on research carried out during the 1970s and 1980s. The St. Vincent parrot is therefore one of the least studied parrot species in the Caribbean (Snyder *et al.*, 2000).

5.1 Diet and feeding in the wild

Very little information is available on the food requirements of St. Vincent parrots in the wild or captivity, at different stages of development and during the breeding and non-breeding seasons. However, some research has been carried out on the foods utilized by this species in the wild.

The St. Vincent parrot is a canopy feeder which consumes a wide variety of fruits, seeds, flowers (Raffaele, 1998; Nichols, 1980; Butler, 1988; Culzac-Wilson, 2004) and leaves (Culzac-Wilson, 2004). It forages in flocks of up to a dozen (Juniper & Parr, 1998), and may sometimes forage in partially cultivated areas (Andrle & Andrle, 1975; Christian, 1993; Juniper & Parr, 1998; Culzac-Wilson, 2004).

St. Vincent parrots have been recorded as feeding on the fruits of Penny Piece *Pouteria multiflora* and Bullet *Manilkara bidentata* (Kirby, und.); the fruits, flowers and seeds of *Cordia sulcata*, *Dacryodes excelsa*, *Mangifera indica*, *Krugiodendron ferreum*, *Micropholis chrysophylloides*, “sweetwood”, *Pouteria multiflora*, *Dussia martinicensis*, *Talauma dodecapetala*, *Inga* spp., *Richeria grandis*, *Psidium guajava*, *Clusia*, *Annona muricata*, *Calophyllum brasiliense*, *Andira inermis*, *Cordia alliodora* (flowers only), *Aiphanes erosa*, *Acrocomia aculeta*, *Euterpe globosa*, *E. hagleyi*, *Ficus clasiifolia*, *F. insipidia*, *F. trigonata* and *F. citrifolia* (*Ficus* spp.) (Nichols (1980); Lambert (1983) and Butler (1988)); fruits of *Rudgea caribaea* and flowers of *Byrsonima coriacea* (Lambert, 1983); and *Cecropia peltata* and *Meliosma virescens* (Butler, 1988). Nichols (1980) also had reports of parrots feeding on *Manilkara bidentata* though this was never observed. The plant is also considered rare in St. Vincent, and believed confined to the lowland forests (T.Nichols *in litt.*). Research completed in 2003 on the diet of St. Vincent parrots identified the bird as additionally foraging on the fruits of

Sapium caribaeum, flowers of *Clusia alba*, *Aechmea sp.* and *Hibiscus elatus*, and seeds of *Leucaena leucocephala* (Culzac-Wilson, 2004). Both *Leucaena leucocephala* and *Hibiscus elatus* are plantation species used in reforestation. There has also been reports that the St. Vincent parrot also feeds on the fruit of *Licania ternatensis* (Culzac-Wilson, 2004). It was also possible to grow *Clusia* and *Ficus insipida* from droppings of nestling St Vincent Parrots (T.Nichols *in litt.*).

5.2 Nest site selection

Nests are generally in cavities of mature, large trees (Christian, 1993; Juniper & Parr, 1998), mainly *Dacryodes excelsa* due to its brittle limbs and tendency to become hollowed out as the tree matures. As these brittle limbs fall, they leave natural cavities (Nichols and Nichols, 1973; Laidler and Laidler, 1977; Lambert, 1983). Where necessary to increase suitability, birds further excavate these cavities and use the chips as nest (Laidler and Laidler, 1977). Nichols (1980) compiled a list of seven (7) species (including *D. excelsa*) that are used by St. Vincent parrots for nesting. These additionally include *Sloanea sp.*, Penny Piece *Pouteria multiflora*, Waterwood *Chimarrhis cymosa*, Broadleaf, Jumbie Bead *Ormosia monosperma* and Breaknail *Margaritaria nobilis*. Heights above ground of nest cavities ranged from 3 m to 28.8 m. Nest cavity width ranged from 10 cm to 1.8 m, entrance height ranged from 15 cm to 2.4 m and depth ranged from 24 cm to 6.1 m. It appears though that parrots will also utilize other tree species as long as they contain a suitably-sized cavity (Laidler and Laidler, 1977). Clark (1905) even reported a pair of parrots breeding in an old estate chimney near Kingstown. A local guide working along with Laidler and Laidler, 1977 discovered that the deeper the cavity, the more likely it is to be utilized every breeding season, and that holes prone to dampness were least favoured. Competition for nest sites occurs between pairs (Nichols 1974, 1976; Laidler and Laidler, 1977).

5.3 Vocalization

The St. Vincent parrot has a wide vocal repertoire including yapping cries, loud guttural trumpeting *screee-eee-ah*, honking sounds similar to the call of a domestic goose, shrieking *scree-ree-lee-lee*, bubbling and short dog-like scolding sounds, squawks, deep grating *draaak* and dry *sceeeet* sounds (Juniper & Parr, 1998). A loud *quaw quaw quaw* can be heard in flight (E. Kirby, pers. comm. to Forshaw, 1989). Some calls are rather complex and comprised of trills, resonant squawks, whistles

and shrieks (Juniper & Parr, 1998), chortling (Butler, 1988) and rasping squawks to softer squeals, trills and chirps (Laidler & Laidler, 1977). Parrots are invariably noisy when feeding (Laidler and Laidler, 1977) and foraging birds sometimes sound like people squabbling (*see* Juniper & Parr, 1998) or sometimes squeaking like the turning of a rusty lock (Butler, 1988).

5.4 Behaviour

St. Vincent parrots are gregarious birds and may generally be found in flocks of approximately twenty (20) to thirty (30) birds. However, birds are also seen in the wild flying in discernable pairs (Nichols, 1980). Laidler and Laidler (1977) indicate that when flying or immediately after taking flight, loud “quaa-quaa” are produced (see also Butler, 1988), and that, as outline above, feeding is accompanied by a range of sounds. Birds would often remain in the vicinity of the food tree even when disturbed (Laidler and Laidler, 1977).

In the wild, birds display daily activity patterns/flight activity (Lambert, 1983; Butler, 1988; Birdlife International 2000) and like other psittacines, show distinct dawn and dusk peaks of activity (Butler, 1988). Dawn activity begins at about 06:15 and occurs with intermittent lulls until about 08:00 (Butler, 1988). During this time, the majority of birds are seen undertaking short-distance movements, usually singly, in pairs or small groups. Vocalization is far less obvious than during the dusk periods. From 08:00 until midday, there is a lack of flight activity and few sightings can be made. There is however, the occasional short-distance movement between trees to new feeding areas, with parrots heard “chortling” in the canopy. This time is usually spent foraging (Butler, 1988). Flight activity increases in the early afternoons, with short-distance movements observed as birds change trees, forage, preen and rest (Lambert, 1983; Butler, 1988).

Dusk activity begins after 16:00 hrs and peaks between 16:30 hrs and 17:15 hrs, followed by a lull before a second surge in activity just prior to dark (Lambert, 1983; Butler, 1988). The greatest bird activity is observed during these times, with mean group size being larger and individual birds more vocal, calling almost continuously. During this period, a relatively large proportion of long-distance flights (with birds flying very high) can be observed, and represent movements from feeding to roosting sites (Butler, 1988).

The activity of parrots is markedly affected by weather conditions. During heavy rains, parrots tend towards inactivity and become very quiet (Butler, 1988). They often sit still in exposed positions, with the rain splashing off their feathers. When the rain ceases, there is a period of intense vocalization often associated with short-distance flights (Butler, 1988).

During the breeding season, birds can be heard emitting moaning and wailing sounds, associated with the conflicted anxiety of individual birds over whether or not to enter a selected nest cavity.

Wild and captive birds can often be heard emitting very loud squawks, presumably alert calls, in the presence of raptors. This has been observed in the wild, and at the Nicholls Wildlife Complex where there is a resident pair of Black Hawks (*Buteogallus anthracinus*). When these raptors fly over the aviaries, an alert call is given by one bird and then loud continuous squawks can be heard coming from almost all of the other parrots.

5.5 Reproductive biology

The St. Vincent parrot forms loose nesting assemblages of approximately 12 birds, with each pair defending its own nest site but tolerating close proximity of nearby pairs, even often feeding with them (Nichols, 1975). The size of the breeding population may vary from year to year depending on weather and food availability (Butler, 1988; Juniper & Parr, 1998; see also Collar *et al.*, 1992).

Breeding takes place from about February, with eggs laid from April to May. During drier years, birds may lay eggs as early as January/February (Butler, 1988), or as late as August (Laidler and Laidler, 1977). Under especially wet conditions and during wetter years, birds may not attempt to breed at all (Butler, 1988; Juniper & Parr, 1998).

5.5.1 Reproductive potential

The normal clutch size in captive and wild birds is two (Forshaw, 1974; Nichols, 1980; D. Edwards, pers. comm.). If a third egg is produced in the wild, it is pushed aside (Nichols, 1980). In captivity too, the third egg rarely hatches. There had only been one record of a St. Vincent parrot laying three (3) fertile eggs and raising them to fledging (Nichols, 1980) in captivity at that time. More recent data now allow better estimates of this potential, including that important mortality is among juveniles just

after fledging.. In the wild and in captivity, only one or two young are raised, even in the best years (Nichols, 1974; also Low, 1984).

After chicks hatch in the wild, females are said to remove the shells and deposit them some distance from the nest, presumably as a decoy (Laidler, 1977). Nichols (1976) estimates a 50% nest failure due to natural causes. Juvenile parrots may remain with their parents up to the following breeding season (see Butler, 1988) and therefore, while most wild birds are observed in distinct pairs, it is not unlikely to see groups of three or four in the months between breeding seasons.

5.6 Maintenance and breeding in captivity

The earliest record of the St. Vincent Parrot in captivity was that in the Earl of Derby's collection in 1851 and at the Zoological Society of London in 1874. Though St. Vincent parrots are easily tamed and hence one of the reasons they are attractive as pets (Butler, 1988), breeding in captivity is much less simple. Noegel *et al.* (1990) summarized the difficulty of breeding this species in captivity by stating "if ever there was a bird to try one's patience in attempting to captive breed it, this is the one".

The first known captive breeding success of a St. Vincent parrot took place at the Houston Zoological Gardens, USA in 1972 (R.J. Berry *in* Pasquier, 1981). The clutch consisted of two eggs of which only one was fertile. The eggs were laid 4 days apart with the first appearing on the 28th March and the second on the 1st April. Incubation began on the laying of the second egg and the chick hatched by the 25th April. The male was not observed incubating but fourteen days after hatching, when the chick's eyes opened, the male was seen entering the nest box. The chick fledged sixty-seven (67) days after hatching.

Since this original breeding, success has occurred in several other collections, but overall has been variable. Captive breeding of the St. Vincent parrot has been troubled with, among other things, (1) many captive birds existing singly or in many cases unknowing to their owner, in pairs of similar sex, (2) susceptibility to diseases which may often lay undetected for many years and without adequate veterinary detection regimes, (3) limited knowledge of the breeding biology and requirements of this species. Lambert (1983) has also identified mismatched pairings as a factor affecting captive breeding. Historically, sex was determined by behaviour observation during the breeding season and because St.

Vincent parrots are not sexually dimorphic, many 'pairs' were indeed of similar-sex birds. Recent advancements in sex-determination and DNA testing to determine relatedness and compatibility have however served to better guide pairing arrangements of captive birds.

Eggs are white, measuring approximately 46.6 x 38.8 mm (Forshaw, 1989), oval and both ends are rounded. Clutch size normally ranges from 1-3 birds although additional eggs can be obtained if earlier-laid eggs are 'pulled' (R. J. Berry pers. comm. to T. D. Nichols 1980) or if clutch is lost early in the season (D. Edwards, pers. comm.). Infertile eggs are common. Of the total thirty-five (35) eggs laid at the Nicholls Wildlife Complex between 2000 and 2003, twenty-four (24) were infertile (D. Edwards pers. comm.). Hatching occurs approximately 25 to 27 days after laying, although eggs have been hatched as early as 22 days and as late as 30 days after laying (D. Edwards pers. comm.). Incubation begins with the laying of the first egg (Noegel, 1990; D. Edwards, pers. comm.) and thus chicks are normally born a few days apart. Forshaw (1989) states that fledging normally occurs 67-69 days after laying. Records at the Nicholls Wildlife Complex however show that fledging occurs between 67 and 102 days after hatching. The period required before fledging appears to be dependent on several factors including health of the chick and the number of birds in the clutch. Further research will be necessary to further pinpoint the determining factors. In the wild however, chicks may not be allowed the security or time to spend such extended periods in the nest.

During the breeding season at the Nichols Wildlife Complex, nesting pairs are left undisturbed except for cleaning and feeding in the early mornings, and for a second feeding on hatching of the eggs. After hatching, more detailed observations are made of the nest-box and chick(s) to ensure proper physical development and growth, detect illness and ecto-parasites at an early stage and ensure proper feeding.

The diet of captive birds in SVG includes guavas *Psidium guajava*, fresh vegetables, weeds, seeds, bananas *Musa* sp., coconut *Cocos nucifera*, pawpaw *Carica papaya*, bread and milk (Laidler, 1977), citrus *Citrus* sp., mangoes *Mangifera indica*, golden apples *Spondias dulcis*, dunce plums *Ziziphus mauritiana*, Barbados cherries *Malpighia puniceifolia* and a number of other fresh fruits. Additionally, chicken pellets and other commercially formulated foods (made from a variety of grains, seeds and vegetables fortified with vitamins and minerals) are occasionally added as a supplement to ensure a more balanced diet (Crosta, 2001). Calcium supplements are also provided for breeding pairs at the Nicholls Wildlife Complex (D. Edwards pers. comm.).

Artificial incubation and hand-rearing is possible (R. Sweeney, pers. comm.) but parent-rearing is usually encouraged. Exceptions are made when it becomes necessary to remove eggs from diseased parents in an effort to break the disease chain (D. Waugh, pers. comm.), in cases of parental aggression, in birds with a history of egg and chick destruction and in cases of multiple chicks where one is being cared for much more than the other. Sometimes in the latter case, birds are fed supplementally until they are able to beg adequately for food on their own (C. Thomas, pers. comm.).

The Nicholls Wildlife Complex was established with birds obtained from illegal 'holders' in 1988. Establishment of this facility is part of an ongoing effort to maintain a viable on-island population of captive birds as a safeguard in support of the wild population. It also acts as an educational tool and provides an opportunity for research.

5.7 Longevity

The oldest living bird recorded in the International Studbook was born around 1960. However, another specimen has been recorded as living up to 80 years in captivity (R. Sweeney, pers. comm.).

6.0 LEGAL STATUS AND PROTECTION

6.1 Local

Review of pertinent literature suggests that the St. Vincent parrot was afforded protection since 1901 when the Birds and Fish Protection Ordinance came into existence. Under this Ordinance, the parrot was given total protection and it was illegal to kill, wound or capture any parrot, nest, or egg thereof (Forestry Division, 1994).

Later in 1912, a proclamation declared all Crown Lands above 1,000 feet above sea level as forest reserves and essentially gave protection to prime parrot habitats located within rainforest. The first main Forestry legislation followed many years after with the Forest Act No. 25 of 1945 and for many years up to the 1990s provided the legislative framework for the management of key parrot habitats.

These first three pieces of legislation would have had limited impact on curtailing some of the main threats to the conservation of the parrot, namely trade, harvesting and habitat loss. Butler (1988) stated that these measures seemed only as “paper protection” and it was only since the mid-1970s that real concern was shown for the plight of the species.

The most significant piece of legislation to impact on the conservation of the St. Vincent parrot came into being on the 9th November, 1987. The Wildlife Protection Act (WPA) of 1987 made provision for the protection of wildlife and matters connected therewith and incidental thereto. Importantly, the Wildlife Protection Act of 1987 according to Section 30 (2) stated “within three months of the 2nd November, 1987, every person who has a Saint Vincent parrot in captivity shall make an application in writing to the Chief Wildlife Protection Officer for registration of that parrot” and Section 30 (4) indicated that “there shall be no registration or issuing of a license in respect of any parrot kept in captivity after the period provided for under Subsection (2)”. Additionally, for the first time a specially designated parrot habitat came into being in the form of a Wildlife Reserve called the St. Vincent Parrot Reserve of approximately 10,870 acres (Figure 5). Whether the current boundaries of this reserve are adequate remains debateable, given that important areas for the parrots are excluded.

Figure 5: The St. Vincent Parrot Reserve



Source: Forestry Department, Ministry of Agriculture and Fisheries - 2004

According to Section 13 of the 1987 Wildlife Protection Act, offences against totally protected species such as the St. Vincent parrot are liable upon conviction for the first offence to a fine of East Caribbean (EC) \$2,000.00 and, in the case of a second or subsequent offence, to a fine of EC \$4,000.00 and to imprisonment of one (1) year. The Wildlife Protection Act of 1987 replaced the Bird and Fish Protection Ordinance as it pertained to wildlife covered under the new Wildlife Act.

After the passage of the Wildlife Protection Act, another new Act came into being that strengthened habitat protection in some parrot habitat areas. The Forest Resource Conservation Act (FRCA) No. 47 of 1992 replaced the Forest Ordinance (No. 25 of 1945). The Act made provision for the conservation, management and proper use of the forests and watersheds, declaration of forest reserves, cooperative forests and conservation areas, the prevention and control of forest fires, and matters connected with those purposes. The Cumberland Forest Reserve (one of the main parrot habitat areas) was declared under the new Act that enables preservation of flora and fauna according to Part III Section 10 (2)d. Crown Land fire prevention and control measures under the FRCA of 1992 (Part VII) indirectly affords some habitat protection to the St. Vincent parrot.

6.2 International

International protection for the St. Vincent parrot is obtained under the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) to which St. Vincent and the Grenadines became an official member in 1989. The illegal pet trade has been one of the main threats to the conservation of the species, hence CITES (which regulates trade in endangered species) provides invaluable international legal protection for the *A. guildingii*. The St. Vincent parrot is an Appendix 1 listed species which means it is restricted from international trade, except for scientific purposes.

In 1980, the international St. Vincent Parrot Captive Breeding Consortium was formed with the idea of managing their respective parrots as a total population in the interest of the species (Forestry Division, 1994). The members of the Consortium since 1991 have signed an agreement that contains a clause that gives ownership of all St. Vincent parrots held by members of the Consortium to the Government of St. Vincent and the Grenadines.

7.0 THREATS TO THE NATURAL AND CAPTIVE POPULATIONS

Threats to the St. Vincent parrot are generally categorized under anthropogenic or those due to natural factors. Anthropogenic factors by far collectively pose the greatest threats to the survival of the species. Hunting, poaching for the illegal pet trade and habitat destruction and degradation have, over the years impacted to varying degrees on the birds. The natural threats to the parrot have been thought to be minor, particularly during the last twenty years with no volcanic eruption nor major hurricanes affecting the country. Other natural threats due to predation, competition and disease have not been widely studied but are thought to be negligible.

7.1 Natural threats

7.1.1 Volcanic activity

Volcanic eruptions can potentially have a direct detrimental effect on the population and indirectly impact on habitat over a considerable period of time depending on the nature of the eruption. Five volcanic eruptions have occurred since 1717, with three (3) occurring in the 20th Century (1902, 1970 and 1979). The hot ash and toxic gases associated with eruptions have a direct detrimental effect on parrots and other wildlife (Lambert, 1983). After the 1979 eruption, individual parrots died as far south as the Buccament Valley (Nichols, 1980). However, historically habitat destruction caused by volcanic events has been virtually confined to the slopes of La Soufrière and the adjacent areas of Morne Garu and Richmond Peak (Butler, 1988). The La Soufrière volcano is still considered active and any future eruption is likely to have some impact on the population and habitat. A major volcanic eruption on a relatively small island can have a devastating impact on the parrot population.

7.1.2 Hurricanes

St. Vincent and the Grenadines lies within the hurricane belt and is prone to hurricanes annually, during the period June to November. Clark (1905) recorded the effects of the great hurricane of September, 1898. According to Clark, many parrots strayed into smaller towns in such helpless conditions that they fell prey to the villagers. Two St. Vincent parrots were even picked up dead on the shores of St. Lucia. In terms of impact on habitat, Clark stated “on the next day, the island appeared as if it had been swept by fire, there was not a leaf nor any green thing in sight.” Low (1972)

also reported that the species population was terribly reduced at the time of the great hurricane in 1898. The last major hurricane to affect the island was hurricane Allen in 1980. The impact was relatively minor and Lambert (1983) indicated that according to their guide, a large number of the trees which fell in the Colonaire valley were *Dacryodes excelsa* - a noted nest tree for the St. Vincent parrot. One of the most important long-term effects of hurricanes may therefore be on reducing the amount of parrot nest sites. In the short-term, food shortages may occur due to the blowing down of fruits from all trees in exposed situations (Lambert, 1983). According to Snyder *et al.* (2000), both types of natural disasters are to be expected in the future, and can only be effectively countered by a healthy population of parrots in a healthy quantity of habitat and, in view of the vulnerable situation, by a self-sustaining captive population.

7.1.3 Predation and nest site competition

The extent, if any, of predation on eggs, fledglings and adults is still uncertain. Actual and potential predators include the Opossum *Didelphis marsupialis* (Laidler & Laidler, 1977; Nichols, 1974, 1980), rats *Rattus rattus* (Laidler & Laidler, 1977) and the Broad-winged Hawk *Buteo platypterus* (Laidler & Laidler, 1977; Lambert, 1983). Potential nest site competitors include the Scaly-breasted Thrasher, the honey bee (Forestry Department, 1984) and a parasitic fly *Philornis pici*. Laidler (1976) suspected Thrashers but was unable to provide any evidence for them being a competitor. Christian (1993) has stated that there is no unanimous agreement about the predation of parrot eggs and chicks by Thrashers (e.g. refer to Nichols, 1980; Lambert, 1983). However, Butler (1988) further states that the Scaly-breasted Thrasher is unlikely to be a competitor since, unlike the related Pearly-eyed Thrasher which occurs on St. Lucia and Dominica is a competitor of the St. Lucian Amazon (*A. versicolor*) and the Red-necked Amazon (*A. arausiaca*), it is not a cavity nesting species.

7.1.4 Diseases and other health concerns

There is no known or documented disease that has affected the wild population and it is thus thought to be generally healthy. Most of the known diseases and health-related concerns have been established for the captive held population, particularly that outside of St. Vincent.

Although there has been little or no documented evidence of disease or health problems affecting wild populations, several factors suggest the need for caution. For example, some evidence exists that endangered species may have an enhanced susceptibility to disease because of the reduced diversity that can result from small population size (O'Brien & Evermann, 1988; Thorne & Williams, 1988).

Disease risks to the wild population are also not far-fetched since for a relatively small island, there is high importation of consumable chicken products and some degree of imported pets and pet birds. Several habitat areas are also exposed to human contact through hunting, and deforestation activities where inadvertently wild populations can become exposed to disease. In addition, parrots venture into human habitats and plantations for foraging which can further increase their exposure.

Captive populations of St. Vincent parrots are known to be affected by disease and other health-related problems. Noegel *et al.* (1990) stated that these beautifully strong birds have a tendency towards obesity, a dusty feather coat, and a high incidence of skin lesions.

Typical disease and viral infections known to affect or have potential to affect captive St. Vincent parrots include Psittacine Proventricular Dilatation Disease (PDD), avian tuberculosis varieties - *Mycobacterium genavense*, *M. avium*, *M. intracellulare* (de Soye *et al.*, 2002) and *M. tuberculosis* (B. Raphael pers. comm. to D. Bruning), salmonellosis, Pacheco's disease and other herpes infections, and Psittacosis *Chlamydophila psittaci* (Sweeney, und.).

Health analyses of local St. Vincent-held captive populations have found parrots testing positive for Circovirus (PBFDV) and slightly positive for Avian Polyoma virus (Crosta, 2001). The presence of lipomas, obesity and ecto-parasites are also recorded health conditions.

Disease and health conditions have been recorded for several captive birds held outside St. Vincent and the Grenadines. Based on tests conducted in 1989, Life Fellowship Bird Sanctuary in the USA had 70% of its birds cultured out with *Enterobacter sp.* bacteria, 23% had haemolytic *E. coli*, 30% had non-hemolytic *E. coli* and one bird cultured positive for *Staphylococcus* (congluase negative), *Staphylococcus sp.*, and *Salmonella sp.* group C (Noegel *et al.*, 1990).

Avian tuberculosis is currently one of the greatest health concerns of holders of captive St. Vincent parrots. The Chief Veterinarian at the Loro Parque Fundación, Dr. Lorenzo Crosta, has termed it a 'hot potato' for everyone. First of all, there is not one but four species (*Mycobacterium genavense*, *M. avium*, *M. intracellulare* and *M. tuberculosis*) that can cause the disease in Amazons (B. Raphael pers. comm. to D. Bruning; see also Helga Gerlach, *in de Soye et al.*, 2002). According to Crosta, 2001b (*in de Soye et al.*, 2002), *M. avium*, *M. genavense* and *M. intracellulare* are infectious agents. Their capability of infecting a bird is dependant on several factors and, although they are not as aggressive

(in terms of infectivity, not pathogenicity) as other bacteria are, they can easily infect birds when the latter are exposed for a long enough period (Crosta, 2001b *in de Soye et al.*, 2002). Furthermore, this disease can also lay dormant in exposed birds for long periods of time. In one case, a male at the Houston Zoo that was exposed to avian TB, tested negative for six years thereafter, only to have died of the disease in the 7th year (D. Bruning *in* Proceedings of the St. Vincent Parrot Conservation Consortium meeting – February 1999). *M. avium* is also known to survive for at least seven years in soil (Helga Gerlach, *in de Soye et al.*, 2002). For these reasons, and the difficulties associated with disease-detection in living specimens, many birds exposed to the disease have been considered no longer suitable for the captive breeding programme.

As a response to the above concerns, a protocol to deal with avian TB-exposed captive St. Vincent parrots was compiled by a number of veterinarians, curators and other contributors from several organizations on behalf of the St. Vincent Parrot Conservation Consortium and Government of St. Vincent and the Grenadines (see de Soye *et al.*, 2002). Organizations that contributed to this protocol included the Loro Parque Fundación, Wildlife Conservation Society, Paradise Park, Houston Zoo and the International Zoo Veterinarian Group. The protocol addresses issues such as quarantine of exposed birds, and the diagnosis and treatment of the disease, and *'provides recommendations, based on cutting edge veterinarian advice, on ways of carefully incorporating avian TB-exposed females and their offspring ... into the nucleus of healthy reproducing birds, in order to maximise breeding success of the population supervised by the St. Vincent Parrot Conservation Consortium'* (de Soye *et al.*, 2002).

7.1.5 Small population size

The St. Vincent parrot has presumably always had a small population (Butler, 1988) and though the population is at the largest it has been in recent history (refer to Section 4.2), its confinement to a small-island, relatively fragmented ecosystem that is frequented by natural disasters and man-made threats could very well mean that the population will always be relatively small.

Small populations have a greater tendency towards extinction due to loss of genetic variability, fluctuations in genetic and environmental factors or natural catastrophes (Primack, 1998).

Information on the wild population relative to determining effective population size, demographic status and genetic variability is unavailable. Additionally, minimum viable populations have not been determined for either the wild or captive population. Thus conservation of the species has been very

limited and focuses mainly on increasing population numbers. There has been some advancements with the captive population however, due especially to the work of the St. Vincent Parrot Conservation Consortium and the maintenance of the *Amazona guildingii* International Studbook. Genetic analyses are being carried out on more and more of the captive stock and pairings are more scientifically arranged in an effort to reduce loss of genetic variability and prevent genetic drifts. It is however clear that much more research work needs to be done on the population to determine minimum viable populations (MVPs) and ensure that the best and most effective management regimes are put in place.

Several authors have advanced propositions on the numbers of individuals required to maintain genetic variability and avoid inbreeding depression. Wright (1931) and Franklyn (1980) suggest that 50 reproductive individuals will lose 1% and 2-3% heterozygosity per generation – a loss which will cause minimal effect on overall genetic variability. But these results were based on domesticated animals and may not be applicable to wild populations. Lande (1988, 1995) has suggested that protecting 500 to 5000 individuals would adequately preserve genetic variability and allow a minimum number of individuals to survive in catastrophic years and return to former levels (see Section 9.0 for recommendations related to the St. Vincent Parrot).

Research on the bird's habitat and demography will also be necessary to determining minimum viable populations. Though this activity may require some long-term research, determination of MVP can more adequately be used to ascertain the amount of suitable habitat required for this population based on studies of home range size of individuals and colonies of endangered species (Thiollay, 1989).

7.2 Anthropogenic threats

7.2.1 Hunting

For almost three decades now, hunting for food has no longer been a major threat to the population, as noted by Laidler and Laidler (1977), Lambert (1983), Butler (1988), Forestry Division (1984), Juniper and Parr (1998). However, although Lambert (1983) noted that the St. Vincent parrot was not hunted for food, a recent report by Ivor Jackson & Associates (2003) states that the activity is still ongoing.

There is to another concern related to the hunting of other species of game birds such as the Scalynaped Pigeon *Columba squamosa*. Due to the fact that these birds often utilize similar habitats and

feed trees as the St. Vincent parrot, it is not unlikely that parrots may accidentally be shot during the hunting season. One experienced hunter explained of almost having shot a St. Vincent parrot which was feeding in the same tree as a flock of these pigeons (G. Gaymes, pers. comm.).

7.2.2 Pet trade

Butler (1988) has indicated that capture of parrots for pets by natives is a tradition that was adopted after emancipation of slavery and mention was made also of capture of young birds from nests by natives.

Over the years, several authors have noted the capture of birds for export. Gochfeld (1974) mentioned commercial dealing poses the most serious threat to species. In 1973, Andrle and Andrle met a trapper who claimed to have taken ten (10) nestlings in 1973 and Butler (1988) indicated reports from Nichols in 1976 of a person apprehended at the airport whilst attempting to leave with two St. Vincent parrots. Lambert (1983) reported being told by a local poacher involved in hunting up until 1978 that he had caught twenty-seven (27) nestlings during a 2-3 year period. The Forestry Division (1994) in a paper on the conservation of the parrot stated “the illegal trade still occurs, although it is difficult to determine to what extent.” The high price and interest in the bird internationally, coupled with the many open sea exit routes are contributory factors to this purported continuing illegal pet trade.

A recent update of the St. Vincent parrot programme by the Forestry Department in 2001 emphasized that there appeared to be a ‘significant amount of smuggling of St. Vincent parrots for the illegal pet trade’ (Forestry Department, 2001). This statement has been made in light of the increased reports coming from areas known for the poaching of parrots from the nest. It further states that in recent times, poaching of eggs from nest trees had become an important part of the operation and these activities were of greatest significance in South Rivers, Congo Valley, Jennings Valley and areas of the North Leeward portion of the island. Foreign parrot smugglers were rumoured to be changing their approach to smuggling birds out of the island by increasing their focus on the purchase eggs instead of chicks, as otherwise done in the past (B. Johnson, pers. comm.). Local persons, some of them prominent, therefore supply foreigners with eggs and birds which are most likely shipped out via sea exits.

The Forestry Department is aware of St. Vincent parrots in the Czech Republic, held by a known Amazon parrot smuggler, and it is rumoured that another 40 were being held in Germany in 1994. In

addition, there were reports that there were presumably 6 birds in Switzerland in 1999 (D. Bruning *in* Proceedings of the St. Vincent Parrot Conservation Consortium meeting – February 1999).

7.2.3 Habitat degradation

Throughout the population's history, deforestation has apparently been the greatest threat to the bird. Historically, many authors have attributed the population decline to deforestation (Gochfeld, 1974; Lambert, 1983; Forestry Department, 1994; AvianEyes, 2003). For example, Nichols (1980) showed that Mesopotamia had supported a population of approximately 30 birds in 1978. However, by 1982, Lambert (1983) found that agriculture development for banana production had resulted in the loss of almost all of that forest.

Charcoal production using middle-aged Gommier *Dacryodes excelsa* was seen as a threat that had destroyed many potential nest trees in Colonaire valley in 1982 (Lambert, 1983). The tendency on part of artisan charcoal producers to utilize selected mature rainforest species such as Gommier *D. excelsa* and *Inga* spp. for charcoal production will eventually impact the parrot's food supply and potential available nest cavities (Lambert, 1983) and trappers had also damaged or destroyed nest sites by cutting open trees to obtain the young (Snyder *et al.*, 1987).

Butler (1988) classified deforestation into four (4) eras: the 1500 - 1630 era of early settlers with disturbance confined to lowland coastal areas; the 1630s - 1880s when extensive monoculture began and forests were cut to produce energy for sugarcane factories; 1880s - 1940s, with the abolition of slavery, and leasing of subsistence plots in upland areas; and 1940s - 1988 increases in population, energy and agriculture demands saw more forested areas being cleared. Agriculture and illegal marijuana cultivation still continue to eat away at and affect prime habitat areas up to today. According to the Forestry Division's update of the St. Vincent Parrot Conservation Programme (und.), deforestation was listed as one of the three (3) factors that may be attributed to a decrease of parrot numbers recorded in some areas during the 1999 Parrot Census. Butler (1988) suggested that the St. Vincent parrot is probably confined to approximately 15% of its original range due to human activity.

From the late 1960s to present, there have been efforts by the Forestry Department to reforest several patches within Secondary Rainforest and prime habitat areas. Many of the species utilized (*Pinus caribaea* and *Swietenia macrophylla*) are of no value for St. Vincent parrots in terms of food and nest trees and instead represent, to a great extent, degraded habitat. Though Butler (1988) recommended

that indigenous species be given priority for use in reforestation efforts, there has still been a concerted focus on fast-growing, commercial exotics.

These introduced species also cause some threat to the natural habitat of the St. Vincent parrot. Just over five years ago, there was a serious concern over the possible impacts of the Hibiscus Pink Mealybug *Maconellicoccus hirsutus* (which had already done considerable damage in Grenada) on the forests of St. Vincent, particularly because of the use of *Hibiscus elatus* as a reforestation species within the natural forest. This further illustrates the need to use indigenous species in reforestation efforts. These species are already adapted to local conditions and may have higher pest and disease resistance.

The impact of the Armadillo *Dasypus novemcinctus* which was introduced as a game species in 1973 (Ivor Jackson & Associates, 2003) is of major concern to the Forestry Department at the moment. Armadillos undermine large trees, along bank-sides, uproot soil and in many cases are causing overall increases in erosion within the forest ecosystem. Additionally, the hunting of the Armadillo as a game species has not been very effective in controlling the population, and hunting of this species is not allowed within the protected habitats, allowing the population the opportunity to multiply in some of the most critical areas. There is apparently now a general population explosion of the Armadillo. Continued undermining of trees leave them susceptible to toppling and erosive soil activities reduce the regenerative potential of the forest in some areas. Addressing the effects of this invasive species will be crucial to maintaining the integrity of this important habitat.

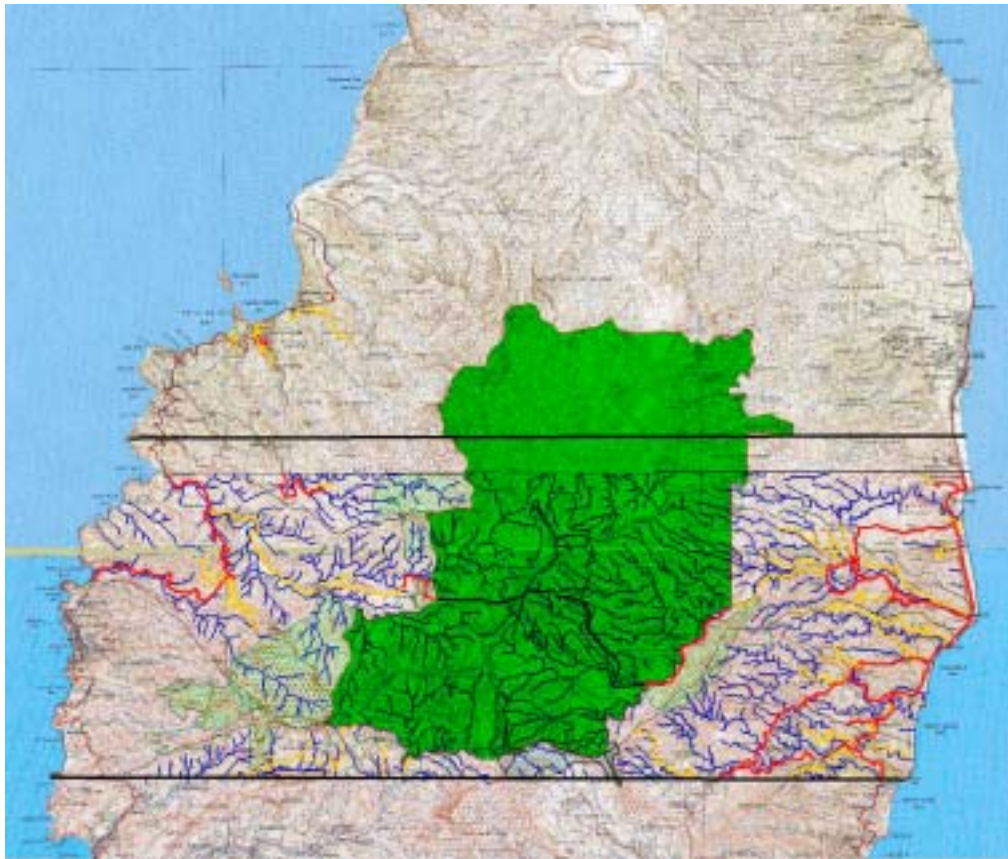
Mention must also be made of the Government of St. Vincent's intention to construct a cross country road with the potential to impact significantly on the parrot population, and other wildlife and habitat. In an environmental catalogue of the proposed route for the road, Ivor Jackson & Associates (2003) highlighted several issues of concern should the road be constructed. These concerns include further deforestation for marijuana cultivation, continued squatting and encroachment into Crown Lands, hunting and illegal trading of parrots, pollution of rivers and loss of biodiversity. The report also acknowledged the limitations in capacity of the Forestry Department to undertake the necessary surveillance and enforcement of legislation.

With specific reference to the St. Vincent parrot, the report underlines the grave issues of theft of chicks and eggs from nest sites, and the continued hunting of the species for food, which could lead to

the extinction of this endemic species. It summarizes that without strict surveillance and strong penalties, parrot theft and smuggling could escalate if the cross country road provides easier access to its habitat. Figure 6 illustrates the proposed inclusive zone for construction of the road which is intended to connect the western and eastern portions of the island. It also shows this zone relative to the present St. Vincent Parrot Reserve. A final decision for the road's specific location has not yet been advanced but any such road constructed within the proposed zone will bisect and open up prime wildlife habitat and watershed areas.

The Forestry Department, the St. Vincent Parrot Conservation Consortium, and several other local and international persons and organizations have expressed concerns about the road to the Government and people of the St. Vincent and the Grenadines. The St Vincent Parrot Conservation Consortium, in October 2003, presented a resolution to the government to urge a re-routing of the proposed cross-country road to outside of the zone where the greatest ecological damage and threat to the survival of the St Vincent Parrot could occur. Nevertheless, recent thrusts illustrate the political will to complete this endeavour. All of the above being said, the need for urgent implementation of many of the actions outlined in this Plan and continued dialogue between the Forestry Department and other agencies such as the Roads Department will become even more crucial.

Figure 6: Map showing inclusive zone for construction of the Cross Country Road St. Vincent



Source: Forestry Department, Ministry of Agriculture and Fisheries - 2004

(Note: Inclusive zone is indicated by arrows and located between the two darkest horizontal lines)

8.0 CONSERVATION MEASURES TO DATE

As stated earlier, although conservation efforts for the protection of the St. Vincent parrot started with the Bird and Fish Protection Ordinance of 1901, followed by incidental protection through the establishment of Crown Lands above 1000 ft in 1912 and the Forest Act of 1945, and then later in 1979 by the declaration of the parrot as the national bird of St. Vincent, these legislations and declarations did little to protect the species, and thus, much of the illegal harvesting continued.

It has only been since the mid-1970s that real concern has been shown for this species (Butler, 1988), through the initiative of the Forestry Division, which was at the time directed by Mr. Calvin Nicholls and its St. Vincent parrot conservation programme that this species received the kind of attention that recorded positive changes for its well-being. The following summarizes the major conservation activities and efforts to date.

1970s – mid-1980s:

- Ongoing research by several individuals including Andrle and Andrle (1975), Nichols & Nichols (1973), Nichols (1974, 1976, 1980), Lack *et al.* (1973), Laidler (1977), Laidler & Laidler (1977), Lambert (1983) which served to provide earlier information on the biology and ecology of the parrot and highlight the plight of the species.

- Limited reforestation work using species such as *Hibiscus elatus* and *Pinus caribaea*.

1979: The St. Vincent Parrot is declared the national bird of St. Vincent and the Grenadines, during the national independence celebrations. This was followed by poster depictions of the parrot donated by the Jersey Wildlife Preservation Trust and were distributed throughout the island (Butler, 1988).

1980: Formation of the International Captive Breeding Consortium for the St. Vincent Parrot (recently renamed the St. Vincent Parrot Conservation Consortium), and commencement of International Studbook. Since then the Consortium has also been involved in transferring and pairing of captive held birds outside St. Vincent to improve captive breeding potential.

1982/83: Funding proposals sent to World Wildlife Fund (US) and Jersey Wildlife Preservation Trust International to assist with procurement of a four-wheel-drive vehicle to assist with patrol work, radio communications equipment, repair of a ranger station, training for forestry personnel in wildlife management techniques and to establish an aviary. These proposals arose out of a visit by Paul Butler of RARE Centre for Tropical Bird Conservation and Gabriel Charles of the St. Lucia Forestry Department who were already conducting similar activities with success in St. Lucia.

1987:

- RARE Centre for Tropical Bird Conservation offered to fund technical assistance to replicate the successes of the conservation programme for St. Lucia's *A. versicolor* whose population had increased from 100 birds in 1977 to 200 – 250 ten years later.
- The Wildlife Protection Act was passed and the Birds and Fish Protection Ordinance repealed as pertained to wildlife covered under the new Act.
- Establishment of a 10, 870 acre St. Vincent Parrot Reserve

1988:

- Commencement of a one-year conservation programme through Mr. Paul Butler and a financial investment from RARE of US \$37, 400.00. The terms of reference of this contract included conducting of interviews to determine public perception of the forest and St. Vincent parrot; the registration and banding of all captive birds on the island; providing assistance with the revision of the Birds and Fish Protection Ordinance; the design and distribution of environmental education materials; the censusing of the wild population of parrots; and provision of an overview and management guideline for the proposed Parrot Reserve which was to be established by the Government of St. Vincent and the Grenadines.
- Commencement of an ongoing biennial census of the wild population, ongoing monitoring of captive population, and registration and banding of all new birds born into captivity (since 1988). (Any other un-banded or unregistered birds discovered are considered illegally possessed).
- Construction of the Nicholls Wildlife Complex and commencement of captive breeding facility at the Botanic Gardens.

1989: St. Vincent and the Grenadines becomes a signatory to the Convention on the International Trade in Endangered Species of Flora and Fauna.

1993: Forestry Officer Fitzroy Springer visits the Jersey Wildlife Preservation Trust to observe techniques in captive breeding.

1989 to 1994: The Canadian International Development Agency (CIDA) Project

- To enhance the Forestry Department's capacity to manage the forest resources of St. Vincent and the Grenadines. Components included activities such as reforestation, silvicultural and watershed management, construction of a Forestry Department headquarters, survey of forest boundaries, training of staff in the science and practice of forestry, recreation management and forest utilization; preparation of the Forest Resources Conservation Act, No. 47 of 1992; environmental education.

1996, 2000 & 2001: Visits to St. Vincent made by Emily Ladwig of New York Zoo, Michael Russello a New York student, and Dr. Lorenzo Crosta Chief Vet at Loro Parque, respectively. These visits were made to assist with the captive management programme and obtain feather samples for DNA analysis in the first two incidences, and to assess the health status and management programme of the St. Vincent parrot in the latter case.

2001: Commencement of the Integrated Forest Management and Development Programme which aims to assist the Department in achieving its mission of protecting and developing the forest resources of St. Vincent. Such improved forest resource management is expected to greatly benefit the parrot and its habitat. The Programme has three main components: the strengthening of the Forestry Department provision of infrastructure, equipment and human resource development; a project management unit; and an alternative livelihood project aimed at providing viable alternative economic gains to rural areas and thus reduce the negative impact on the forest (Providence, 2003).

2003: Chief Veterinary Officer, Dr. Kathian Herbert-Hackshaw visits Loro Parque for training in aspects of avian medicine, including physical examination and avian nursing and surgical procedures.

- Collaborative research between the Forestry Department and Independent Researcher on the Food and Nest Site selection of the St. Vincent Parrots in the St. Vincent Parrot Reserve.

9.0 MAINTAINING A VIABLE CAPTIVE POPULATION

Although many of the holders of St. Vincent parrots who are non-members of the St. Vincent Parrot Conservation Consortium agree to a moral obligation to assist the Government of St. Vincent in the conservation of the species, the fact that these captive birds are not managed as an entire population has led to the relatively haphazard and uncoordinated breeding of the species. In this way, minimizing loss of genetic diversity, attaining a minimum viable population in captivity and preventing inbreeding may not be effectively achieved. It is thus likely that although birds are increasingly being paired according to least relatedness, the loss of genetic diversity is occurring at a greater rate within these smaller captive populations than would occur if the foreign stock were managed as one population.

According to Allendorf (1986), the loss of heterozygosity should be a concern for all captive breeding managers. Foose *et al.* (1986) have indicated that the retention of at least 95% of the genetic variance present in ancestral populations should be the aim of population managers.

Within a population, genetic diversity comes primarily from the founders¹ (Ballou, 1984). A larger number of founders can produce a higher number of offspring and thus, the sooner the population will reach its target size (Ballou, 1984; Soulé *et al.*, 1986). Soulé *et al.* (1986) have recommended that a number of greater than 20 founders is optimum for ensuring preservation of 95% of the genetic diversity over 200 years (see also Foose *et al.*, 1986). Fewer than 6 founders will cause the group to lose more than 10% of its genetic variation as soon as it reproduces (De Boer, 1985). Thus, the fewer the individuals comprising the founder populations, the more different it will be from its original large population (De Boer, 1985).

In a study conducted on the Northern Helmeted Curassow *Pauxi pauxi* of Venezuela, Diaz Matalobos (1991) sought to simulate growth and management of three hypothetical captive founder populations, utilizing available computer software (such as SPARKS, GENES, CAPACITY and VORTEX), under three different conditions to give an indication of efforts required for an effective cooperative programme (see Appendix 4). For a further explanation of the methods utilized, see Diaz Matalobos, (1991). It is strongly recommended that similar modelling is undertaken for the captive population of

¹ An animal from a source (e.g., wild) population that actually produce offspring and has descendents in the living derived (e.g., captive) population (Foose, 1991 *in* Diaz Matalobos, 1991).

the St Vincent Parrot, in particular to predict what amount of space in captivity might be required after defined periods of time.

The results from these three populations showed that for a population of 20 founders, it was possible to sustain 90% genetic variability over 200 years but that it was impossible to retain 97.5% genetic diversity over any length of time and that a larger number of founders (> 35) was required for this percentage of heterozygosity (Diaz Matalobos, 1991). In a population of 10 founders, a reasonably effective size could not be maintained and it could only reach 87.5% of the heterozygosity with a very high carrying capacity. Furthermore, to reach 90% of the heterozygosity, this population needed a larger number of founders.

In the third population, ten founders were also used but this population differed from the second in that some eggs were foster-reared instead of parent-reared (those from double-clutching) (Diaz Matalobos, 1991). This third population could achieve 90% of retained genetic diversity with a huge carrying capacity for 200 years but 10 founders were unable to achieve a higher percentage of heterozygosity in the long-term, needing twice the number of founders and an immense carrying capacity.

The findings of this study conducted by Diaz Matalobos (1991) therefore supported the submissions of previous authors such as Ballou (1984), Foose *et al.* (1986) and Soulé *et al.* (1986), and have been used to guide recommendations for captive management of the St. Vincent parrot, in the interim, until data are obtained from more in-depth analyses of the population's viability and the Minimum Viable Population required for long-term survival of the species.

Recommendations

In the management of the founder population to achieve a minimum viable population, the following recommendations need be taken into consideration.

1. Based on the research of Diaz Matalobos (1991), Foose *et al.* (1986) and Soulé *et al.* (1986), the author of this conservation plan recommends that a total of between 20 and 26 founders can be used as a minimum feasible number to initiate an effective captive breeding programme for the St. Vincent parrot (see Action 6a).

As previously shown, a minimum of 20 founders will be required to maintain 90% genetic diversity (Soulé *et al.*, 1986), while a higher number of greater than 35 founders will retain 97.5% genetic diversity over any length of time (Diaz, Matalobos, 1991; see also Lacy, 1989).

The International Studbook for *A. guildingii* indicates that there are currently 21 founders listed. Recognizing the fact that not all legally-held birds are represented within this studbook, the present founder population is possibly larger than currently known and thus, these birds, if adequately deployed and managed can successfully support the *ex-situ* conservation efforts for the species and ensure maintenance of the recommended levels of diversity.

2. Founder equalization is essential for reduction of long term loss of alleles (Jones *et al.*, 1985).

A sufficient number of founders is not the only requirement to ensure preservation of genetic diversity over generations, but founder equalization will be essential from the onset of the captive breeding programme (Templeton, 1990). If all founders contribute equally to the descendent population, the Founder Equivalents² remains the same as the actual number of founders (Diaz Matalobos, 1991). Unequal contribution results in fewer Founder Equivalents. Thus, according to Lacy (1989), a reduction in Founder Equivalents relative to actual numbers of founders will mean an over representation of some founders with minimal contributions of others. Authors such as Jones *et al.* (1985) consider that equalizing representation is even more important than minimizing inbreeding coefficients in genetic management.

3. Planning should be organized at the international level to allocate the number of individuals necessary within the available captive institutions (Soulé *et al.*, 1986). These allocations should be overseen by the Forestry Department and the St. Vincent Parrot Conservation Consortium.

² The number of equally represented founders that would produce the same gene diversity as that observed in the surviving population, acknowledging the founder alleles have already been lost due to bottlenecks. Founder equivalents measures the loss of genetic diversity due to the uneven representation of founder lineages in the surviving population (Foose, 1991 *in* Diaz Matalobos, 1991).

When a new programme is initiated, the equalization of founder contributions should be a priority. In already-established populations, caution should be taken to aim for this and a good genetic analysis of each individual should be done before further breeding (Diaz Matalobos, 1991).

4. Once the population has reached its Carrying Capacity, it should be stabilized at this point by demographic management (Diaz Matalobos, 1991). A way of pursuing this is to maximize Generation Times to retard the loss of genetic variation over time (Foose *et al.*, 1986).

The following recommendations have been adapted from Diaz Matalobos (1991) and are applicable to the current conservation plan.

5. Different populations should be bred in different countries with a single population management ideal, in other words, subpopulations should be managed as a whole.
6. Programmes should be based on the long-term with constant review over short periods of time.
7. While the population is reaching its Carrying Capacity the sex ratio should be equalized, and the same as family sizes. Also, avoidance of inbreeding should be a management target.

10.0 STRATEGY FOR CONSERVATION OF THE ST. VINCENT PARROT

The actions contained in this plan focus primarily on the conservation of the species in its natural habitat. The merit of the captive breeding programme both on and off the island is recognized but is not proposed as a long-term solution to the recovery of the species (though maintenance of a minimum viable captive back-up stock and education role are considered).

Ongoing population censuses show at minimum a stability in the wild population of St. Vincent parrots, and while the impacts of natural and anthropogenic threats are real and can be disastrous, the species has shown itself time and again to be very resilient to major, catastrophic events.

It is proposed that current conservation measures in the forms of habitat improvement and protection, increased law enforcement, reduction in the illegal pet trade and improvements in species research and management will go a long way in ensuring that the species is secured against natural disasters. Furthermore, captive breeding for re-introduction should not be seen as priority in light of the growing population, limited knowledge of the bird's ecology (habitat requirements, food, impacts of disturbance), and other associated problems such as introduction of disease into the wild population, domestication of birds, poor socialization and problems with predator recognition and avoidance.

Population Viability Analyses and habitat carrying capacity must be determined for the species to provide a focus for management of the wild and captive populations.

Finally, the captive populations should be seen as an available tool for research, conservation education and exhibitions (see Snyder *et al.*, 1996) and in many cases these should perhaps be the activities that are given priority for captive stock.

10.1 Overall objectives

1. To achieve measurable improvement in quality and quantity of habitat available, and direct protection of free-living birds, for a sustainable maximum wild population.

2. To achieve a healthy minimum viable captive population that is strategically located within facilities in and outside of St. Vincent and the Grenadines.

10.2 Specific objectives

1. To enhance habitat and species conservation and management programmes for the St. Vincent Parrot.
2. To review and improve the legal and institutional framework governing species conservation.
3. To develop and implement species research and monitoring programmes.
4. To increase public awareness and involvement through development and implementation of public education programmes.
5. To increase the capacity of the St. Vincent Government staff and other persons to implement species conservation strategies.
6. To improve the captive management programme for the St. Vincent parrot.
7. To establish a functional conservation plan monitoring and review body.

10.3 Conservation criteria

1. All priority habitat areas outside the St. Vincent Parrot Reserve have been identified and protection status designated under the Wildlife Protection Act.
2. Forest management strategies are implemented to quantitatively and qualitatively improve key habitats for the species.
3. Legislation is reviewed and legal and institutional measures are implemented to protect habitat and species with conservation threats reduced to negligible levels.
4. Research conducted to determine population viability, trends and distribution; derive greater understanding of the bird's ecology and natural and anthropogenic threats impacting upon the species.
5. Public education programme is conducted to improve conservation awareness levels among the populace and provide positive conservation attitude towards the species.
6. Training is obtained for Forestry Department and other support personnel in conservation of the species.

7. Minimum viable captive population is achieved, and captive population managed according to captive management standards and guidelines.
8. Functional conservation plan review body with monitoring and review of plan is achieved.

10.4 Definition of action plan priorities

Category 1

- Action that would immediately impact on the conservation of the species and the habitat in the short term.
- Activities, particularly research and monitoring, which will contribute information and knowledge to inform the conservation plan.
- Generally, activities, due to availability of expertise and resources, that can be successfully implemented in the short term.

Category 2

- Actions in the medium and long term that will result in improvement in the following: – protection of the habitat against man-made threats; improved qualitative and quantitative habitat attributes.
- Activities that will contribute towards the improvement in the overall habitat requirements and conservation of species within the geographical range.
- All activities that will heighten awareness level among populace and contribute towards engendering national pride in the bird as a national symbol.

Category 3

- All activities that will contribute in the long-term to improving the conservation status of the bird and which may need resources that are not immediately available.
- All actions that will contribute information and knowledge to facilitate implementation of previously mentioned activities.

10.5 Action plans

The action plans outline all the stated activities that need to be implemented to fulfil the seven specific objectives for the conservation of the species, during and after the conservation plan period. The categorization of the relative importance of the suggested activities are indicated as well as implementation responsibility and time frame for execution. Result indicators are also specified as a basis to determine the success of actions.

10.5.1 Action plan outline

Action plans have been grouped according to the specific objectives as outlined above. Each action plan contains information under the following sub-headings:

Aims: A synopsis of the Action plan's main objectives.

Justification: A statement of project need and/or urgency.

Description: Outlines some possible ways of how the aims might be achieved.

Time scale: The length of time implementation of the Action plan might last, including the time needed to set up and execute the required action(s).

Resources: No estimations of cost are attempted, the rationale being that the budget estimates for any actions should be current, and establishes at the time that proposals are developed for projects to address specific needs as presented in this Plan.

10.5.2 Result indicators

Result indicators (Table 2) are enumerated for each action plan to serve as a guide when evaluating the status and success of the actions contained in the conservation plan.

10.6 Conservation plan review process

It is envisaged that an immediate priority will be the establishment of a conservation plan review body to coordinate the implementation of actions contained within the plan and conduct reviews. The review body is expected to convene annually to review, identify and allocate resources for conservation plan implementation as well as review progress of plan implementation. The St. Vincent Parrot Conservation Consortium and Forestry Department will determine persons to be a part of this team. It is recommended that the numbers be kept to a maximum of five (5) persons to facilitate

effective functioning. Additional expertise may be co-opted where necessary to provide advice and recommendations to the process. Decisions will be made via consensus. It is expected that the roles of the review team will include the following:

- Review and monitor conservation plan implementation,
- Source and identify expertise and resources to facilitate plan implementation,
- Resolve difficulties that may arise during plan implementation,
- Facilitate adjustments and changes that may be required during plan implementation.

Table 1: Relationship between specific objectives, conservation criteria and actions

Overall objectives	Specific objectives	Conservation criteria	Actions
<p>To achieve measurable improvement in quality and quantity of habitat available for a sustainable maximum wild population.</p>	<p>1. To enhance habitat and species conservation and management programmes for the St. Vincent Parrot</p>	<ul style="list-style-type: none"> ● All priority habitat areas outside the St. Vincent Parrot Reserve have been identified and protection status designated under the Wildlife Protection Act. ● Forest management strategies are implemented to quantitatively and qualitatively improve key parrot habitats for the species. 	<p>Action 1a: Demarcate St. Vincent Parrot Reserve Boundaries</p> <p>Action 1b: Increase protected habitat</p> <p>Action 1c: St. Vincent parrot habitat rehabilitation</p> <p>Action 1d: Establish forest patrol unit</p> <p>Action 1e: Develop a wildlife management Programme</p> <p>Action 1f: Control and strictly regulate importation of exotic birds into St. Vincent and the Grenadines</p> <p>Action 1g: Increase networking to reduce the illegal pet trade</p> <p>Action 1h: Strict regulation of developmental activities within Reserves and protected habitats</p>
	<p>2. To review and improve the legal and institutional framework governing species conservation.</p>	<ul style="list-style-type: none"> ● Legislation is reviewed and legal and institutional measures are implemented to protect habitat and species with conservation threats reduced to negligible levels. 	<p>Action 2: Review and improve existing Wildlife Protection Act and fulfil guidelines stipulated by the Act.</p>
	<p>3. To develop and implement species research and monitoring programmes.</p>	<ul style="list-style-type: none"> ● Research conducted to determine population viability, trends and distribution; derive greater understanding of the bird's ecology and natural and anthropogenic threats impacting upon the species. 	<p>Action 3a: Conduct species and habitat research</p> <p>Action 3b: Nest site monitoring</p> <p>Action 3c: Review of census method</p> <p>Action 3d: Captive breeding research</p> <p>Action 3e: Population viability analysis</p> <p>Action 3f: Assess habitat areas for types and magnitudes of anthropogenic threats</p>

	4. To increase public awareness and involvement through development and implementation of public education programmes.	<ul style="list-style-type: none"> Public education programme is conducted to improve conservation awareness levels among the populace and provide positive conservation attitude towards the species. 	<p>Action 4a: Develop and implement national education and awareness programmes</p> <p>Action 4b: Develop St. Vincent parrot conservation workbook and related materials</p> <p>Action 4c: Enhance educational and interpretive potential of the Nicholls Wildlife Complex</p>
	5. To increase the capacity of the Forestry Department and other personnel to implement species conservation strategies.	<ul style="list-style-type: none"> Training is obtained for Forestry Department and other support personnel in conservation of the species. 	<p>Action 5a: Training of staff and other personnel to develop a human resource base to facilitate conservation of the species</p> <p>Action 5b: Training of support personnel</p>
To achieve a healthy minimum viable captive population that is strategically located within facilities in and outside of St. Vincent and the Grenadines.	6. To improve the captive management programme for the St. Vincent parrot.	<ul style="list-style-type: none"> Minimum captive viable population is achieved, and captive population managed according to captive management standards and guidelines. 	<p>Action 6a: Enhance management of captive population</p> <p>Action 6b: DNA and related analyses of the captive population</p> <p>Action 6c: Improve conditions for captive birds</p> <p>Action 6d: Construct additional facilities at the Nicholls Wildlife Complex</p>
	7. To establish a functional conservation plan monitoring and review body.	<ul style="list-style-type: none"> Functional conservation plan review body with monitoring and review of plan is achieved. 	<p>Action 7: Manage conservation plan process through a conservation plan team</p>

Table 2: Conservation plan actions and corresponding result indicators

Actions	Result indicators
Action 1a: Demarcate St. Vincent Parrot Reserve Boundaries	The physical boundaries of the St. Vincent Parrot Reserve are demarcated
Action 1b: Increase protected habitat	Gaps assessed for expansion and additional habitat area legislated for protection of the parrot.
Action 1c: St. Vincent parrot habitat rehabilitation	Forest management programmes implemented to improve quality of available habitat
Action 1d: Establish forest patrol unit	Forest patrol and monitoring unit developed and functional. Reduction of illegal wildlife-related activities within habitats.
Action 1e: Develop a wildlife management programme	Wildlife management programme with required staffing for the Unit developed.
Action 1f: Control and strictly regulate importation of exotic birds into St. Vincent and the Grenadines	Assessment conducted to facilitate stricter monitoring and control of exotic bird importation.
Action 1g: Increase networking to reduce the illegal pet trade	Information sharing and intelligence network established to detect illegally traded birds and prevent illegal pet trade.
Action 1h: Strict regulation of developmental activities within Reserves and protected habitats	Strict regulatory framework established to prevent infrastructure development and other non-compatible and negative activities within Reserves.
Action 2: Review and improve existing Wildlife Protection Act and fulfil guidelines stipulated by the Act.	Wildlife Protection Act is reviewed and upgraded with required regulations developed.
Action 3a: Conduct species and habitat research	Information available on the species biology and ecology
Action 3b: Nest site monitoring	Information available on the St. Vincent parrot's nesting ecology. Nest sites identified and mapped
Action 3c: Review of census method	Census methods are reviewed, improved and available for use in the 2006 census.
Action 3d: Captive breeding research	Co-ordinated captive research programme initiated among local and foreign held populations.
Action 3e: Population viability analysis	Minimum viable population estimates (wild and captive) determined.
Action 3f: Assess habitat areas for types and magnitudes of anthropogenic threats	Relative anthropogenic threats and magnitudes determined.
Action 4a: Develop and implement national education and awareness programmes	Implementation of a national education programme to increase public awareness about the St. Vincent parrot and its habitat.
Action 4b: Develop St. Vincent parrot conservation workbook and related materials	Parrot workbook and other educational material developed and available for educational use.
Action 4c: Enhance educational and interpretive potential of the Nicholls Wildlife Complex	Interpretive centre at the Nicholls Wildlife Complex completed and functional
Action 5a: Training of staff and other personnel to develop a human resource base to facilitate conservation of the species	Staff trained to improved wildlife management expertise within the Forestry Department

Action 5b: Training of support personnel	Security and administrative personnel at entry and exit ports trained to enhance detection and law enforcement in illegal pet trade.
Action 6a: Enhance management of captive population	Components of captive breeding programme implemented to achieve a viable and healthy captive population.
Action 6b: DNA and related analyses of captive population	DNA and endoscopic analyses conducted on all captive stock and information included in International Studbook
Action 6c: Improve conditions for captive birds	Standardized husbandry manual produced for management of captive population to ensure maintenance of a healthy stock.
Action 6d: Construct additional facilities at the Nicholls Wildlife Complex	Required breeding aviaries and facilities, including emergency installations, constructed.
Action 7: Manage conservation plan process through a conservation plan team	Conservation plan team is established and functional

ACTION 1: ENHANCE HABITAT AND SPECIES CONSERVATION

Action 1a: Demarcate St. Vincent Parrot Reserve boundaries	
<i>Aims</i>	To ensure physical delineation and protection of the present St. Vincent Parrot Reserve.
<i>Justification</i>	Habitat loss continues to be one of the main threats to <i>A. guildingii</i> population and distribution. Efforts to establish a Reserve have been successful but the absence of clear boundaries does not facilitate effective enforcement and protection, and allows for encroachment, marijuana cultivation and other squatting-related activities. A physical boundary is therefore key to effective management of this resource (and all other areas set aside for protection of the species).
<i>Description</i>	<p>A cadastral survey of the 10, 870 acre St. Vincent Parrot Reserve boundaries, along with installation of clearly-defined boundary markers (monuments) and signs where necessary along the periphery. These markers may be placed for example, near possible access routes and areas of potential encroachment. It will also be necessary to survey and demarcate boundaries of any other area designated for the species' conservation, particularly if the current Reserve is expanded as recommended in Action 1b.</p> <p><i>Note:</i> Survey and installation of monuments can be done via the Government's Surveys Department in the Ministry of Agriculture or by a private survey firm.</p>
<i>Responsibility</i>	Forestry Department with support of the Lands and Surveys Department. Support could also be obtained through the Integrated Forest Management and Development Programme.
<i>Time frame</i>	This work may begin in year 1 of the Plan and should be completed within a one to two year period.
<i>Funds/resources needed</i>	Funds will be needed for surveyors, monuments, signage and field workers.

Action 1b: Increase protected habitat	
<i>Aims</i>	To identify gaps in the protected habitat for the St. Vincent parrot and to advocate its expansion or the designation of additional protected areas (as a means of protecting critical habitat areas).
<i>Justification</i>	<p>Several areas such as Congo, Byera and Jennings valleys, Belleisle, Convent, Fenton and other areas of high parrot activity are currently not within designated protected areas (see Appendix 1). Acquisition and inclusion of these areas as protected areas will ensure that these habitats and populations are protected and managed for this and other wildlife. It will also allow for control of negative activities such as game hunting and developments such as roads which are currently possible in some parrot habitat areas. Assessments of habitat areas is also essential in ensuring that the most effective protected areas system is implemented and limited conservation resources are targeted in the most effective areas.</p> <p>Habitat loss is also a key factor which continues to threaten the survival and distribution of this and other protected species. Protection of all areas within the bird's range will reduce fragmentation and increase overall area of protected habitat. Furthermore, in the absence of information which will only be obtained through further research on the species ecology, it is pertinent that as much of its habitat areas as possible are protected.</p>
<i>Description</i>	<p>Surveys should be conducted and assessments made of both habitat and population distribution to identify areas of high parrot densities and occurrence (especially for example, those used for nesting, foraging, roosting). These assessments must be conducted within and outside existing protected areas. Gaps located within the current protected area should inform recommendations or advocacy for inclusion for protection. The results of these assessments will be used to determine value of these areas and priorities for action, expansion of current Reserve or identification of new or additional localities for protection. Expansion of the protected area needs also to consider availability of suitable habitats that are located as far south from the volcano as possible to provide a safer habitat zone in the event of volcanic activity.</p> <p>In the case of private ownership, lands could either be acquired through purchase, or in exchange for state-owned lands elsewhere. Additionally, other options may be explored such as including those lands as protected habitats through cooperative agreements etc.</p>
<i>Responsibility</i>	Forestry Department, Lands and Surveys Department and Ministry of Agriculture. Consortium assistance will be required in the case of locating funds for land acquisitions through purchase. The Integrated Forest Management and Development Programme could also play a significant role in habitat improvement and management and may provide some financial resource.
<i>Time frame</i>	Ongoing – Detailed research work will be required to assess habitats during the first two years. Additionally, ongoing work will be required to justify site importance and advocate their inclusion as protected areas. In the case of private lands, time will be required to establish legal agreements or locate funds for purchase.
<i>Funds/Resources needed</i>	Funds will be needed to recruit, train and equip personnel for the programme; and to develop management plans for the selected areas.

Action 1c: St. Vincent parrot habitat rehabilitation

<i>Aims</i>	To encourage continued establishment of natural forest, and reforest and enrich the St. Vincent Parrot Reserve and other protected areas using indigenous plant species while managing exotic plantations within habitat areas for conversion to natural rainforest.
<i>Justification</i>	Deforestation and habitat degradation have been identified as major threats to the species. This action seeks to reverse habitat loss, reclaim areas that have been deforested or degraded and to improve and increase the amount of essential habitat for the species long-term survival. The majority of the plantations within habitat areas and the Parrot Reserve are not currently managed being managed to effectively encourage natural habitat development, therefore reducing the amount and quality of habitat available to birds. Additionally, absence of undergrowth and ground cover in some plantations is causing increased erosion and reducing the integrity of the forest.
<i>Description</i>	Based on on-the-ground assessments of current plantations, areas should be prioritized for systematic conversion through reforestation and enrichment planting with a mixture indigenous species focusing particularly on those species identified as being important for food and nesting. It will also be necessary in some instances to reforest or create buffer zones around present and future protected areas to reduce human-bird conflicts and prevent encroachment into habitats. Appropriate management prescriptions must be developed to outline specific activities required and to provide a basis for monitoring and assessing effectiveness of strategies and prescription. This will also aid further development and improvement of prescriptions and management guidelines. It will be necessary to create linkages with and seek input from other agencies and stakeholders such as the Integrated Forest Management and Development Programme, St. Vincent Electricity Services (Vinlec), National Parks Unit (NPU), Central Water and Sewage Authority (CWSA) and Environmental Health Services, which all benefit directly and indirectly from these forest habitats. Other stakeholders such as tour operators and research organizations which utilize these habitats should also be required to contribute the conserving these habitats.
<i>Responsibility</i>	Forestry Department with the support and assistance of the above-mentioned organizations. Persons will also be required to do planting, operate at and monitor study sites. An experienced forest manager will also be required for any necessary refinements or changes in strategies.
<i>Time frame</i>	In the short-term – establishment of mixed indigenous plantations and executions of enrichment planting. The first two years may be required for assessments and nursery establishment; the third for planting. Longer terms will be required for monitoring sites and assessing prescriptions.
<i>Funds/Resources needed</i>	Funds will be needed for assessment, nursery development and maintenance, reforestation and forest management. Costing and acreage will need to refer to the most recent reforestation projections of the Forestry Department. Proper habitat assessments must also be completed.

Action 1d: Establish forest patrol unit	
<i>Aims</i>	To establish a Forest Patrol Unit to conduct regular monitoring and patrols within the St. Vincent Parrot Reserve and other habitat areas.
<i>Justification</i>	Illegal activities such as nest robbing continue to occur. However, currently there is no regular and systematic monitoring of reserves due to limited human resource and inadequate focus given to wildlife issues. Forest protection and monitoring is particularly important during the bird's breeding season when increased poaching is likely and in areas near to established squatting and agricultural activity. A continuous presence during these times will act as a deterrent to offenders, allow for greater vigilance and early detection to minimize negative impacts and where possible, enable speedy apprehension and prosecution of offenders, especially those in contravention of the Wildlife Protection and Forest Resource Conservation Acts.
<i>Description</i>	<ul style="list-style-type: none"> - Recruitment and training of suitable personnel for staffing of Unit. - Equip and uniform the Unit in order to function effectively in the field. - This Unit will come under the direction of the Wildlife Protection Officer and it will be necessary for the Unit to develop a strategic working alliance with the Police Department. <p>It will be important that the Wildlife Protection Unit (see Action 2) be exclusively involved in such activity. In the short-term, a minimum of two teams could be established, one each operating on the Windward and Leeward sides of the island.</p>
<i>Responsibility</i>	Forestry Department through the Chief Wildlife Protection Officer with critical support from the Police and legal Departments.
<i>Time frame</i>	Ongoing
<i>Funds/Resources needed</i>	Funds will be required to train and equip staff and also to procure a 4-WD vehicle specifically for the Patrol Unit. Other equipment required will include First Aid kits, cameras, communication and surveillance equipment, binoculars and camping gear. Total costs will be based on crew size, salary scale, number of teams etc.

Action 1e: Develop a wildlife management programme

<i>Aims</i>	To develop a wildlife management programme with necessary staffing to effectively implement wildlife management activities.
<i>Justification</i>	Conservation of the St. Vincent parrot and development of related actions cannot occur in isolation of an overall wildlife management programme that encompasses particularly those species that share a similar habitat with the St. Vincent Parrot. The St. Vincent parrot is just one of the many species of plants and animals found on the island and it is therefore important that a holistic programme be developed to ensure that adequate focus is given the island's biodiversity. Over the years there has been insufficient focus on wildlife management issues overall, with no specific officers appointed as provided for by the Wildlife Protection Act of 1987. The several anthropogenic threats such as the illegal pet trade, deforestation, habitat degradation among others, highlight the need for the appointment of staff according to Section III of the Act. The effective and specialized management of wildlife, especially the St. Vincent parrot requires that the necessary personnel be designated to this task. This will enable development and implementation of wildlife management programmes as well as facilitate more effective implementation of the present wildlife Act and international Conventions. The Chief Wildlife Officer will also play a significant role in coordinating the implementation of the Conservation Plan.
<i>Description</i>	<p>The current staff arrangements and limitations may mean that additional persons may need to be employed to staff the Unit. Additionally, in the absence of personnel trained in Wildlife Management, there will be a definite need to train these persons over a short and long term period. Through the Consortium and other external agencies, experienced wildlife managers may spend time with the Department to assist with the development of programmes and communication of wildlife management techniques. Other training may be sought via the University of the West Indies, and other organizations which are members of the Consortium. See also Action 5a.</p> <p>In reviewing the Wildlife Protection Act as specified in Action 2 consideration should also be given to Section III in relation to staff allocation and appropriateness of job titles.</p> <p>There may be a need to make the necessary annual budgetary provisions for staff salaries and allowances and operating provisions.</p>
<i>Responsibility</i>	Forestry Department. Advice and other assistance may be obtained from the St. Vincent Parrot Conservation Consortium, University of the West Indies and other external agencies. There is also the option for the Forestry Department to have some of this work completed through contractual arrangement with wildlife professionals and other institutions.
<i>Time frame</i>	2005 – discuss and prepare proposals for inclusion in 2006 work plan; 2006 onwards – implementation
<i>Funds/Resources needed</i>	It is expected that staff salaries will be a part of the Forestry Department's annual budget. Additional financial resources will be required for tertiary training. It is possible that scholarships and funding assistance may also be available.

Important note regarding the introduced armadillo population

Despite the crucial need to address the effects of this invasive species, in order to maintain the integrity of the important forest habitat (see page 37), it is so firmly entrenched that, as experience from other islands with similar well-established alien pest species shows, any action remotely likely to effective against it will require a national strategy. Actions to conserve the St Vincent Parrot can of course contribute to the national strategy.

Action 1f: Control and strictly regulate importation of exotic birds into St. Vincent and the Grenadines	
<i>Aims</i>	To reduce the possible threats of introduction of diseases via exotic birds and other wildlife.
<i>Justification</i>	The importation of pet birds is on the increase and species such as lovebirds and budgerigars are being increasingly offered for sale on the market. Additionally, poultry products and stocks are continuously imported into the island. These birds and products are a possible source of threat to the endemic St. Vincent parrot, and other indigenous birds, particularly as carriers of diseases which may affect local species. It is absolutely necessary that the St. Vincent parrot and other endemic and indigenous species be given priority for protection and be safeguarded from all possible and potential threats caused by these exotic birds. The situation becomes even more critical when one recognizes that many of these diseases, such as Tuberculosis, can remain latent and go undetected for long periods of time. Furthermore, pet birds have been known to escape from their keepers on occasions and can easily come into contact with indigenous species.
<i>Description</i>	There will be a need for assessment of current implications for allowing importation of exotic birds and poultry, and the capacity to monitor and control the potential spread of related pest and diseases. There will also be a need for the tracking and monitoring of birds and dealers through proper record keeping, to include origin and status and quarantine measures needed and currently put in place. Based on the results of the assessment, it may be necessary to limit the types, quantities and markets of species traded. Finally, amendments of legislation may be required based on the results of assessments.
<i>Responsibility</i>	Forestry Department in collaboration with the Veterinary Department.
<i>Time frame</i>	2 years
<i>Funds/Resources needed</i>	There may be a need for foreign expertise to assist with consultations, studies and advice.

Action 1g: Increase networking to reduce the illegal pet trade	
<i>Aims</i>	To investigate the current routes and personnel involved in the illegal trade of St. Vincent Parrot and take actions to reduce and eventually eliminate this smuggling through destruction of linkages.
<i>Justification</i>	The illegal pet trade continues to rank high as a main threat to the species and appears to be on the increase again since an apparent lull in the late 1980s early 1990s. Based on reports received by the Forestry Department, the harvesting of eggs from the nest is rumoured to have become a critical component of the smuggling operation.
<i>Description</i>	It is important that an awareness be created among Caribbean counterparts (e.g. the Society for the Conservation and Study of Caribbean Birds) and a holistic approach to networking and intelligence sharing be developed. Locally, the necessary agencies need to be made aware and working relationships be more formally established. This will also require establishing and maintaining linkages with other Caribbean countries, especially those with similar problems of illegal trade, to maintain vigilance at sea and other ports, and communicate data obtained on trappers, traders and illegally-held collections around the world. This effort will require a designated officer, possibly the Chief Wildlife Officer, working along with local Immigration, Port and Police Authorities, and establishing an intelligence network with other counterparts regionally and internationally. The Consortium can assist with the networking and creation of linkages on the international level.
<i>Responsibility</i>	Forestry Department
<i>Time frame</i>	Ongoing
<i>Funds/Resources needed</i>	Resources will be needed for meetings, training sessions and equipping staff with necessary communication for networking. Additional cost will be required for training as identified in Action 5b.

Action 1h: Strict regulation of developmental activities within Reserves and protected habitats	
<i>Aims</i>	To strictly regulate, and where necessary, prevent infrastructure and other non-compatible developmental activities within Reserves and other specially designated protected areas.
<i>Justification</i>	<p>Several wildlife reserves have been specially designated due to their important watershed and habitat values. However, despite their designation, the relevant regulatory framework is weak or absent. A critical example is the proposed cross country road that, if constructed, is likely to bisect the St. Vincent Parrot Reserve and the last remaining stand of primary forest on the island. This road will also have the potential for acute negative biophysical environmental impacts. Sensitivity is required as impacts can either be direct or indirect and can be accumulative and difficult to identify and assess. Moreover, some impacts may only become apparent in the long-term.</p> <p>Furthermore, many of St. Vincent's protected areas are located within ecologically fragile ecosystems, where incompatible development can be devastating, with potentially irreversible human and environmental impacts. These areas are also some of the country's greatest biodiversity storehouses.</p>
<i>Description</i>	<p>In order to preserve the integrity of specifically designated protected areas of high conservation value that are also ecologically fragile, the following are recommended:</p> <ul style="list-style-type: none"> ▪ A review of the current status of protected area/reserve designation to determine adequacy of protection offered, categorization and existing weaknesses. ▪ Review of current Forest Resources Conservation Act No. 47 of 1992, the Wildlife Protection Act (see Action 2) and other pertinent Acts to adequately address the protection and conservation needs of specifically designated protected areas such as the St. Vincent Parrot Reserve. ▪ To ensure that there are clear policies and a strict regulatory framework, through an appropriate agency with clear guidelines and mandates, to preserve the integrity of specially designated reserves.
<i>Responsibility</i>	Forestry Department with support from the Legal Affairs Department, National Parks Authority and Physical Planning and Development Authority. If deemed necessary, other professional consultancy can be sought.
<i>Time frame</i>	2005 – 2006
<i>Funds/Resources needed</i>	Funds will be required to conduct review of current legislative and regulatory framework governing specifically designated protected areas to determine weaknesses and improvement required to conserve and maintain the integrity of such areas, as well as the associated benefits.

ACTION 2: REVIEW AND IMPROVE LEGAL AND INSTITUTIONAL FRAMEWORK GOVERNING SPECIES CONSERVATION

<i>Aims</i>	To review the existing Wildlife Protection Act with special focus on penalties, captive birds, hunting seasons, designation of other protected areas and strengthening local capacity to monitor on-island and foreign-based St. Vincent parrots. Two critical components will be the development of Regulations, and establishment of a Wildlife Protection Unit to include a Chief Wildlife Protection Officer and Wildlife Officers.
<i>Justification</i>	<p>Since its enactment in 1987, Regulations have not been passed for the Act. Absence of Regulations limit the operations and enforcement capabilities of staff of the Forestry Department. Furthermore, penalties of EC \$2000.00 to \$4000.00 may no longer be prohibitive to illegal trade in the birds when compared to a fetching price of over US 10 000 on the ‘black market’. Overall, the Act needs to be assessed to enhance its ability to provide the legal framework to protect resources, provide direction to staff with regard to protection issues and improve the regulation of activities that will promote more effective wildlife conservation. Enhancement of legal coverage given to local captive stock also needs to be examined. For example, in the absence of requisite legal regulatory framework and the limited recognition of advisory mechanisms, some local authorities find loopholes that ‘allow’ for the distribution and donation of birds to non-Consortium members without the necessary advice and approval of the Forestry Department and St. Vincent Parrot Conservation Consortium.</p> <p>Some important areas for consideration in reviewing the WPA are as follows:</p> <ul style="list-style-type: none"> ▪ An important priority will be the inclusion of local CITES legislation. Alternatively, a totally new legislation may be developed to cater for local CITES implementation. ▪ Inclusion of the St. Vincent Parrot Conservation Consortium as an official advisory body allowing its advice to carry more weight, both locally and internationally. ▪ Increased powers to the Forestry Department to ensure that movement of captive birds are regulated and sanctioned by both organizations. ▪ Establishment of additional totally protected areas, and closure of areas during the breeding season. ▪ The development of Regulations for the Act. ▪ Review of fines and penalties for increase. ▪ Stricter measures to prevent further registration of illegally-held birds (some birds have been registered since 1988). ▪ Exploration of legal measures that will allow for law enforcement in relation to illegally-held captive birds outside the national territory of SVG. ▪ Rigorous control of importation of birds and other wildlife for the local pet market.
<i>Description</i>	A review body should be established to review legislation and to make recommendations. The services of appropriate technical and legal experts to draft Amendments should be engaged. These amendment should then be submitted to the Ministry of Agriculture for discussion and forwarding to Cabinet. Assistance and guidance can also be obtained from other Caribbean countries/counterparts which have recently developed or reviewed their legislations.
<i>Responsibility</i>	Forestry Department, with the support of the Government’s Legal Department

<i>Time frame</i>	2005 for assessment and recommended changes to the Act; 2006 – 2007: amendments to the current Act with the addition of Regulations.
<i>Funds/Resources needed</i>	Funds will be needed for review and drafting of amendments and regulations. It is expected that amendments and drafting will be undertaken by the Government's Legal Department.

ACTION 3: DEVELOP AND IMPLEMENT SPECIES RESEARCH AND MONITORING PROGRAMMES

Action 3a: Conduct species and habitat research	
<i>Aims</i>	To carry out research into the biology, ecology and habitat requirements of the St. Vincent Parrot.
<i>Justification</i>	Little information is available on the specific habitat requirements of the species, such as requirements during the breeding and non-breeding seasons, factors determining its distribution (e.g. relative to food availability), and habitat requirements at different stages of its development. This therefore limits specific conservation and management actions that can be implemented. Research will be required in the following areas, among others: mortality rates and breeding ecology in the wild; habitat, food and nest-site requirements; vocalization, behaviour and social dynamics; competition and predation; movement patterns; and genetic viability of the wild population.
<i>Description</i>	<p>Research work should be conducted within the Reserve, and other areas of habitat where St. Vincent parrots occur, to obtain data as listed above in “justification”. Data on specific habitat requirements and use by St. Vincent parrot will also improve management within protected areas and provide information for advocating the establishment of additional protected areas where necessary. These data, when combined with the results of population trends/results of censuses, can further inform the different habitat management approaches used by the Forestry Department. The captive population will also provide a resource for research. A priority listing of research areas should be developed and used to promote research. Encouragement of quantified research work is essential.</p> <p>Linkages may be developed with Universities for certain research work to be conducted as dissertations and other graduate studies.</p>
<i>Responsibility</i>	Forestry Department with the support of the Consortium
<i>Time frame</i>	Ongoing
<i>Funds/Resources needed</i>	Various sources and approaches can be utilized. It may require a local budget component in the Forestry Department’s budget, with assistance sought from NGOs that provide such funds, and applications for research funding grants from regional and international institutions.

Action 3b: Nest site monitoring

<i>Aims</i>	To commence monitoring of nest sites as an important component of researching the bird's breeding ecology.
<i>Justification</i>	Although nesting requirements has been highlighted in Action 3a as one of the areas for research, nest site monitoring has been selected as a component requiring specific immediate focus. Nest success and factors affecting it are critical components of population recruitment. However, recent data are very limited and are perhaps the most difficult to obtain due to location of sites and the impacts of disturbance.
<i>Description</i>	Conduct nest searches and map trees using GPS. Collection of data including nest location, size, tree species utilized and productivity. Additionally, interviews may be conducted with Forestry field staff and other reliable persons to determine location of nests. Monitoring will be the responsibility of the Wildlife Protection Officer(s) and it will be necessary that locations of nest trees be known to a limited number of persons as possible due to threats to these trees. To reduce disturbance and manpower requirements, it is suggested that video probes be used to monitor nests during the breeding season. Training will be required relative to locating site location, reducing disturbance and the use and placement of cameras/probes.
<i>Responsibility</i>	Forestry Department with critical support from the Consortium
<i>Time frame</i>	2005/2006 and ongoing
<i>Funds/Resources needed</i>	Funds will be required to purchase, install and maintain video probes, purchase climbing equipment, and facilitate continuous monitoring and collection of data by the requisite personnel. Cost may vary based on the types of equipment used, numbers of trees monitored and number of personnel involved.

Action 3c: Review of census method	
<i>Aims</i>	To review current census method used biennially to determine population estimates to improve accuracy and geographic coverage of population.
<i>Justification</i>	The current census method has been in use since 1988. Although the census has provided much useful population estimates to assess trends in the population over the years, its ability to provide more precise estimates of population has been a limitation. The extent to which it presently covers the effective habitat range of the species and effectiveness in minimizing duplicated counts is a concern affecting accuracy of results. Furthermore, new population movements outside the four conventional watch sectors and deficiencies at watch points in giving effective coverage to sectors highlight the need for review and improvement.
<i>Description</i>	Review the census method for the following: <ul style="list-style-type: none"> - Effectiveness of watch point coverage of sectors, and the overall collective ability of sectors to effectively survey the population. - Determining the extent and characteristics of population movement between sectors. - Levels of ‘double-counting’ and ways of minimizing or eliminating this. - The need for expansion of effective coverage of sectors into new areas. - Changes or alternative methods that are practical and cost-effective to improve accuracy of population estimates.
<i>Responsibility</i>	Forestry Department. Advice and other assistance may be obtained from the St. Vincent Parrot Conservation Consortium, University of the West Indies and other external agencies. There is also the option for the Forestry Department to have some of this work completed through contractual arrangement with wildlife professionals and other institutions.
<i>Time frame</i>	2005 – 2006: Before the next census due to be started in March 2006
<i>Funds/Resources needed</i>	Funds will be needed to employ personnel to review methods, with associated expenses of fees, per diems, living and travelling expenses.

Action 3d: Captive breeding research

<i>Aims</i>	To develop a research programme for the captive stock of St. Vincent parrots.
<i>Justification</i>	There is still insufficient information available in areas such as the nutritional requirements; bird behaviour at different stages of development and during the breeding and non-breeding seasons; activity budgets; factors determining disease resistance and spread; and factors affecting fertility, among others. These data will contribute to improved management of the captive stock and aid further understanding of dynamics of wild populations. The Nicholls Wildlife Complex houses one of the largest collections of St. Vincent parrots worldwide and provides a good opportunity for research. Current local data collection is mainly centred on breeding season data such as dates of laying, hatching and fledging, and numbers of eggs and chicks produced. An agreed, prioritised set of research activities should be produced, for these to be implemented at the Nicholls Wildlife Complex, and at other sites within and outside of SVG. There are also insufficient current skills and resources available in the Forestry Department to conduct the range and level of research required.
<i>Description</i>	<p>This will require an assessment and prioritization of data and research needs followed by the development of an overall research programme for the captive birds, that will take into account present and future capacity of the Forestry Department and others to conduct the research. Due to the limited wildlife management capacity within the Department, a basic requirement will be the training and involvement of wildlife officers, aviary caretakers and custodians, with input from external expertise. There will also be a need for supporting resources such as computer and software packages that can input and analyze data and training in the use of these equipment. An addition or alternative to such capacity-building can be to contract-out the research to be undertaken.</p> <p>Other equipment such as video cameras and hides may be necessary for obtaining some types of data, particularly during the breeding season.</p>
<i>Responsibility</i>	Forestry Department and other holders of St. Vincent parrots, with input and advice from the St. Vincent Parrot Conservation Consortium and other expertise.
<i>Time frame</i>	Ongoing; 2005 development of research programme, training of data collectors and commencement of some data collection. 2006 - 2010 continued research and training.
<i>Funds/Resources needed</i>	Funds will be required for purchase of equipment (cameras, binoculars, computer), construction of hides, where necessary and accommodating training personnel, or for contracting-out the research.

Action 3e: Population viability analysis

<i>Aims</i>	To conduct a population viability analysis (PVA) to estimate minimum viable population (MVP) estimates (for both captive and wild populations – see Action 6a) as a useful measure to guide conservation of the species.
<i>Justification</i>	The St. Vincent parrot is a vulnerable species according to the IUCN Red Data Listing and in the past has been threatened with possible extinction. The scientific basis for determining appropriate viable population estimates will serve as a measure against which the success of efforts to conserve the species can be measured.
<i>Description</i>	Determine and or source information for PVA to include deterministic factors such as recruitment rates, longevity, fecundity, and stochastic factors such as demographic structures, environmental variations, catastrophic events, genetic risk and other variables necessary. A PVA will assess ways in which factors such as habitat loss, environmental uncertainty, demographic and genetic stochasticity all interact to determine extinction probabilities for the species. There will be a need to recruit appropriate expertise to conduct PVA modelling to determine MVP estimates (for an example, see Appendix 4)
<i>Responsibility</i>	Forestry Department with support from the St. Vincent Parrot Conservation Consortium.
<i>Time frame</i>	A 2 – 3 year period will be the absolute minimum necessary to collect input data to start the PVA in order to begin MVP estimates. Of necessity, the process will need regular up-dates as more data become available from a longer-term research effort.
<i>Funds/Resources needed</i>	Funding will be required to provide support to the research programme in order to derive necessary input data for computer modelling. Funding will primarily be needed to cover expenses associated with engaging necessary expertise to conduct PVA.

Action 3f: Assess habitat areas for types and magnitudes of anthropogenic threats	
<i>Aims</i>	To conduct habitat assessment to determine current threats and their magnitudes, and priority areas for action.
<i>Justification</i>	Several authors (including Clark, 1905; Gochfeld, 1974; Laidler & Laidler, 1977; Juniper and Parr, 1998; Nichols, 1980; Lambert, 1983; Butler, 1988; Snyder <i>et al.</i> , 2000; AvianEyes, 2003; Ivor Jackson & Associates, 2003) have identified several threats to parrot habitats and population distributions. These include both natural and man-made. Though there have been no major natural disasters in recent times, there has also been no recent large-scale work conducted to pinpoint the relative magnitude and importance of such activities as marijuana cultivation, selective logging for charcoal burning, encroachment rates into protected habitats and hunting activities during the open season. These issues can only be properly addressed and justifications made for remedial actions if baseline data on their occurrence is quantified and made available. Furthermore, it has not been a practice by the Forestry Department to make routine assessments of habitats after natural disasters to determine their short and long-term impacts.
<i>Description</i>	An examination of the most recent aerial photos of forest areas to determine rainforest cover and areas with greatest human impact. Several ground surveys should also be conducted to verify information gained from aerial photos and determine more specifically, the levels of and reasons for habitat disturbance and loss. It will also outline possible effects of these threats on species abundance and distribution.
<i>Responsibility</i>	Forestry Department (forest survey team), Surveys Department
<i>Time frame</i>	2005-2006, and ongoing if necessary
<i>Funds/Resources needed</i>	A forest survey team will be required to conduct field assessments. Additionally, resources of the Surveys Department in terms of aerial photos and interpretation will be necessary. Assistance may be required from the Police Department for accessing some potential problem areas where illegal activities re being conducted.

ACTION 4: INCREASE PUBLIC AWARENESS AND INVOLVEMENT

Action 4a: Develop and implement national education and awareness programme	
<i>Aims</i>	To conduct public education and awareness programmes to stimulate support and appreciation for the St. Vincent Parrot.
<i>Justification</i>	Public education and support will be a critical component of the success of this conservation plan. Though there has been past successful education campaigns, particularly in the 1980s, which have contributed to the conservation of the species by engendering national pride in and appreciation for the St. Vincent Parrot, since the early 1990s there has been very little focus with regards to the plight of the species. Thus several groups of the populace have not been exposed in more recent times to pertinent information regarding the bird. Reported increases in illegal activity relative to the parrot have been linked to this drop in focus on the parrot. Thus a renewed and focussed education programme is necessary.
<i>Description</i>	Activities for this action will include (1) conducting pre and post surveys to assess public awareness levels and attitudes towards the St. Vincent Parrot, (2) based on the findings of the public survey, developing ongoing public education programme to encompass all strata society (farmers, NGOs, students) and (3) a post survey to assess success of the programme and to inform adjustments to future programmes. It is recommended that an anti-poaching campaign be included as a component of the education package. (This campaign may also include rewards for information on poachers etc).
<i>Responsibility</i>	Forestry Department (Environmental Education Unit), St. Vincent Parrot Conservation Consortium, with assistance from the Ministry of Education. Additionally, training may be obtained through the RARE Centre for Tropical Conservation's education programme.
<i>Time frame</i>	2005 – design and source funding for programme; 2005/2006 and onwards – implementation of programme.
<i>Funds/Resources needed</i>	Funds will be required for conducting surveys and specifically for designing conservation education tools such as posters, pamphlets, videos, newsletters etc, and supporting the programme's execution.

Action 4b: Develop St. Vincent parrot conservation workbook and related materials

<i>Aims</i>	To develop a resource workbook and other educational materials on the St. Vincent parrot and its conservation to be used by teachers.
<i>Justification</i>	The majority of the population (approx. 67%) is under the age of 30 years. This workbook can help to raise awareness among the young, especially of schooling age, and will be an investment in the future conservation of the species.
<i>Description</i>	<p>The workbook will be geared towards teachers and educators for use in the classroom and among the younger populace. It will provide background information on the parrot, its ecology, and role within the rainforest habitat and contributions towards overall biodiversity. It should also outline factors affecting the parrot and highlight ways in which students and young people can play their part in conserving the parrot and other wildlife in St. Vincent and the Grenadines.</p> <p>Other educational materials will be used to create awareness among students and the general public and can include posters, pins, badges, videos, stuffed toys, key chains, magnets and stationary.</p> <p>A team of professionals in the field of education, conservation, art, etc should be recruited to design, prepare and be responsible for the printing of the workbook. There will also be need for training of teachers on the use of the workbook and activities in and out of the classroom. A number of training sessions will be required over the period of the Plan to involved as many teachers as possible. Development of workbook and conducting of training sessions can also be done in collaboration with the Ministry of Education. The other educational material can be designed by the Forestry Department with input from the St. Vincent Parrot Conservation Consortium.</p>
<i>Responsibility</i>	Forestry Department with support from St. Vincent Parrot Conservation Consortium. Additional support can also be obtained through the Parrot Working Group of the Society for the Conservation and Study of Caribbean Birds (formerly the Society for Caribbean Ornithology).
<i>Time frame</i>	2005 – design and prepare workbook and other materials, 2006 onwards – workbook ready for use and distribution
<i>Funds/Resources needed</i>	Funds will be required to recruit the workbook design team, preparation and production of workbook and conduct training sessions. Funds may also be obtained through royalties from organizations and companies that use the St. Vincent parrot as part of their promotion, local sponsorship and regional and international environmental education agencies.

Action 4c: Enhance educational and interpretive potential of the Nicholls Wildlife Complex

Aims To enhance the educational capability of the Nicholls Wildlife Complex (NWC) to include an Interpretive Centre (IC) as a component.

Justification The NWC offers an excellent opportunity for educating visitors about the parrot. However, its educational component is limited to one (1) billboard showing the stages of development of the St. Vincent parrot, and one or two small labels for the parrot's cages. There is one other billboard displaying some of the wildlife found in St. Vincent and about three other cage label for animals such as the Agouti, Tortoise and Orange-winged parrot. There is no interpretive 'facility' at the site which informs visitors about the biology or ecology of the bird and of the protective (legal) measures in place. Additionally, although there are several caretakers working at the site, none are specifically assigned to give information to visitors. Limitations in space would necessitate a redesign of the current layout to include a small interpretive building. This can be obtained through relocation of one of the display cages. The proposed layout will allow for separation of the IC from breeding cages.

Description The layout of the NWC to be redesigned to allow for construction of an IC for visitors to the facility (Refer to proposed layout in Appendix 3). An interpretive team responsible for design of displays within the IC will be established and information presented will be based on the life of the St. Vincent parrot and the work carried out at the NWC. The displays should include pictures, specimens, charts and even videos displaying information on threats and reasons for protection, biological and ecological data. Persons could also be allowed to view live samples or pictures of eggs, feathers, nest boxes, juvenile birds (photos), examples of morphological differences, aspects of captive and veterinary care, data obtained from local and international research, diseases affecting birds and the roles of Vincentians in protecting the species. Several support tools such as brochures/pamphlets, videos of life in the wild, posters and buttons, a parrot membership club with membership package, parrot field expeditions will also add appeal especially to younger visitors and school groups. The birds placed in the display cages will complement the information given at the IC. These birds should include older birds unfit for the breeding programme and for release. Birds of breeding quality should be kept from the display aviary to avoid stress to these animals. Vegetation and suitable fences between the IC and the cages, along with the staffing of the IC will ensure visitor control and adequate information dissemination. This activity may require the involvement of private custodians.

Responsibility Forestry Department, local and international custodians, Consortium

Time frame 2005 – design and seek funding; 2006/2007 – construction and operation of IC.

Funds/Resources needed Funds will be needed for the construction of the IC and redesign of the present layout of the NWC, for the development of the interpretive team and displays, for maintenance of the IC and for payment of the one staff for the IC.

ACTION 5: CAPACITY-BUILDING FOR IMPROVED IMPLEMENTATION OF CONSERVATION STRATEGIES

Action 5a: Training to develop a human resource base to facilitate conservation of the species	
<i>Aims</i>	To develop the local human resource capacity through the training of St. Vincent Government staff and other persons in research, wildlife management, animal husbandry, veterinary management of captive population, and forest protection to enhance the overall conservation status of the bird.
<i>Justification</i>	Currently, the local expertise is very limited in terms of wildlife management (both captive and wild) and training has been identified as one of the main needs of the Forestry Department to improve its conservation capacity. Additionally, a need has been identified for the training of a prosecution officer to facilitate enforcement of the Wildlife Protection and other relevant Acts.
<i>Description</i>	<p>Training can take the following forms:</p> <ul style="list-style-type: none"> ▪ Attachments to regional and external facilities and programme; ▪ Short and long term training courses; ▪ Making training information available to staff through literature, video, CD-roms, internet facilities, conferences etc; ▪ Visit to St. Vincent from experts on attachment or to facilitate training; ▪ Utilizing local expertise to train and contribute to programmes. <p>(Note: The Department's access to current information through bulletins, journals, dissertations etc is very limited. Access to such will increase exposure to novel conservation approaches, worldwide trends and practices, and provide a supporting base for any staff training activity. Thus subscription to pertinent journals will also contribute to increased awareness).</p>
<i>Responsibility</i>	Forestry Department with support from the Consortium
<i>Time frame</i>	Ongoing
<i>Funds/Resources needed</i>	Both local and external funding will be required to conduct training. Final figures will be dependent on, among other things, methods of training utilized and the level of voluntary input. Cost will also be associated with accommodating foreign expertise. There may be an option to source funds under the Integrated Forest Management and Development Programme's 'Forestry Department strengthening' component.

Action 5b: Training of support personnel

<i>Aims</i>	To increase awareness among support personnel involved in law enforcement.
<i>Justification</i>	Many security and administrative personnel operating at ports of entry and exit in St. Vincent are not aware of the levels of smuggling, methods utilized and ways of identifying specific types of apparatuses used in the smuggling of chicks, eggs and adult birds. Many are unaware too of the laws governing trade in the species or its parts. It will be necessary to educate personnel such as staff of the Coast Guard, Airport Authority, Fisheries, Veterinary, Customs and Police Departments in order to increase vigilance and reduce trade.
<i>Description</i>	Workshops will be necessary with the above-mentioned and other pertinent personnel for training in identification of current methods utilized in smuggling, local and international laws governing trade in the St. Vincent parrot and other wildlife, and methods for apprehending and seizing offenders.
<i>Responsibility</i>	Forestry Department with support of Consortium (through for e.g. external private zoos and legal bird holders).
<i>Time frame</i>	2005 – 2006 (and repeated in 2008 if necessary)
<i>Funds/Resources needed</i>	Funds to conduct two such workshops.

ACTION 6: IMPROVE CAPTIVE MANAGEMENT PROGRAMME

Action 6a: Enhance management of captive population	
<i>Aims</i>	To enhance the captive management programme through strategic distribution and management to achieve a viable and healthy captive population.
<i>Justification</i>	Even with the relative stability of the wild population, a well-managed <i>ex-situ</i> population will be essential to the survival of the species, especially due to the vulnerability of this small-island population to environmental events. Healthy captive populations are also important for behavioural and genetic research, raising conservation awareness and as an insurance against extinction. Therefore there is need for a well coordinated and strategically managed stock in and out of St. Vincent. It is imperative that captive populations are managed so that they are healthy, minimize genetic drifts, and high captive management husbandry standards are used.
<i>Description</i>	<p>The results of the population viability analysis will be used as a strategic guide to determine the MVP for the captive stock. This information, along with that obtained from DNA screening will be used to strategically distribute the captive stock among selected facilities in and out of St. Vincent (i.e. within SVG and among Consortium members). Although these birds will be distributed among several different institutions, the population must be managed holistically to obtain the desired results (Diaz Matalobos, 1991). In the interim however, based on the results of research carried out by authors such as De Boer (1985), Foose <i>et al.</i> (1986), Soulé <i>et al.</i> (1986), and Diaz Matalobos (1991), it is recommended that a captive breeding programme may be initiated between the above institutions and involving between 20 and 26 founders (minimum) be implemented; with specific attention being given to founder equalization (Jones <i>et al.</i>, 1985; Templeton, 1990). This figure should be easily achievable since 21 founders have already been identified within the International Studbook for the St. Vincent Parrot (Woolcock, pers. comm.), and may actually even be higher based on the fact that all captive birds are not included in the data. If attainable, this number should be increased to over 35 founders to maintain a higher genetic diversity as demonstrated by Diaz Matalobos (1991) for the <i>Pauxi pauxi</i>. Additional and supporting recommendations are also found in Section 9.0 of the present document.</p> <p>There will be a need for improved monitoring and management of locally-held captive birds among custodians as outlined in Action 6c. Further attempts must also be made to include other captive birds in the International studbook. Additionally, in order to develop a viable stock and maximize genetic variability outside of St. Vincent, the Consortium may also need to consider the following:</p> <ul style="list-style-type: none">▪ Developing partnerships and pairing arrangements (particularly involving founders) with non-Consortium members who have legal ownership of birds. These arrangements will necessitate development of a system to determine legal ownership and distribution of offspring resulting from these arrangements.▪ In the most recent attempt by the Consortium to encourage membership and increased registration of birds, some 40% of the responses proved quite favourable (D. Woolcock, pers. comm.) However, only one holder subsequently joined the Consortium (D. Woolcock, pers. comm.). It is therefore recommended that all non-Consortium holders be again approached, with primary emphasis being placed on the 40% persons who returned positive responses.▪ Furthermore, the Consortium should consider sending contingents comprising

representatives from the Forestry Department, Government of St. Vincent and the Grenadines and St. Vincent Parrot Conservation Consortium to discuss matters pertaining to membership and the species' conservation with non-members.

- Encouraging, in the interim, the formation of bi-lateral arrangements between non-Consortium members (with legal title to birds) and the Government of St. Vincent and the Grenadines (via the Forestry Department) in terms of enlisting legal birds and contributing other resources to the captive breeding and conservation programme. Historically, a lack of trust with both the Consortium and its members has been a factor contributing to the unwillingness of some holders to become members of the Consortium (D. Woolcock, pers. comm.). However, many non-member holders do agree to a moral obligation to assist the Government of St. Vincent in the conservation and long term management of the species. Allowing these bi-lateral agreements will, in the first instance, allow for birds to be recruited into the programme and, may eventually stimulate these holders to become members of the Consortium.

(It must be noted that the further movement of birds outside of St. Vincent will need to be addressed carefully as there are several ramifications associated with such actions. These include, among others (1) exposure of birds to illnesses that may prevent them or their offspring returning to St. Vincent if needed for the local conservation programme and (2) the possible increase in removal of wild birds by locals who may feel that if birds can be 'given' to foreign institutions, then locals have a right to birds too; as seen in previous incidences).

<i>Responsibility</i>	Forestry Department with active collaboration from the St. Vincent Parrot Conservation Consortium and International Studbook Keeper
<i>Time frame</i>	Activities need to be continuous during execution of Conservation Plan and beyond.
<i>Funds/Resources needed</i>	Funds will be needed to implement all elements of programmes itemized under 'Description'.

Action 6b: DNA and related analyses of the captive population

<i>Aims</i>	To continue analysis of the captive population to determine gender and genetic relatedness using endoscopy and DNA.
<i>Justification</i>	The St. Vincent parrot is not sexually dimorphic and therefore requires non-morphological scientific methods to determine gender. Further, improved captive management programmes will require maximization of genetic variation and minimizing of inbreeding to develop healthy and viable <i>ex-situ</i> populations. There have been efforts in the past to determine sex and levels of relatedness among the captive population. However, segments of the captive population's gender and levels of relatedness are still unknown. Furthermore, new additions to the captive population from births will require determination of gender and possibly ongoing DNA analyses of the population.
<i>Description</i>	<ul style="list-style-type: none">- Conduct DNA analysis using PCR and other appropriate methods to ensure that the gender and genetics (genetic relatedness) of the present captive held stock are determined by 2006.- Institute a programme to systematically allow for DNA analysis of all untested captive birds.- Records maintained of DNA analysis and information provided to Studbook keeper.- Results used to inform other actions associated with captive management programme such as Action 6a.
<i>Responsibility</i>	St. Vincent Parrot Conservation Consortium, International Studbook Keeper
<i>Time frame</i>	Period 2005 – 2006 used to complete DNA and endoscopic testing of the captive population. 2006 onward – establish regular programme for testing of new birds.
<i>Funds/Resources needed</i>	Funds will be needed to employ specialists to conduct sampling and engage services of a laboratory facility to conduct analysis and provide results.

Action 6c: Improve conditions for captive birds	
<i>Aims</i>	To improve the living and health conditions of captive birds held at the Nichols Wildlife Complex (Botanical Gardens) and with local custodians.
<i>Justification</i>	As an insurance population, it is necessary for all captive birds to be maintained at optimal condition. According to the Chief Veterinary Officer of St. Vincent (Dr. Kathian Herbert-Hackshaw), there are several issues for concern among captive birds, especially those with local custodians. These include birds being fed on the same surface as they are defecating, overfeeding leading to obesity, poor condition and location of pens. Though birds at the Nichols Wildlife Complex are generally in better condition, the facility is now experiencing some overcrowding, and St. Vincent parrots are held in close proximity to other parrots and wildlife types including Orange-winged parrots, Agoutis and Tortoises. These animals are a potential threat to the St. Vincent parrot (as, for example, carriers of disease) and are occupying well needed space at the aviary.
<i>Description</i>	<p>Review, reprint and redistribution of the 1980s manual on the care and handling of captive St. Vincent parrots. Inputs to be made from local vets and relevant personnel of the Loro Parque Fundación and other members of the St. Vincent Parrot Conservation Consortium to address more current issues in captive breeding and handling. In the interim however, simple handouts may be produced and distributed to custodians. There will be a need for continued regular checks and stricter enforcement of recommendations by the Forestry Department and Veterinary Official, particularly with custodians who are lapsed on implementing recommendations.</p> <p>Several workshops organized for custodians to outline the importance of proper care of these birds will also be helpful. Many custodians are not fully aware of their role and the role of their 'pet' St. Vincent parrots to the overall conservation of the species.</p> <p>At the Nicholls Wildlife Complex, all other captive animals must be removed and possibly relocated to another part of the Botanic Gardens where they could provide a conservation education role on the biodiversity of St. Vincent and the Grenadines. These species can also be used to highlight the effects of introduced species on local wildlife and habitat. A vacant area, once used as a stud centre is a possible option.</p> <p>Orange-winged parrots can either be euthanased or sterilized and distributed to custodians, possibly off the mainland on islands with no local parrots. No further breeding of this species should be encouraged at the Nicholls Wildlife Complex.</p>
<i>Responsibility</i>	Forestry Department, with assistance from Veterinary Division and the Consortium
<i>Time frame</i>	2005 – 2006: Review and distribute manual, and conduct at least one workshop with custodians. 2005 – relocation of all other wildlife from Nicholls Wildlife Complex.
<i>Funds/Resources needed</i>	Funds will be required to review and reprint approximately 100 manuals and conduct workshop (s).

Action 6d: Construct additional facilities at the Nicholls Wildlife Complex

Aims To construct additional facilities to improve breeding potential of and overall husbandry standards for the St. Vincent parrot, including emergency accommodation.

Justification The current facilities at the Nicholls Wildlife Complex are presently overcrowded. The breeding aviaries comprise only four cages and presently potential breeding pairs are being housed in display cages. Birds in the display aviaries are subject to high levels of disturbance and human interaction due to the Botanical Gardens being one of the island's main visitor attractions. Though additional breeding cages can be constructed at the Complex, too many more would lead to crowding of the site and reduction of the natural environment that should be encouraged for these birds. It would also mean removal of some of the fruit trees and other vegetation that are used to provide food, shade and natural sceneries for the birds. (See current layout of the Complex – Appendix 2).

The site is in need of an examination room and sick bay, and a quarantine facility to house incoming birds (Dr. K. Herbert-Hackshaw, pers. comm.). These should be given priority for construction at the site.

To reduce the present overcrowding within cages, additional cages will be required. Due to lack of space for expansion at the Nicholls Wildlife Complex, an additional captive breeding facility may have to be constructed. This facility should be removed from the current stock, thereby establishing a second safety-net population on-island, and be located in an environment that is as close as possible to a natural rainforest setting. It should also allow for limited human interaction with birds and be removed from the wild population to prevent possible transmission of disease to the wild.

In addition, the threat to the captive birds from a major volcanic eruption or the direct impact of hurricanes cannot be ignored, and emergency installations to accommodate the birds in safety during the most critical periods should be available.

Description In the interim, construction of 4 to 6 breeding cages to accommodate potential pairs relocated from Display Aviary 1, and other potential pairs. Construction of an examination room which houses additional storage for examination equipments etc and additional cages for the sick bay so sick birds can be separated and not held in the same cage (see Appendix 3 for proposed layout). In the following phase, emergency installations should be constructed.

As outlined in Action 6c, all other wildlife currently kept at the Nicholls Wildlife Complex will be relocated to a separate facility which can be constructed at another location within the Botanical Gardens, possibly at the site of the old Stud Centre.

While the construction of additional breeding facilities have been recommended to cater for birds displaced by the proposed Interpretive Centre and to reduce the present crowded situation, any further attempt to increase the local captive population and to construct corresponding breeding facilities should be based on scientific reasoning including that of maintaining genetic viability, reducing inbreeding and genetic drifts, and on the recommendations expounded in Action 6a and Section 9.0. Breeding should not, locally or at any foreign facility, be merely based on facilitating previously successful pairs or increasing numbers. Issues of cost, duplication of efforts, and overpopulation within the captive stock need to be taken into consideration and are real issues which may determine the success or failure of the overall captive management programme.

Where the need for such facilities to house an expanded local population arises, an assessment of possible areas to construct the additional facilities will be required. This assessment will need to take into consideration the provision of a natural habitat, limited human disturbance, provision of security, remoteness from wild birds and ensuring that it is not in close proximity to human communities. (A possible area for consideration is the Montreal Valley.) It will also need to consider annual operational costs and whether the Forestry Department will have the requisite financial and other resources to maintain these captive birds at internationally accepted captive standards.

There are several birds at the Complex which are related due to the fact that breeding success over the years has been obtained mainly from two pairs. These birds can be matched with other unrelated birds at the Complex or possibly from those held with custodians to establish the population at the new breeding facility. The suggestion for the establishment of an interim captive founder population (Action 6a) will be pertinent. It is recommended that new pairings result from free mate choice by the parrots made when they are put into groups in the same large aviary, under close supervision. The temporary separation of established pairs that have stopped producing after several successful years may trigger new clutches. It will be extremely important to create an awareness of such intentions among custodians from the inception, to reduce any future tensions should birds be required to establish breeding pairs. No more birds should be removed from the wild.

Responsibility Forestry Department with advice and support from the Consortium

Time frame 2005 – 2006: construction of additional facilities at the Nicholls Wildlife Complex to house displaced birds and to provide additional space to the current population. 2005 – 2007 assessment of need for continued breeding of population, site assessments for locating additional breeding facility, and, where necessary, construction of new breeding facility.

Funds/Resources needed

**ACTION 7: MANAGE CONSERVATION PLAN PROCESS THROUGH A
CONSERVATION PLAN TEAM**

<i>Aims</i>	To develop a functional conservation plan team to guide implementation, and to review, monitor and identify financial resources for plan implementation.
<i>Justification</i>	It is necessary to have an appropriate body to monitor and undertake review to ensure plan's objectives and associated action plans are effectively implemented to achieve the desired conservation criteria/outcomes.
<i>Description</i>	The conservation plan body will be required to meet once yearly to review the conservation plan and actions status. It should consist of representatives from the St. Vincent Parrot Conservation Consortium, Forestry Department (Wildlife Protection Officer), Veterinary Unit, environmental groups, NGOs and any other person deemed necessary by the Consortium. It is recommended that a total of 5 persons be a part of this team, with additional resource persons being co-opted when needed.
<i>Responsibility</i>	St. Vincent Parrot Conservation Consortium
<i>Time frame</i>	The Team is expected to meet at least once annually throughout the life of the Conservation Plan.
<i>Funds/Resources needed</i>	Funds will be needed for accommodation, travel, hosting of meetings and information dissemination. Final costs will depend on the composition of the team.

Table 3: St. Vincent parrot conservation plan: layout of activities

Actions	Time frame				
	Year 1	Year 2	Year 3	Year 4	Year 5
Action 1a: Demarcate St. Vincent Parrot Reserve boundaries					
Action 1b: Increase protected habitat					
Action 1c: St. Vincent parrot habitat rehabilitation					
Action 1d: Establish forest patrol unit					
Action 1e: Develop a wildlife management programme					
Action 1f: Control and strictly regulate importation of exotic birds into St. Vincent and the Grenadines					
Action 1g: Increase networking to reduce the illegal pet trade					
Action 1h: Strict regulation of developmental activities within Reserves and protected habitats					
Action 2: Review and improve legal and institutional framework governing species conservation					
Action 3a: Conduct species and habitat research					
Action 3b: Nest site monitoring					
Action 3c: Review of census method					
Action 3d: Captive breeding research					
Action 3e: Population viability analysis					
Action 3f: Assess habitat areas for types and magnitudes of anthropogenic threats					
Action 4a: Develop and implement national education and awareness programme					
Action 4b: Develop St. Vincent parrot conservation Workbook and related materials					
Action 4c: Enhance educational and interpretive potential of the Nicholls Wildlife Complex					
Action 5a: Training to develop a human resource base to facilitate conservation of the species					
Action 5b: Training of support personnel					

Action 6a: Enhance management of captive population					
Action 6b: DNA and related analyses of the captive population					
Action 6c: Improve conditions for captive birds					
Action 6d: Construct additional facilities at the Nicholls Wildlife Complex					
Action 7a: Manage conservation plan process through a conservation plan team					

Table 4: St. Vincent parrot conservation plan: Activity schedule

Specific objectives	Actios	Priority category	Agency	Time frame
1. To enhance habitat and species conservation and management programmes for the St. Vincent Parrot	Action 1a: Demarcate St. Vincent Parrot Reserve Boundaries	2	FD, L&SD	2005 - 2007
	Action 1b: Increase protected habitat	2	FD, L&SD, SVPCC	2005 - 2010
	Action 1c: St. Vincent parrot habitat rehabilitation	1	FD, VINLEC, NPU, CWSA, EHS, CWSA, IFM&DP	2005 - 2010
	Action 1d: Establish forest patrol unit	1	FD, SVGPF, LD	2005 - 2010
	Action 1e: Develop a wildlife management Programme	2	FD, SVPCC (support from UWI & other agencies)	2005 - 2007
	Action 1f: Control and strictly regulate importation of exotic birds into St. Vincent and the Grenadines	2	FD, VD	2006
	Action 1g: Increase networking to reduce the illegal pet trade	1	FD, SVPCC	2005 - 2010
	Action 1h: Strict regulation of developmental activities within Reserves and protected habitats	1	FD, LD, NPU, PPDA	2005 - 2006
2. To review and improve the legal and institutional framework governing species conservation.	Action 2: Review and improve legal and institutional framework governing species conservation	1	FD, LD	2005 - 2007
3. To develop and implement species research and monitoring programmes.	Action 3a: Conduct species and habitat research	1	FD, SVPCC	2005 - 2010
	Action 3b: Nest site monitoring	1	SVPCC	2005 - 2010
	Action 3c: Review of census method	1	SVPCC, FD	2005 - 2006
	Action 3d: Captive breeding research	2	FD, SVPCC (support from universities etc)	2005 - 2010
	Action 3e: Population viability analysis	1	SVPCC, FD	2005 - 2008
	Action 3f: Assess habitat areas for types and magnitudes of anthropogenic threats	1	FD, LD	2005 - 2007
4. To increase public awareness and involvement through development and implementation of public education programmes.	Action 4a: Develop and implement national education and awareness programmes	1	FD, SVPCC	2005 - 2010
	Action 4b: Develop St. Vincent parrot conservation workbook and related materials	1	SCPCC	2005 - 2007
	Action 4c: Enhance educational and interpretive potential of the Nicholls Wildlife Complex	2	FD, SVPCC	2005 - 2006
5. To increase the capacity of the St. Vincent Government staff and other persons to implement species conservation strategies.	Action 5a: Training to develop a human resource base to facilitate conservation of the species	1	SVPCC (other local and external expertise)	2005 - 2010
	Action 5b: Training of support personnel	1	FD	2005 - 2006
6. To improve the captive management programme for the St. Vincent parrot.	Action 6a: Enhance management of captive population	2	FD, SVPCC	2005 - 2010
	Action 6b: DNA and related analyses of the captive population	2	SVPCC	2005 - 2010
	Action 6c: Improve conditions for captive birds	1	FD	2005 - 2010
	Action 6d: Construct additional facilities at the Nicholls Wildlife Complex	1	FD, SVPCC	2005 - 2008
7. To establish a functional conservation plan monitoring and review body.	Action 7: Manage conservation plan process through a conservation plan team	2	SVPCC	2005 - 2010

Key to table

CWSA	Central Water and Sewage Authority	PPDA	Physical Planning and Development Authority
EHS	Environmental Health Services	SVGPF	St. Vincent and the Grenadines Police Force
FD	Forestry Department	SVPCC	St. Vincent Parrot Conservation Consortium
IFM&DP	Integrated Forest Management and Development Programme	UWI	University of the West Indies
LD	Legal Department	VD	Veterinary Department
L&SD	Lands and Surveys Department	VINLEC	St. Vincent Electricity Services
NPU	National Parks Unit		

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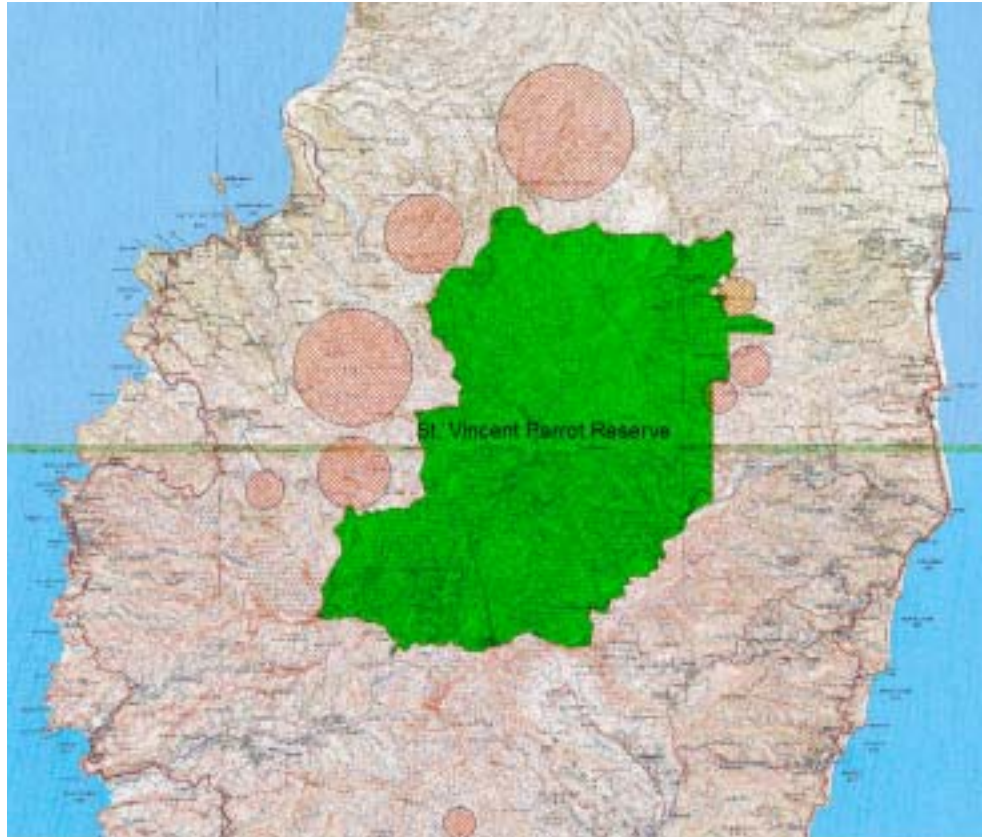
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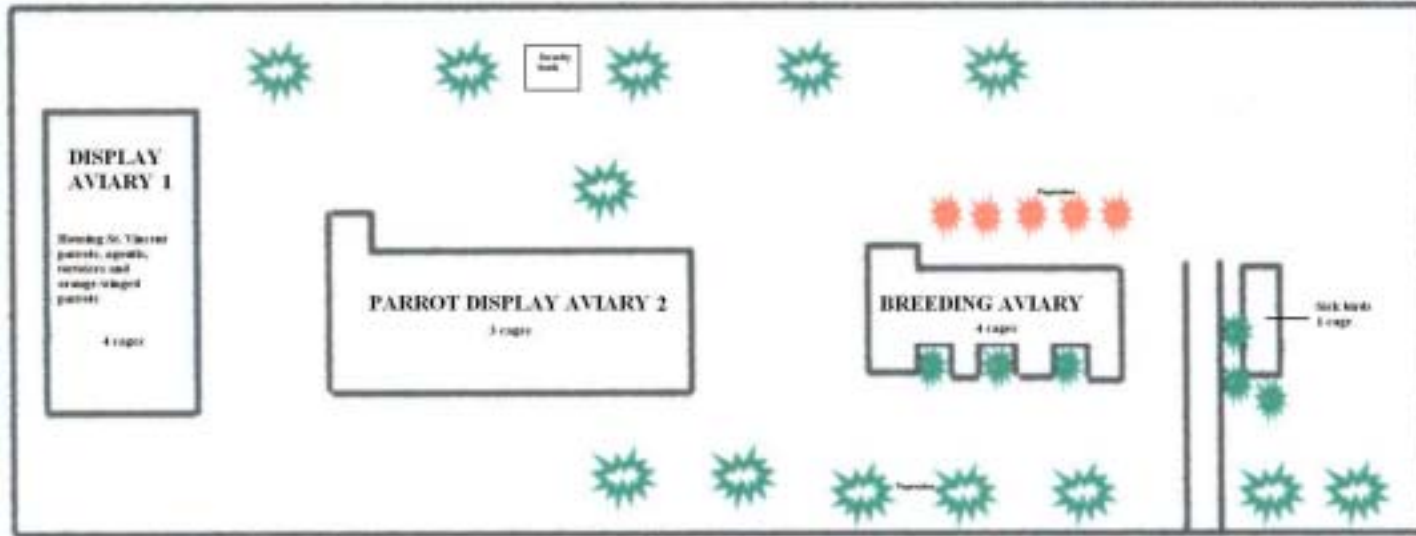
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APPENDIX 1: Location of St. Vincent parrot populations outside of the St. Vincent Parrot Reserve

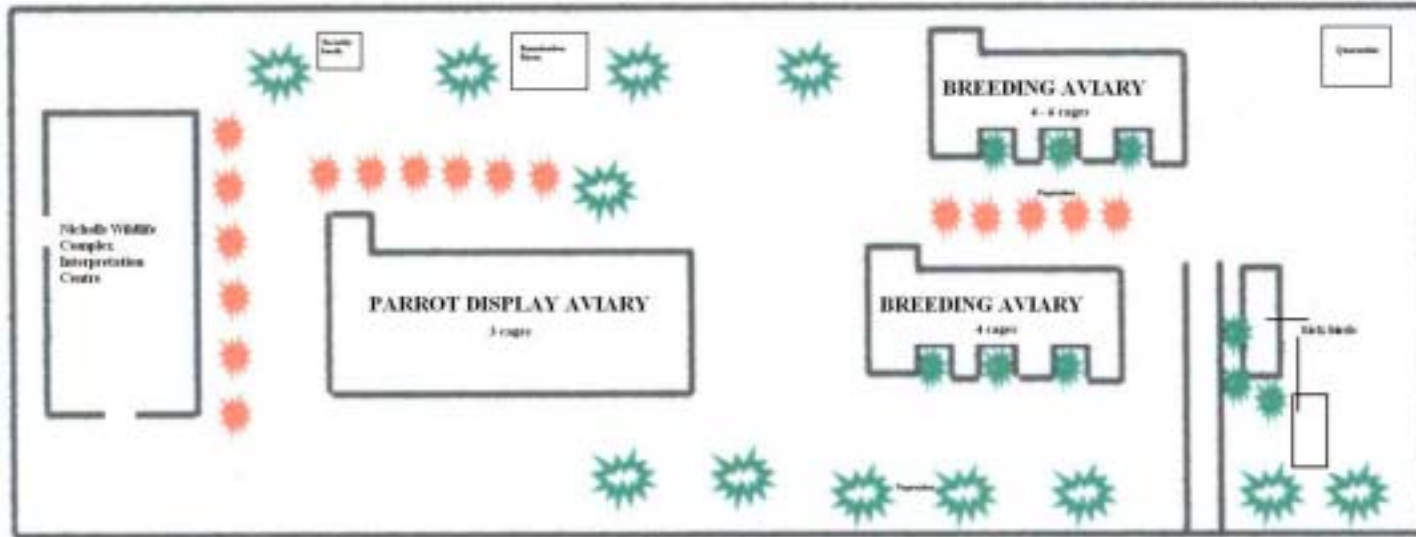


Source: Forestry Department, St. Vincent and the Grenadines

**APPENDIX 2: Present layout of the Nicholls Wildlife Complex, Botanical Gardens
St. Vincent**



**APPENDIX 3: Proposed layout of the Nicholls Wildlife Complex, Botanical Gardens
St. Vincent**



APPENDIX 4: Different conditions for the three theoretical populations of Northern Helmeted Curassow *Pauxi pauxi*

Source: Diaz Matalobos, 1991

CONDITIONS	POPULATION I	POPULATION II	POPULATION III
NO. OF FOUNDERS	20 (10.10)	10 (5.5)	10 (5.5)
HUSBANDRY	GOOD	POOR	POOR WITH DOUBLE CLUTCHING
GENETIC MANAGEMENT	YES	NO	NO
NO. OF BREEDING YEARS	10	10	10
AGE OF FIRST BREEDING	3	3	3
MAXIMUM AGE AT DEATH (YEARS)	20	20	20
NO. OF CLUTCHES /Pr/Year	1	1	2
NO. OF EGGS/Pair/Year	2	2	4
% OF FERTILITY	80	80	70
% OF HATCHABILITY	80	60	55
% OF MORTALITY < 30 DAYS	20	35	35
% OF SURVIVAL	80	65	65

APPENDIX 4 cont: Three theoretical populations of Northern Helmeted Curassow *Pauxi pauxi*

Source: Diaz Matalobos, 1991

Summary of reports for populations I - II - II from SPARKS program

		POP I	POP II	POP III
STUDBOOK	Totals	124.124. (248)	37.34. (71)	57.58. (115)
AGE PYRAMID REPORT	Totals	M. 74 F. 72	M. 19 F. 17	M. 32 F. 27
FECUNDITY/MORTALITY REPORT	Fecundity (Mx) Age ranges	M. 3 - 10 F. 3 - 14	M. 3 - 12 F. 3 - 12	M. 3 - 13 F. 3 - 14
	Mortality (Qx) Age ranges	M. 0 - 9 F. 3 - 14	M. 0 - 10 F. 0 - 13	M. 0 - 10 F. 0 - 13
	T: mean for M/F	6.476	6.718	7.228
	Ro: mean for M/F	2.53	1.904	2.611
	Lambda: mean for M/F	1.15	1.10	1.14
	r: mean for M/F	0.143	0.096	0.133
	Mortality < 30 days	21%	33%	32%
INBREEDING COEFFICIENT (F) REPORT	% individuals with an F of:			
	0.000	100.0	83.0	93.5
	0.625	0.0	0.0	0.0
	0.1250	0.0	0.0	1.7
	0.2500	0.0	17.0	0.8

M: Males

F: Females

T: Generation time

Ro: Net Reproductive Rate

Lambda: Growth Rate per Generation

r: Intrinsic Rate of Increase

% F: Inbreeding Coefficient

Summary of genetic reports for populations I - II - III from GENES program

	POP I	POP II	POP III
NO. OF FOUNDERS	20	8	10
MEAN RETENTION	0.924	0.890	0.918
FOUNDER GENOMES SURVIVING	18.488	7.122	9.178
FOUNDER EQUIVALENTS	16.359	6.491	9.010
FRACTION OF WILD GENE DIVERSITY (H) RETAINED	0.962	0.901	0.927
FRACTION OF WILD GENE DIVERSITY (H) LOST	0.038	0.099	0.073
MEAN INBREEDING COEFFICIENT	0	0.024	0.012