

2003 Technical Report #11

Baseline Avian and Vegetation Surveys
BIRD ISLAND WILDLIFE PRESERVATION AREA 2001

Conducted
by

CNMI Department of Lands and Natural Resources
Division of Fish and Wildlife

Wildlife Section
P.O. Box 10007, Lower Base
Saipan, MP 96950

Justine de Cruz, Laura Williams, Nathan Johnson,
Vicente Camacho, and Juan Salas

Surveyed 11 - 15 December 2001



**BASELINE AVIAN AND VEGETATION SURVEYS OF BIRD ISLAND
WILDLIFE PRESERVATION AREA 2001**

11 – 15 DECEMBER 2001

by Justine de Cruz, Laura Williams, Nathan Johnson,
Vicente Camacho, and Juan Salas

Division of Fish and Wildlife
Wildlife Section
P.O. Box 10007, Lower Base
Saipan, MP 96950

Executive Summary

In order to manage the Bird Island Wildlife Preserve and terrestrial portions of the Bird Island Sanctuary appropriately, the CNMI-Division of Fish and Wildlife conducted baseline forest bird, reptile, rodent, and vegetation surveys from 11 - 15 December 2001. The purpose of the surveys was to assess the status of the Preserve's terrestrial wildlife populations and to serve as an inventory of the biological diversity and distribution of natural resources in the protected area. The surveys were performed in preparation for improving management of the protected area's resources and it is intended that the biological data serve as a basis for the management plan. Results of the bird and vegetation surveys are presented in this report with results of other biological surveys to follow.

Fifteen species of birds totaling 424 individuals were counted during the survey. Over 20 feral and domestic roosters and chickens were observed and these should be eliminated from the Preserve. One White-tailed tropicbird, 19 Brown Noddies, and a dozen White terns were among the seabirds recorded incidentally. No endangered Mariana swiftlets were detected in the area, but they have been observed foraging over this forest on other occasions. Of the remaining forest birds, the most commonly detected were the Bridled white-eye, Rufous fantail, and Golden white-eye. Micronesian starlings, Collared kingfishers, Mariana fruit-doves, and Micronesian honeyeaters were detected often. The endangered Nightingale reed-warbler, White-throated ground-dove, Philippine turtle-dove and endangered Micronesian megapode were rarely found. Populations of all of the forest birds in the Bird Island Wildlife Preserve appeared to be robust in December 2001.

A total of 16 tree species were identified throughout the Bird Island Wildlife Preserve during vegetation surveys, two of which were non-native introduced

species, *Leuceana leucocephala* and *Albizia lebbek*. These two species and the native *Cynometra ramiflora* dominated the forest in terms of density, frequency of occurrence, and importance value. The average density of all tree species in the area was 33.45 trees / 100 m² and the most abundant species in all size classes was *L. leucocephala*. The understory was dominated by small sized *C. ramiflora*, a native species, while the larger size classes were composed completely of non-native species. Canopy cover was fairly high throughout the conservation area and the ground cover was quite variable.

The Bird Island Wildlife Preservation Area was a forest mosaic in December 2001. Native forest was concentrated in the ravine areas, whereas the flat, inland areas were dominated by *L. leucocephala* overstory. Spatially, the conservation area is composed of a patchwork of tangantangan forest, stands of mixed native and introduced trees, and a low percentage of native forest. Native tree species such as *Aidia cocochinensis*, *Ochrosia marianneis* and *Cynometra ramiflora* were most common in the smaller size classes where *L. leucocephala* was less prevalent.



Aerial view of the Bird Island Wildlife Preserve and the Saipan Upland Mitigation Bank 2002.

I. Introduction

On 16 July 1991, the Department of Lands and Natural Resources (DLNR) received the Grant of Public Domain Lands from the Marianas Public Land Corporation establishing the Bird Island Wildlife Preserve on the northeastern coast of Saipan. The primary objectives of the wildlife area include the conservation of wildlife species and protecting fish, plant and wildlife resources for the people of the Commonwealth's use and enjoyment. The Bird Island Wildlife Preserve is managed by DLNR through the Division of Fish and Wildlife (DFW) and ensures the survival of endemic plant and animal species while providing opportunities for public recreation, aesthetic enjoyment, science research, and education. The boundaries of the Bird Island Wildlife Preserve are described on DLS Check No. 044 A 00 encompassing an area of 118 ha (Fig. 1).

Large portions of the 118 ha Preserve have been altered over time. Two cattle ranches were actively grazing cows over 27 ha of the southern portion of the Preserve throughout the 1980's. Forest and wildlife food plots were established in 1989 inside of the Preserve as mitigation for the Air Force Radar facility and for the Kan Pacific go cart raceway. These were maintained until 1995 for growing wildlife food and reforesting the area with native trees. In the late 1990's, squatters who farmed the land behind Bird Island Bay reversed the course of these agricultural experiments by cutting down the forest and planting crops. These farmers were forcibly removed in 2001 and new reforestation plots planted by the Division of Agriculture are now actively managed by DFW. Daok (*Calophyllum inophyllum*), nunu (*Ficus prolixa*), gulos (*Cynometra ramiflora*), ifit (*Intsia bijuga*), kafu (*Pandanus fragrans/tectorius*), lemai (*Artocarpus altilis*), and talisai (*Terminalia catappa*) have been planted in the formerly farmed area of the Preserve.

Attempts to alter the boundaries of the Preserve have met with varying success. In 1995 an attempt to excise approximately 30 ha around The Grotto failed due to the presence of a substantial number of endangered species. However, the boundaries were substantially altered in 1997 when the legislature authorized a portion of the property to be leased by the Bird Island Development Corporation for the construction of a resort and golf course. The remaining Preserve is estimated to be under 70 ha. Even this small conservation area was of interest to commercial consultants who proposed to lease the remaining lands and to operate and manage concessions at the parking areas and beaches of the property in 1998 (Pacific Rim Consultants, Inc., *in litt.*).

On 12 February 2001, the Commonwealth legislature declared the islet of Bird Island as a marine sanctuary to promote conservation of both wildlife and marine life. The boundaries of this sanctuary overlap along the coastline with those of the Bird Island Wildlife Preserve. The sanctuary extends one thousand feet from the low tide line seaward and five hundred feet up the face of the cliff line. In the north, the sanctuary begins at Lichan Point and extends south to include the

Grotto, Bird Island, Bird Island Bay and Bird Island Lookout. Destruction, harassment, removal of plants or animals (including fish), fishing, operation of jet skis, walking on the reef, and harvesting of fish or shellfish are prohibited by law in the sanctuary. Hiking, educational fieldtrips, documentary filming, picnics and other activities that do not negatively affect wildlife are encouraged.

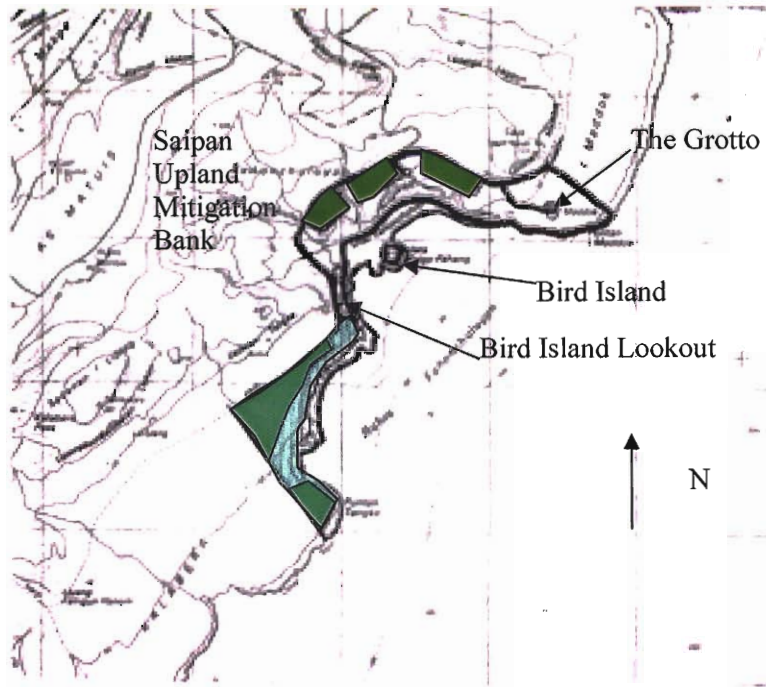


Figure 1. Current boundaries, prior use areas (grazing, forest mitigation plots and agricultural areas in green), and portion of the Bird Island Wildlife Preserve lost to commercial lease (blue).

The Bird Island Wildlife Preserve is bounded on the west by a paved road leading to the Bird Island Lookout, one of the Saipan's major tourist attractions. The road is heavily trafficked by large tour buses. To the west of the road lies the Saipan Upland Mitigation Bank, formerly the Marpi Commonwealth Forest, which forms a nearly continuous expanse of forested area with the Preserve. To the east of the Preserve is the Bird Island Sanctuary, an essentially marine reserve for which management plans are just being formulated. To the north of the Preserve lie public and private lands that are heavily forested but also are used as cattle grazing areas. The northern portion of the Preserve is also bounded by an old forest road that connects the area to the new Marpi Solid Waste Facility. The southern side of the Preserve is bounded by property that has been leased for the construction of a golf course, but which is currently cattle pasture and mixed secondary forest habitat.



Northern portion of the Bird Island Wildlife Preserve fragmented by agricultural clearings and roads.

The Preserve is sectioned by an additional paved road that leads to a second major tourist attraction, known as The Grotto, within the Preserve's boundaries. This is a beautiful natural formation, famous as a dive site, and frequently visited by the island population for picnics and recreational swimming. Parking lots exist at both the Grotto and the Bird Island Overlook. An additional forest road leads to a third parking lot and turn around at the head of a sloping trail leading down to Bird Island Beach. Large signs are displayed in each of the three parking lots that inform the public of the purpose of the Preserve and list both compatible and incompatible uses of the area. Those activities subject to fines are emphasized.

There appear to be no previous wildlife or vegetative assessments of the protected area. However, soil surveys (Young 1989) indicate six soil types, the majority of which are rocky outcrops with poor topsoil development overlaying a limestone substrate (Table 1). The islet of Bird Island and the adjacent coastline supporting the Bird Island Lookout are composed of soils of volcanic origin that are highly resistant to weathering, thus forming one of the most scenic areas of Saipan. This soil is smooth surfaced, so water run off is high, erosion keeps pace with weathering, and the soils are consequently very shallow.

The portion of the Preserve where the Bird Island Lookout and the trail to Bird Island Beach are located have slopes greater than 30%. Because of these steep

slopes and because of the poor water percolation rates of the remaining soils, none of the Preserve is favorable for the development of housing, recreational facilities, or sanitation conveniences that involve septic tanks or absorption fields. However, several areas are conducive to the building of paths and trails if the proper erosion control devices are installed and if the area is filled to help support the weak soils (Table 1). Bird Island islet, and the area to the north of the Bird Island Lookout have substrates that support herbaceous growth and are good areas for openland wildlife. The areas to the ocean side of the Grotto and where the trail to Bird Island Beach is located are composed of soils that are not conducive to herbaceous growth, but support trees and shrubs, and so are good areas for forest-dependent wildlife. The remaining areas are composed of soils that support herbs, shrubs and trees and so are good areas for both openland and forest-dependent wildlife (Fig. 2 after Young 1989).

Table 1. Soils of the Bird Island Wildlife Preserve and recommended uses after Young (1989)

#	Name	Slope (%)	Recreational Uses*	Sanitation Devices	Wildlife Uses
1	Afayan Variant Rock Outcrop	15-30	Trails with much modification	No	Herbs Openland wildlife
2	Afayan Variant Rock Outcrop	30-60	None	No	Herbs Openland wildlife
10	Chinen Clay Loam	0-5	Trails with much modification	No	Herbs, shrubs, trees Openland and Forest wildlife
15	Chinen Rock Outcrop	3-15	Trails with much modification	No	Herbs, shrubs, trees Openland and Forest wildlife
26	Kagman Clay	0-5	None	No	Herbs, shrubs, trees Openland and Forest wildlife
27	Kagman Clay	5-15	None	No	Herbs, shrubs, trees Openland and Forest wildlife
42	Rock Outcrop-Takpochao	60-99	None	No	Trees, shrubs Forest wildlife
50	Tackpochao-Rock Outcrop	3-15	none	No	Trees, shrubs Forest wildlife

*Recreational Uses considered include campsites, picnic areas, playgrounds, paths and trails.

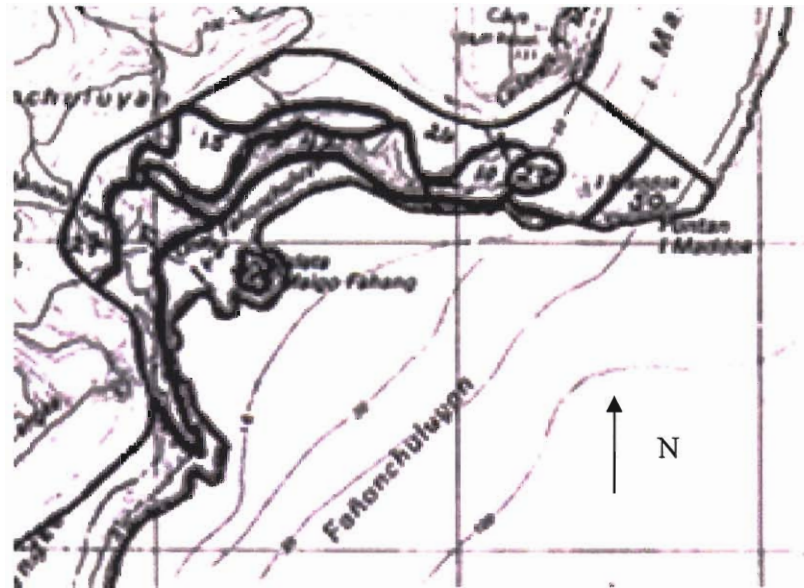


Figure 2. Approximate location of soil types in the Bird Island Wildlife Preservation Area (after Young 1989). See Table 1 for names and characteristics of soils.

In order to manage the Bird Island Wildlife Preserve and terrestrial portions of the Bird Island Sanctuary appropriately, the CNMI-Division of Fish and Wildlife conducted baseline forest bird, reptile, rodent, and vegetation surveys from 11 - 15 December 2001. The purpose of the surveys was to assess the status of the Preserve's terrestrial wildlife populations and to serve as an inventory of the biological diversity and distribution of natural resources in the protected area. The surveys were performed in preparation for improving management of the protected area's resources and it is intended that the data presented here serve as a basis for the management plan. A State Wildlife Grant obtained by the Division in fiscal year 2002 includes a project that will support the formulation of a management plan for the combined Bird Island Wildlife Preserve and Bird Island Sanctuary. The management plan is scheduled to be written in 2003-04. Thus, we are pleased to report the results of the 2001 wildlife surveys in a timely manner below.

II. Forest Bird Surveys

Methods for surveys and analysis

Forest birds were surveyed using Variable Circular Plot (VCP) methodology on 11 - 12 December 2001. Teams of one to two people surveyed 24 points within the Bird Island Wildlife Preserve. Listening stations were located 200 m distant from each other along 14 transects set 200 m apart (Fig. 3). Each transect consisted of between one and three listening stations. One person from

each team counted birds both visually and by song, estimating the lateral distance to each bird detected from the center of the listening station. Listening stations were not permanently marked but can be approximated from the GPS coordinates given in Appendix 1. Calibration exercises conducted prior to beginning the survey were intended to reduce variability among observers. Surveys were conducted from dawn until 1000 hours. Vegetation was described for each listening station and results of the habitat survey are reported in a separate section below.

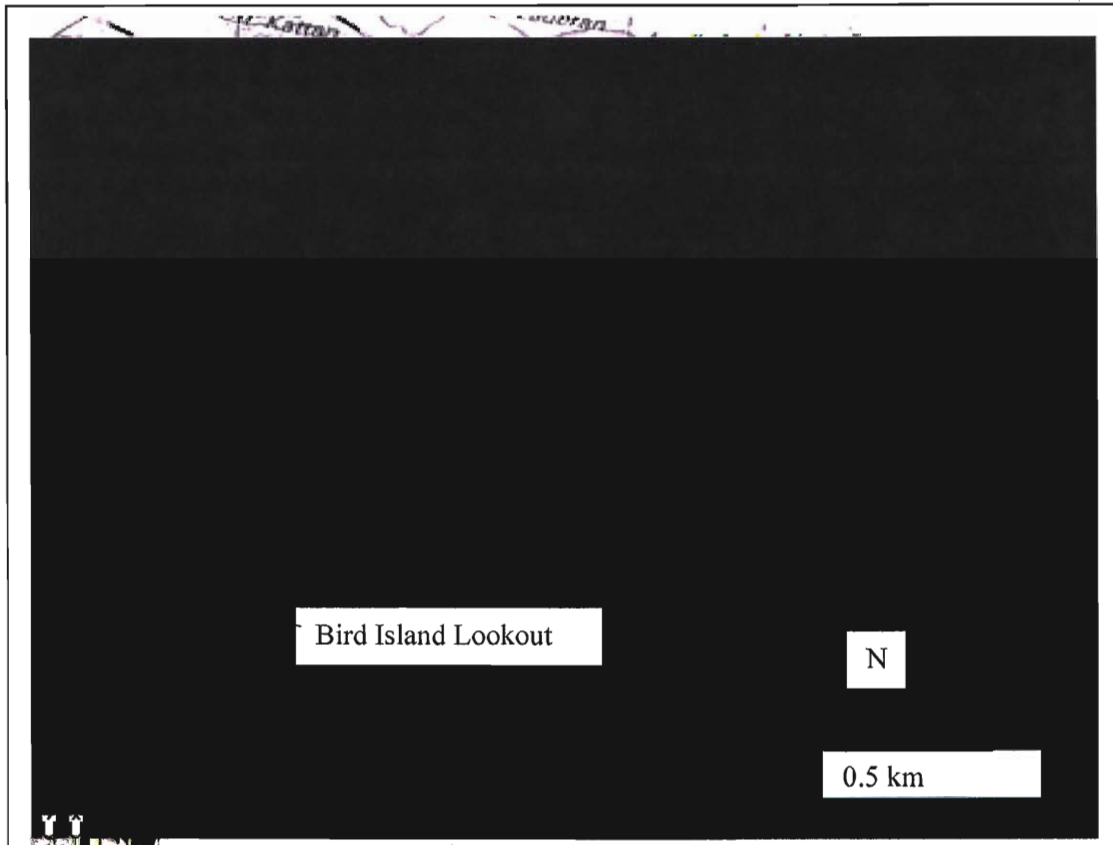


Figure 1. Map of transects and listening stations used in 2001 survey of birds and vegetation. Compass bearings are indicated for each transect.

Density estimates for each species were calculated using the computer program DISTANCE (version 3.5) available on the web. Data for each species were examined using histograms and truncated such that 90-95% of the observations were used to fit the mathematical models. Data were grouped into intervals that allowed a good fit to the half-normal model (intervals and number of groups were different for each species). The χ^2 goodness-of-fit test for all species with the exception of Golden white-eyes ($P > 0.6$) and Mariana fruit-doves ($P > 0.7$) indicated a very good fit between model and data ($P > 0.9$). Data from this survey were grouped with data from other forest surveys conducted on Saipan

yyw
*b2w

and Aguiguan and were run simultaneously to augment the number of detections (sample size) for each species where necessary. Densities were calculated for each species and for each survey independently.

In calculating forest bird abundances we estimated that approximately 70 ha of the protected area is forested at this time. From aerial photos it is known that the majority of this area was under sugar cane production in the 1930's and 1940's, with an old plantation railroad that ran near the current paved road. The presence of extensive secondary forest at this time attests to the re-growth of the forest since that period. Because the amount of habitat available heavily influences abundance estimates, comparisons of densities over time may be the most reliable gauge of population trends in the protected area.

Results and discussion

Fifteen species of birds totaling 424 individuals were counted during the survey. On average, 17.7 birds were counted per station, with over 20 feral and domestic roosters and chickens observed. One White-tailed tropicbird (*Phaethon lepturus*), 19 Brown Noddies (*Anous stolidus*), and a dozen White terns (*Gygis alba*) were among the seabirds recorded incidentally. No Mariana swiftlets (*Aerodramus bartschi*) were detected in the area, but they have been observed foraging over this forest on other occasions. Of the remaining forest birds (Table 2 and Fig. 4), the most commonly detected were the Bridled white-eye (*Zosterops conspicillatus*), Rufous fantail (*Rhipidura rufifrons*), and Golden white-eye (*Cleptornis marchei*). Micronesian starlings (*Aplonis opaca*), Collared kingfishers (*Halcyon chloris*), Mariana fruit-doves (*Ptilinopus roseicapilla*), and Micronesian honeyeaters (*Myzomela rubratra*) were detected often. Nightingale reed-warblers (*Acrocephalus luscinia*), White-throated ground-doves (*Gallucolumba xanthonura*), Philippine turtle-doves (*Streptopelia bitorquata*) and Micronesian megapodes (*Megapodius laperouse*) were rarely found.

Table 2. Numbers of forest birds detected 11 - 12 December 2001 in the Bird Island Wildlife Preserve. Counts are expressed both as total number of detections for the species and as mean number of the species detected per station \pm one standard deviation (SD). The total number of stations surveyed was 24 in 2001.

Bird Species	Total count	mean # birds/station (\pm sd)
Bridled white-eye	214	8.9 (4.18)
Rufous fantail	64	2.7 (1.55)
Golden white-eye	29	1.2 (1.29)
Brown noddy	19	0.8 (0.22)
Micronesian starling	18	0.8 (1.59)
Collared kingfisher	18	0.8 (0.97)



Rufous Fantail

Table 3. Bird density per hectare and estimated species abundance in the Bird Island Wildlife Preserve, December 2001. Calculated densities and the Preserve-wide population estimates are followed by 95% confidence intervals based on an estimated 70 ha of forested land. No population estimates were possible for those species with small sample sizes (e.g., White-throated ground-dove and Micronesian megapode).

Bird Species	Birds/ha 2001 (95% CI)	Protected Area-wide population estimate (95% CI)
Bridled white-eye	89.18 (65.81 – 120.83)	6,242 (4,607 – 8,458)
Rufous fantail	32.17 (22.87 – 45.25)	2,252 (1,601 – 3,168)
Golden white-eye	16.63 (9.26 - 29.87)	1,164 (648 - 2,091)
Micronesian starling	4.17 (1.84 – 9.43)	292 (129 – 660)
Micronesian honeyeater	2.01 (1.02 – 3.96)	141 (72 – 277)
Collared kingfisher	0.56 (0.31 – 1.01)	39 (22 – 71)
Mariana fruit-dove	0.33 (0.17 – 0.63)	23 (1 – 44)
Nightingale reed- warbler	0.32 (0.12 – 0.83)	22 (9 – 58)

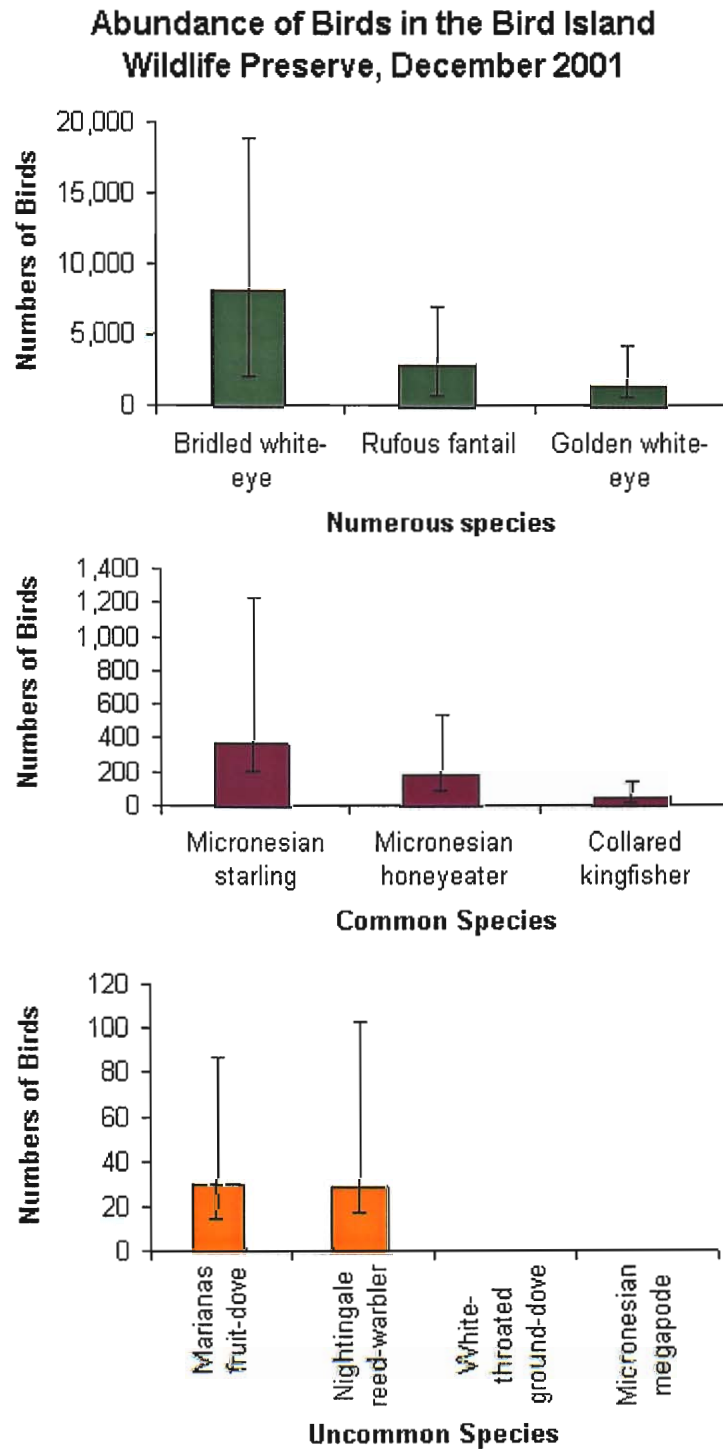


Figure 5. Species abundance in the 70 ha Bird Island Wildlife Preserve in December 2001 (error bars represent 95% Confidence Intervals).

The bird populations of the Bird Island Wildlife Preserve are obviously contiguous with those of the rest of northern Saipan, and in particular with the largely forested Saipan Upland Mitigation Bank. Therefore, factors affecting the populations in the Preserve may not be independent of those in neighboring forests, nor revealed easily because immigration from the neighboring areas would tend to mask the dynamics in the Preserve itself. Because the Preserve's forests are highly fragmented by roads and past agricultural clearings, it is possible that our population estimates for the area are high. However, density estimates are generally consistent with those of neighboring forested areas.

The Preserve appears to support abundant populations of both species of white-eyes and fantails, and the abundance of other endemic forest birds is not unusual for these types of forests. There appear to be a fair number of the endangered Nightingale reed-warbler in the Preserve, however, their distribution is patchy and it is possible that they are not be as densely populated here (ranging from 0.12 to 0.83 per hectare) as they are in the neighboring Saipan Upland Mitigation Bank (ranging on average from 0.41 to 0.82 per hectare in 2001). Micronesian honeyeaters, although far more densely populated on the depauperate northern islands of the archipelago, compete more strongly with other forest birds on Saipan, and thus their population appears to be limited.



Collared kingfisher preying on gecko

III. Vegetation Surveys

Methods for surveys and analysis

Vegetation surveys were conducted simultaneously with forest bird counts using the same transects and stations (Fig. 3). Tree species at each station were surveyed using a modified point-center quarter method (Mueller-Dombois and Ellenberg 1974). Lateral distance from the station center to the nearest tree in each quarter (delineated by cardinal directions) was measured. The selected trees, two meters in height and greater, were identified to species, the diameter at breast height (DBH) measured, and the height estimated. Canopy cover for each station was estimated using a densiometer following manufacturer's instructions. Percent ground cover was estimated using the line intersect method placed randomly within a 1m² area around the station.

The data were analyzed for tree density, absolute frequency, importance value (Mueller-Dombois and Ellenberg 1974) and percent canopy and ground cover. Absolute frequency was calculated as the number of plots in which a species occurs divided by the total number of plots multiplied by 100. The absolute density of all tree species in 100 m² was calculated with the formula Absolute Density = area/D², where D = the mean distance of all distances to all trees in all plots. In order to determine the density of specific tree species the ratio of the number of quarters in which that species occurred to the total number of quarters was calculated. That ratio was then multiplied by the overall absolute density of trees to give the density of each species per 100 m². Basal area (BA) was calculated by the formula $BA = \pi (DBH/2)^2$. Dominance of a species was calculated as the average BA of all plots times species density in 100 m² (as calculated above). The importance value was calculated as the sum of the relative dominance, relative density and relative frequency. Relative values were derived taking the ratio of the individual species to the sum of all species.

Results and discussion

A total of 16 tree species were identified throughout the Bird Island Wildlife Preserve. The average density of all tree species in the area was 33.45 trees / 100 m². There were two non-native introduced species, *Leuceana leucocephala* and *Albizia lebeck*, among the sixteen identified. These two species and the native *Cynometra ramiflora* dominated the forest in terms of density, frequency (Figs. 6 and 7) and importance value (Table 4). The most abundant species in all DBH size classes was *L. leucocephala*. The largest size class, 20 to 24.99 cm DBH, was composed of the introduced *L. leucocephala* and *A. lebeck*. The understory was also dominated by the abundant (but not as abundant as *L. leucocephala*) *C. ramiflora* in the 0-14.99 cm size classes (Fig. 8). The largest size class was composed completely of non-native species whereas the smaller size classes, particularly the smallest, had much larger percentages of native

species (Fig. 9). Canopy cover was fairly high throughout the conservation area and the ground cover was quite variable (Fig. 10).

Table 4. Importance values (sum of relative dominance, relative frequency, and relative density) and basal area for trees surveyed at 25 stations in the Bird Island Wildlife Preservation Area in December 2001.

Species	Common Name	Importance Value	Mean Basal Area
<i>Neisosperma oppositifolia</i>	Fagot	7.43	223.65
<i>Albizia lebeck</i>	Kalaskas	44.06	78.23
<i>Ficus prolixa</i>	Nunu	7.17	73.38
<i>Leucaena leucocephala</i>	Tangantangan	146.31	67.74
<i>Cynometra ramiflora</i>	Gulos	46.93	52.18
<i>Cerbera dillatata</i>	Chiute	3.98	30.27
<i>Premna obtusifolia</i>	Aghoa	3.90	25.80
<i>Drypetes dolichocarpa</i>	Mwelel	3.85	23.01
<i>Pouteria obovata</i>	Lalaha	3.68	13.46
<i>Psychotria mariana</i>	Aploghating	3.61	9.63
<i>Aidia cochinchinensis</i>	Sumak	4.86	8.80
<i>Pandanus dubius</i>	Pahong	3.58	7.96
<i>Casuarina equisetifolia</i>	Gagu	4.77	6.14
<i>Maytenus thompsonii</i>	Lulujut	3.52	4.48
<i>Ochrosia mariannensis</i>	Langiti	3.50	3.63
<i>Morinda citrifolia</i>	Lada	3.46	1.27

The Bird Island Wildlife Preserve was a forest mosaic in December 2001. Native forest was concentrated in the ravine areas, whereas the upper inland areas were flat and dominated by an *L. leucocephala* overstory. Transects C, D and G (see Fig. 3) were primarily *L. leucocephala* (80% of trees surveyed). Transects A, E, F, G and H were a mix of native and introduced trees. The only fully native forest transects surveyed were B and K. Native tree species were most common in the smaller DBH size classes (Fig. 8). The most prevalent native tree species found in the area were *Aidia cochinchinensis*, *Ochrosia mariannensis* and *Cynometra ramiflora*. The largest percent of native trees fell within the 0 - 4.99 cm DBH size class and in the 15-19.99 cm size class (Fig. 9). Conversely, these two size classes have the smallest components of *L. leucocephala*.

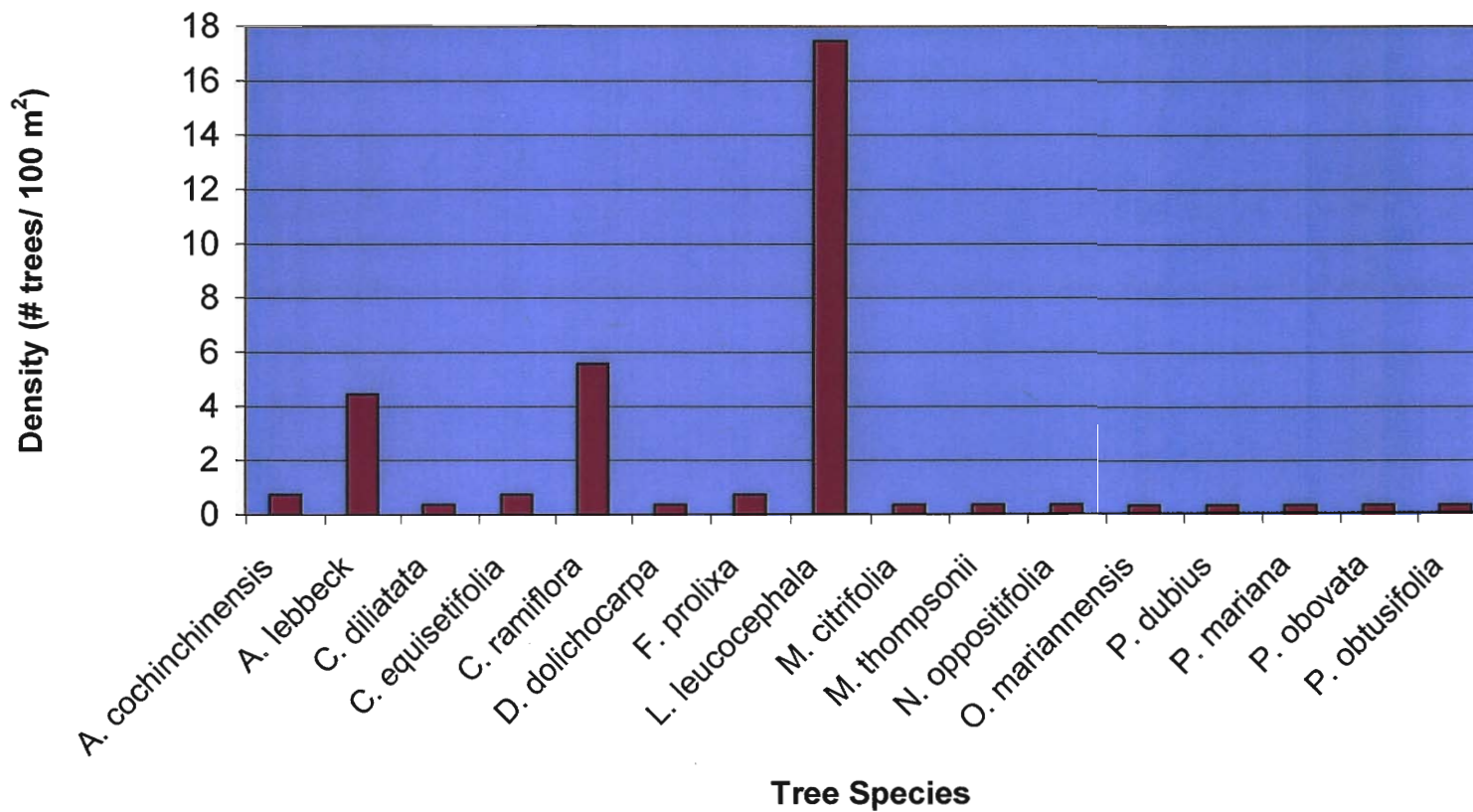


Figure 6. The density (number of trees per 100 m²) of tree species determined from a survey of 25 stations in the Bird Island Wildlife Preservation Area in December 2001.

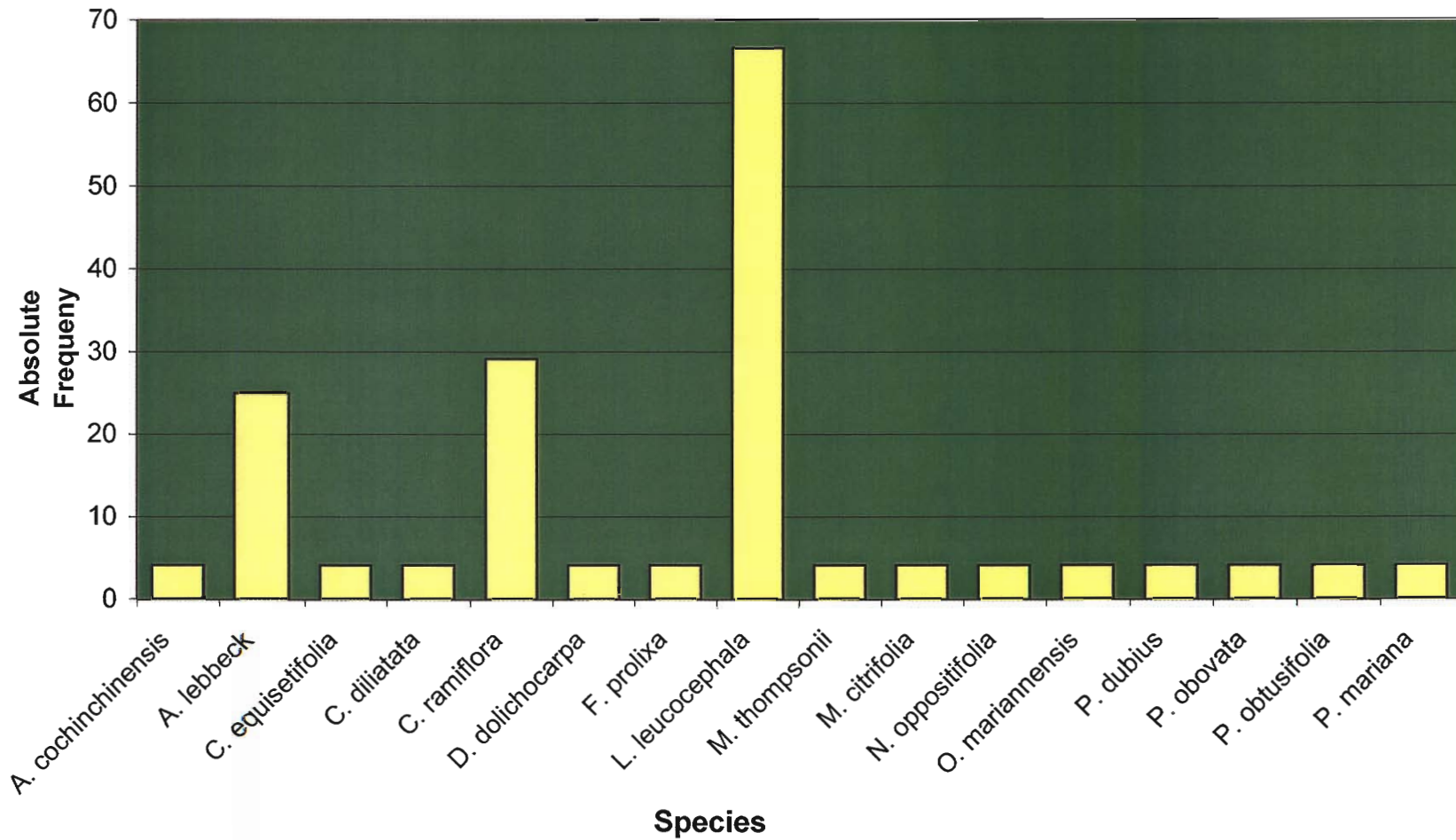


Figure 7. Absolute frequency (relative distribution of trees throughout the area) from 25 stations in the Bird Island Wildlife Preservation Area, December 2001.

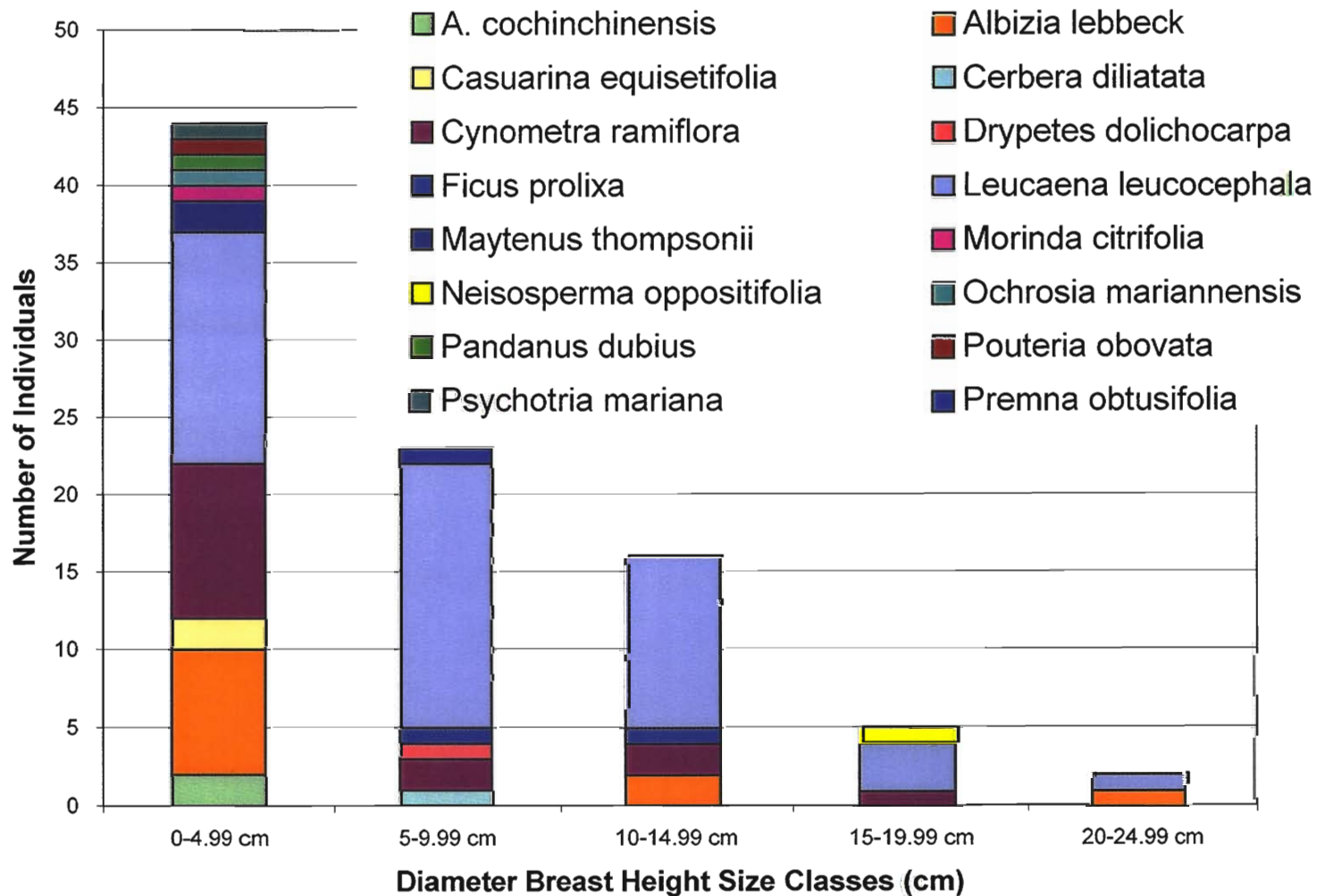


Figure 8. Diameter at breast height (DBH) size classes for trees in the Bird Island Wildlife Preservation in December 2001.

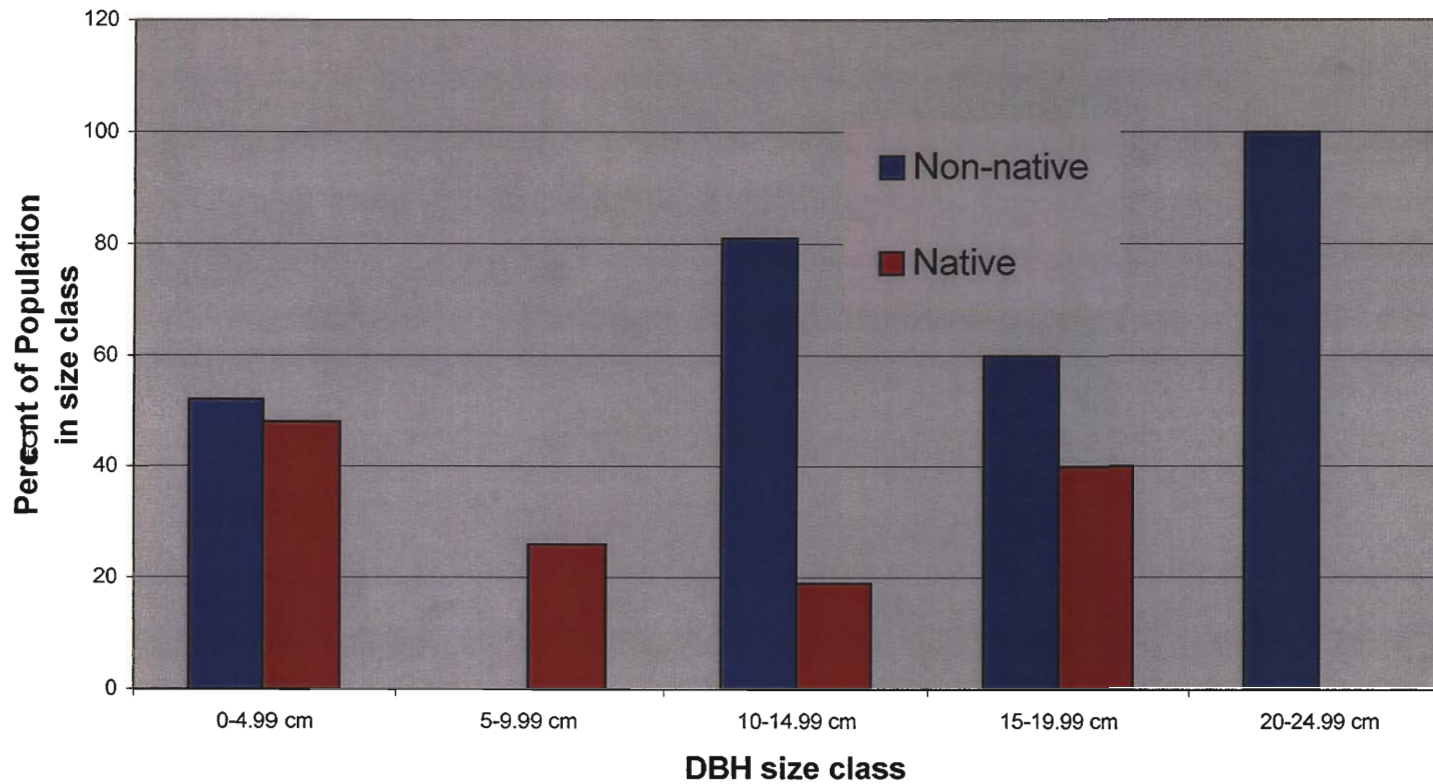


Figure 9. Percentage of native and non-native trees in small to large DBH size classes over the Bird Island Wildlife Preserve in December 2001 ($n = 25$ stations).

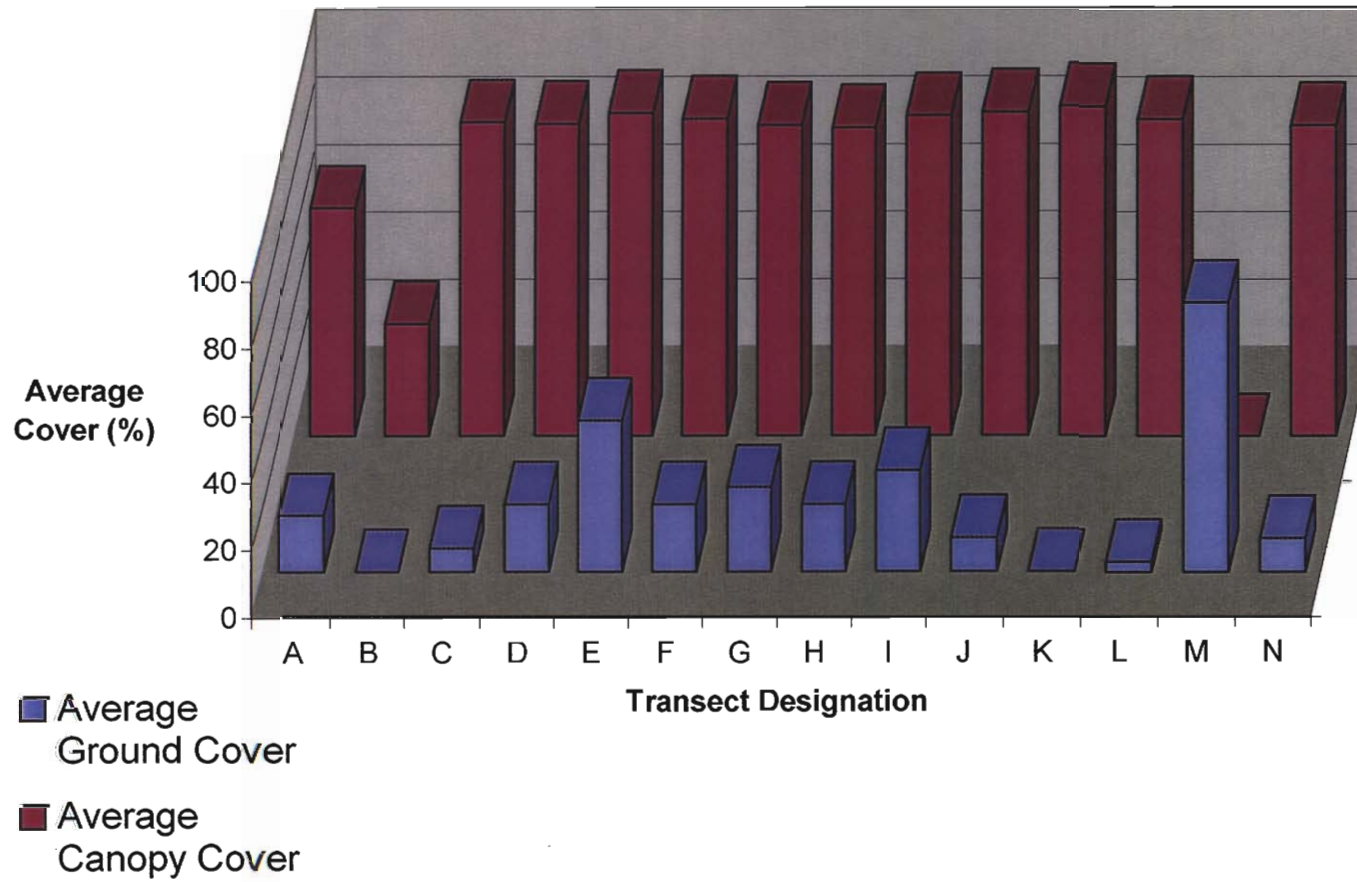


Figure 10. Average percent canopy cover and ground cover of transect stations in the Bird Island Wildlife Preserve in December 2001.

IV. Management Recommendations

The Bird Island Wildlife Preserve has been fragmented by roads, tourist facilities, agricultural clearings, grazing leases, and forestry plots since its inception. It has been reduced considerably in size since its declaration through lack of political will to maintain and protect conservation areas on the island of Saipan. The Preserve deserves improved protection status. The following recommendations to improve protection and enhance forest and wildlife resources are based on past use of the area, the structure of the substrate, and the biological findings of the current surveys:

1. Protect, maintain, and enhance the current continuity of the Bird Island Wildlife Preserve by:
 - a. Maintaining or augmenting current Preserve boundaries;
 - b. Posting current Preserve boundaries to inform the public of the Preserve's physical presence;
 - c. Maintaining informational signage to inform the public of the benefits of the Preserve and the restrictions of its use;
 - d. Prohibiting further road building or the building of tourist and recreational facilities in additional areas of the Preserve.
2. Enhance forest health and continuity by securing long-term maintenance and monitoring of reforestation plots in former agricultural clearing areas.
3. Improve erosion control along current Bird Island Beach trail.
4. Restrict tourist and other recreational facilities to those areas that are already developed.
5. Restrict uses of the remaining intact areas of the Preserve to those supporting scientific research and conservation.
6. Prohibit further manipulation of currently forested areas so that forest continuity and health is maintained at least in its current status.
7. Implement a management plan for the area that strictly protects the current forests and restricts recreational uses to those clearings and soil types that can support them.

V. Acknowledgements

We are indebted to a grant under Federal Aid (Pitman-Robertson funds) to Wildlife Conservation and Restoration for financial support while conducting the surveys and for support during the analysis of data and the writing of this report.

VI. Literature Cited

Mueller-Dombois, D. and Ellenberg, H. 1974. Aims and methods of vegetation ecology. John Wiley and Sons Inc., New York. Pp 100-125.

Young, F. J. 1989. Soil survey of the islands of Aguijan, Rota, Saipan, and Tinian, Commonwealth of the Northern Mariana Islands. USDA, Soil Conservation Service, National Cooperative Soil Survey. Pp. 166 plus maps.



Southern portion of the Bird Island Wildlife Preserve bounded by paved road to the Bird Island Lookout

APPENDIX 1

BIRD ISLAND WILDLIFE PRESERVE
GPS Locations for VCP Survey Stations

Island	Transect	Station	N	E
Saipan	A	1	373644	1687497
Saipan	A	2	373775	1687487
Saipan	A	3		
Saipan	B	1	373638	1687418
Saipan	B	2	373905	1687443
Saipan	C	1	373130	1687296
Saipan	C	2	373288	1687226
Saipan	C	3	373443	1687213
Saipan	D	1	low battery	
Saipan	D	2	372988	1687231
Saipan	E	1	372772	1687316
Saipan	E	2	Poor coverage	
Saipan	F	1	372557	1687599
Saipan	F	2	372605	1687386
Saipan	G	1	372057	1687254
Saipan	G	2	372155	1687150
Saipan	H	1	372403	1687491
Saipan	H	2	372271	1687410
Saipan	I	1	372511	1687416
Saipan	I	2	372386	1687338
Saipan	J	1	371809	1687250
Saipan	K	1	371770	1687032
Saipan	L	1	371873	1686877
Saipan	M	1	371941	1686757
Saipan	N	1	371997	1686484