Final Report

Belau National Museum: Native Birds and Flying Foxes; Natural Aids to Forest Restoration in Lake Ngardok Nature Reserve

Julian Dendy

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Introduction

This report is intended to summarize the approach and results of the activities related to the CEPF funded project, "Belau National Museum: Native Birds and Flying Foxes; Natural Aids to Forest Restoration in Lake Ngardok Nature Reserve," which took place over the time period 2010-2011 in the Republic of Palau. The intent of the project was to assess several low cost, low input methods of restoring forest cover to areas of degraded savanna in the Lake Ngardok Nature Reserve, and to investigate both patterns of resource use in savannas by local avifauna and flying foxes and their response to the restoration methods. The project, in addition to being a collaborative effort between Belau National Museum, Palau Forestry, Institute of Pacific Island Forestry, Melekeok State, and the University of Hawaii at Hilo, served as a UHH Master of Science thesis for Julian Dendy, the project leader. The MS thesis, "Low Input Methods of Forest Restoration and Observations of Native Birds and Flying Foxes in Savanna Habitat in the Lake Ngardok Nature Reserve, Palau," will serve as the principal reference document for the project, containing all of the relevant details, statistics, background information and literature.

Background

The Lake Ngardok Nature Reserve, located within Melekeok State on Babeldaob Island, in the Republic of Palau, was chosen as the study site for the project, as it is recognized both for its environmental and social importance, being a local center of plant and avian diversity and an important source of water for two villages and the new national capitol. The reserve also contains a mosaic of habitats, including relatively large areas of highly degraded savanna, all of which is located within the lake's watershed, and much of which is relatively close to the lake's edge, or to important swamp forest and fresh water marsh habitat. Given the highly degraded and erodible soils in these savanna areas, and the importance of the lake as a local source of drinking water, the savanna here was chosen almost 20 years ago as a site for reforestation efforts by Palau Forestry. They planted hundreds of trees, mostly the non-native *Acacia auriculiformis*, a nitrogen fixing tree they thought would help improve the area's poor soils. The effort was mostly a failure, as the great majority of the planted trees never became established enough to develop root nodules or improve the soil around them, and today these trees remain stunted or have long since died. The soil in Babeldaob's degraded savannas is too poor for tree planting alone to be of much use in restoration and reforestation efforts.

The acidic and near toxic soil, low in nutrients and organic matter, was likely the worst soil that scientists from the US Natural Resource Conservation Service (NRCS) had ever seen, but nevertheless, when they applied fertilizer (added nutrients), lime (reduced acidity and solubility of aluminum), and a thick layer of mulch (added organic matter), they saw a dramatic recovery within 5 months of the health of planted trees in the Lake Ngardok savanna. Based on their promising field trials, scientists from the Institute of Pacific Island Forestry (IPIF), decided to try the approach on small clusters, or islands, of native trees growing in Lake Ngardok savanna, in an effort to see if it could speed up the natural succession process from savanna to forest.

In any restoration effort, the practitioner has the goal of eventually being able to leave the system alone, when it is capable of maintaining the desired ecological and physical processes without any further intervention. In tropical forests, that means determining the principal agents of pollination and seed dispersal, as well as the characteristics of habitat they require and/or are attracted to. In Palau's forests, the principal pollinators and dispersers are mostly known, but their habitat preferences and movements remain mostly unstudied. But given their likely role in maintaining forest tree species diversity and helping revegetate cleared areas in Palau, a monitoring aspect of pollinators and dispersers (birds and flying foxes) was included in the project, in an effort to determine the role these species play in Palau's savanna habitat and succession processes.

Methods

Paired by size, 32 tree islands were selected and measured in the Lake Ngardok Reserve savanna study site. Beginning in March, 2010, the experimental treatments of perimeter trimming, fertilizer application, *Acacia auriculiformis* mulch application, and outplanting of native trees were applied to half of the islands. The fertilizer used was the cheapest locally available option, a 16-8-12 NPK solid fertilizer which was dispersed by hand to selected island interiors on three occasions over the year. The mulch was applied by hand to the perimeter of selected islands, according to the study's split plot design, and was produced by Palau Forestry from locally available *Acacia auriculiformis* branches and leaves, which were processed in a shredder. The native trees (5 species) were selected for their mix of characteristics, grown in the Palau Forestry nursery, and outplanted by hand according to the split plot design and a planting methodology which included incorporating locally available compost and burnt lime into the planting hole, in order to ameliorate the soil conditions. Each tree island's perimeter environment was measured at the beginning and end of the study season (May, December 2010) to detect island change or growth. Four seedling plots were established at the islands' driplines, and measured for seedling density and diversity. Tree and shrub saplings along the islands' driplines were measured for height. Flowering, fruiting, and production of new leaves were monitored for each island every two weeks. All birds and fruit bat visits to all islands and trees, as well as flights through or over the study area were monitored twice daily for a full week, every other week, over the entire study season. Finally, aerial photos and satellite images from three different years were used in a GIS study to determine the background rate of forest change within the reserve over a 60 year time period.

Results

The trimming of vegetation (mostly ferns) around the tree island perimeters (by hand using machetes) resulted in a significant increase of both seedling density and diversity, as both of these measures nearly doubled from the initial condition to the end of the study season. The application of mulch had no measurable effect over the study season on either seedling density or sapling growth. In areas of the split plots where native trees were outplanted, there was a significant increase in seedling density, representing a doubling of the initial condition. The method used for tree planting seems promising, as the overall survival rate over the study season was over 95%, and none of the outplants were ever watered. There was a significant difference of the growth rate among the 5 species planted. *Pterocarpus indicus* was by far the fastest grower, and is highly suitable for restoration efforts, as it produces high

quality wood and food for wildlife. *Macaranga carolinensis* was also a good grower and another good candidate restoration species. The application of fertilizer to tree island interiors resulted in an increase of interior sapling growth, as well as significant increases in the output of new leaves, flowers, fruits, and visits by native birds.

Over the course of the initial study season, and a subsequent six months of periodic monitoring, it was found that the primary candidate seed dispersers of Palau's forests (Palau Fruit Dove, Nicobar Pigeon, Micronesian Imperial Pigeon, and Palau Flying Fox) rarely visit or use trees or tree islands in Lake Ngardok's savannas. However, they do fly through and especially over savanna areas, particularly flying foxes, and could be contributing to seed dispersal into these areas as they fly over them. The number of flyovers of flying foxes over the study season was extremely variable, but seems to be correlated with the fruiting of trees in the area. Given the extremely poor soils in these areas though, if seeds don't land in a favorable spot for survival and growth, like in a tree island, they don't stand a very good chance of developing into trees.

Three relatively small, omnivorous, native species, including two endemics (Dusky White Eye, Palau Cicadabird, and Micronesian Starling), were found to be the principal species visiting the tree islands in the Lake Ngardok savanna study site. These species are known to eat small fruits and seeds, and are likely moving seeds to and from the forest edge and savanna trees and tree islands, particularly of species of shrubs and trees with small fruits that are somewhat adapted to surviving along forest edge or in savanna habitat. Palau's avian pollinator, the Micronesian Myzomela, was the fourth most common visitor to tree islands in the study site. A multiple regression model run in ArcMap on the visitation patterns of birds to the tree islands in the study showed that island size is by far the most important factor in predicting bird visits, followed by the mean total number of fruit, and the mean height of trees neighboring the island. The most frequently visited species of tree in the study was the planted *Acacia auriculiformis*, probably the most common tree species in the study site.

The GIS study, which compared the percentage land cover of savanna and forest inside the Lake Ngardok Nature Reserve over time, showed a 14.2% increase in forest cover and decrease in savanna cover between 1947 and 2006. The rate of forest recovery between 1976 and 2006 was about 3 times slower than between 1947 and 1976.

Discussion

The results of this study show promising possibilities for assisting the regeneration of forest cover to degraded areas of savanna in Palau that are slow to recover on their own, and difficult to improve using tree planting alone. Low-cost and low-input techniques like trimming thick vegetation of ferns around tree islands, and applying fertilizer to tree island interiors, should result in island expansion and increased visits by small to medium sized, omnivorous, native birds. Planting native trees around tree island perimeters, with incorporated compost and lime, seems to result in much greater survival than previous planting efforts, and should lead to island expansion and increased bird visits as well. By concentrating on expanding and connecting islands to each other and nearby existing forest edge, greater visits by birds, maybe even the principal frugivores of Palau, could also be expected.

The Lake Ngardok Nature Reserve is in the process of having its new visitor center and nursery completed, and with funds allocated specifically for nursery tools and supplies, it should be only a matter of time before they have hundreds of new tree saplings ready to be planted. Once the reserve is open to visitors again, one of the activities for visitors will be the option to plant a native tree in the reserve. If the reserve staff follow the planting protocol described in this study, incorporating locally available compost and lime into the planting hole, and planting trees around existing tree islands, then they should be making steady, if slow, progress towards improving the vegetative cover of degraded savanna in the reserve, thereby helping to improve the quality of the watershed, and the integrity of the reserve overall.

By looking at the results of the GIS study, and comparing it to a previous, similar study, we can make some tentative observations about the succession process of savanna to forest in Palau. Both studies found a much faster recovery rate in earlier years, from 1947 to 1976, and this recovery seems to correspond primarily with areas being used for farming by Japanese colonists, which were abandoned after the end of WWII. In later years, after 1976, the rate of recovery slowed dramatically, and probably occurred principally along areas of forest/savanna edge. Interestingly, the rate of recovery was 10 times faster in the Lake Ngardok Reserve than in the Ngermeduu Bay area, and while we can't know for sure due to the uncontrolled nature of the study, the increase in forest recovery rate could be due to the control of fire within the reserve over the past 15 years. Nevertheless, even within the reserve, large areas of savanna have changed relatively little over the past 60 + years, indicating that in degraded areas forest recovery happens very slowly, and probably requires assistance to achieve forest cover.

Conferences and appearances

Over the course of this project, I presented the project background, approach and results at two conferences. I presented at the Tropical Conservation Biology and Environmental Science program's annual symposium, at the University of Hawaii Hilo, in February, 2011. I also attended and presented at the Society for Ecological Restoration's (SER) World Conference on Ecological Restoration: Re-establishing the Link Between Nature and Culture, in Merida, Mexico, August, 2011. Two Palau Forestry employees and I also spoke about the project for an hour on the Palau Conservation Society's local weekly radio program.

Project Partners

Numerous people were involved in the design, implementation, and academic aspects of this project, without whom, it would not have been possible. They are listed here by organization:

Melekeok State- Colin Joseph

Palau Forestry- Edwin Polloi, Kashgar Rengulbai, Omekrael Sadang, nursery staff

Belau National Museum – Alan Olsen, Milang Eberdong, Van Ray Tadao

The Environment Inc.- Ann and Clarence Kitalong

Palau Conservation Society- Anu Gupta

University of Hawaii at Hilo – Dr. Yi Qing Li, Dr. Patrick Hart, Dr. Donna Delparte

USDA, Institute of Pacific Island Forestry- Dr. Susan Cordell, Dr. Christian Giardina, Bernice Hwang, Katie Friday

University of Hawaii Manoa – Dr. JB Friday, Ross Tokashi

Natural Resource Conservation Service, Guam – Dr. Robert Gavenda

PIPES/MASSIP Program – Aleyna Ngirenkoi

Tables and Figures

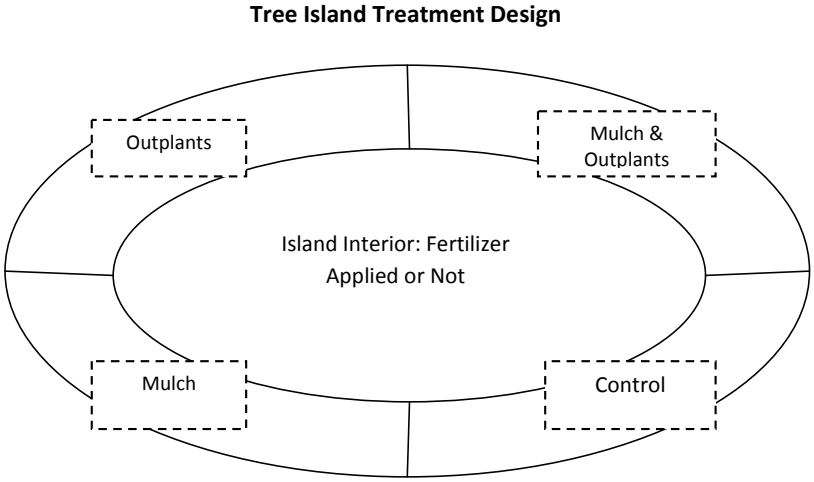

Figure 1: Tree island restoration split plot treatment design for the largest 16 of 32 total islands paired by size, in the Lake Ngardok Nature Reserve savanna study site. All of the paired islands had fertilizer applied to their interiors, or were controls.

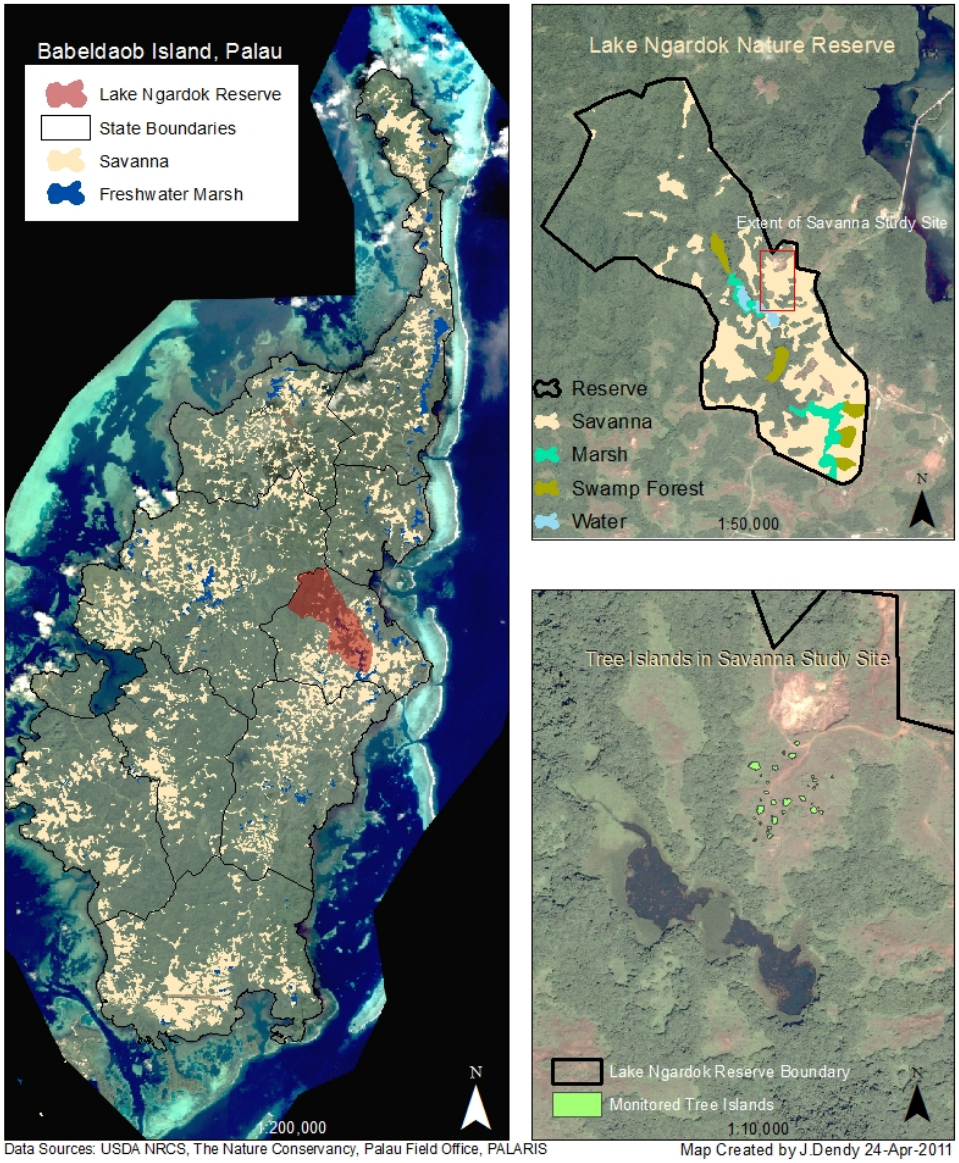

Figure 2. Location of Lake Ngardok Nature Reserve, study site, and tree islands, on Babeldaob.

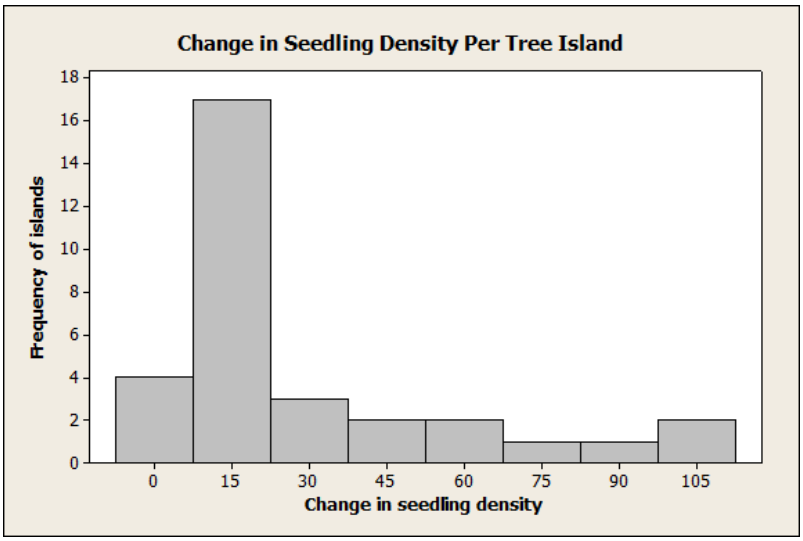

Figure 3: Mean change in seedling density per tree island, six months after an initial island perimeter trimming of non-woody vegetation (within 1m band), in the Lake Ngardok Nature Reserve savanna study site.

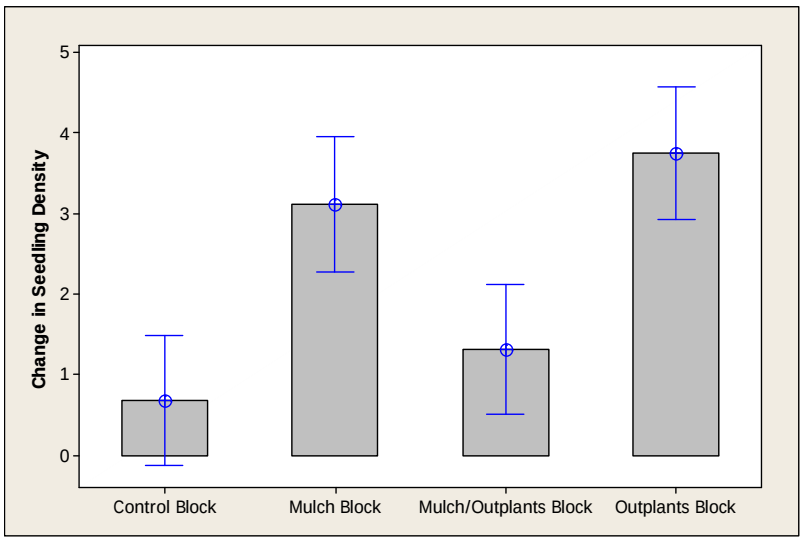

Figure 4: Mean change in seedling density per square meter in the four tree island treatment blocks (control, mulch, outplants, mulch/outplants), after an initial perimeter trimming, over the six month study season (June-December, 2010) in the Lake Ngardok Nature Reserve savanna study site. Bars represent one standard error of the mean.

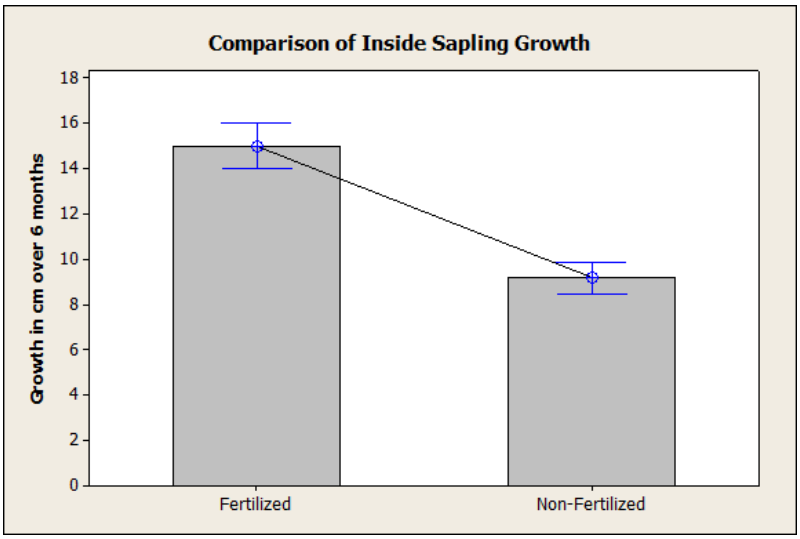

Figure 5: Comparison of growth of saplings inside island drip lines from fertilized and non-fertilized tree islands over six months (June-December, 2010), in the Lake Ngardok Nature Reserve savanna study site. Bars represent one standard error of mean.

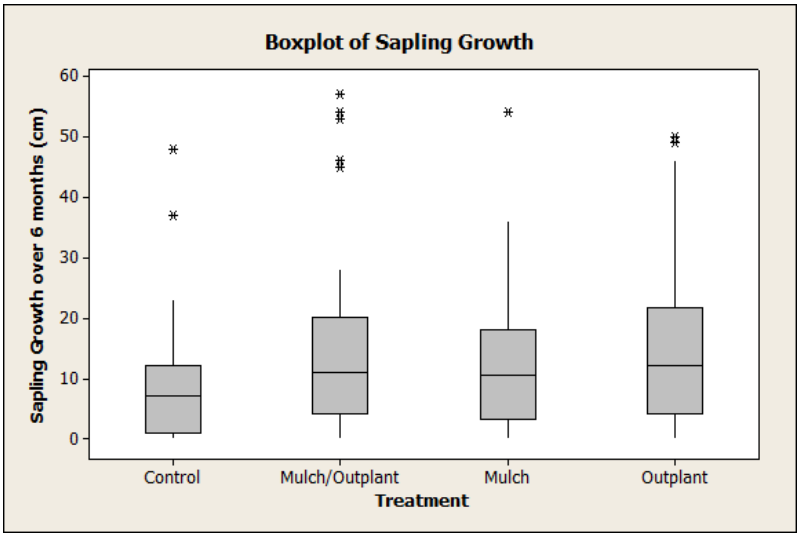

Figure 6: Growth comparison of outside saplings showing means and quartiles in the four tree island block treatments (control, mulch, outplants, mulch/outplants), over six months (June-December, 2010) in the Lake Ngardok Nature Reserve savanna study site. df=160, p=0.241.

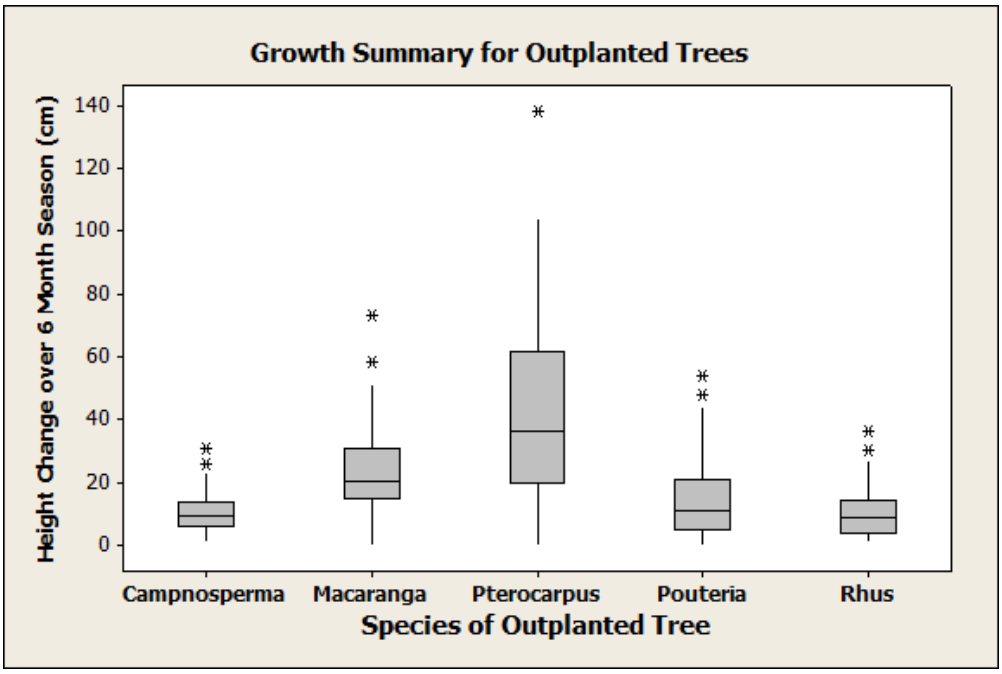

Figure 7: Growth summary of native trees over six months showing means and quartiles (June-December, 2010), outplanted around tree island perimeters in the Lake Ngardok Nature Reserve savanna study site.

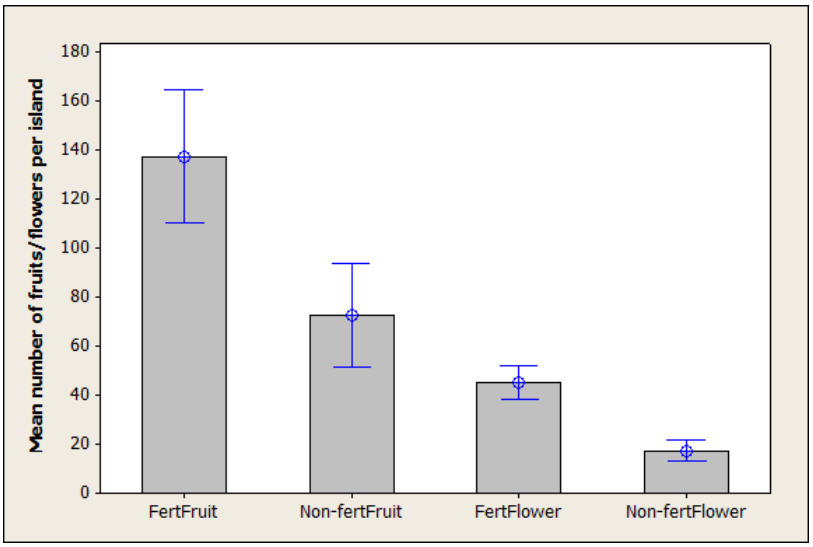

Figure 8: Comparison of mean number of total fruits and flowers between fertilized and non-fertilized tree islands for the six month study season (June-December, 2010) in the Lake Ngardok Nature Reserve savanna study site. Bars represent one standard error of mean.

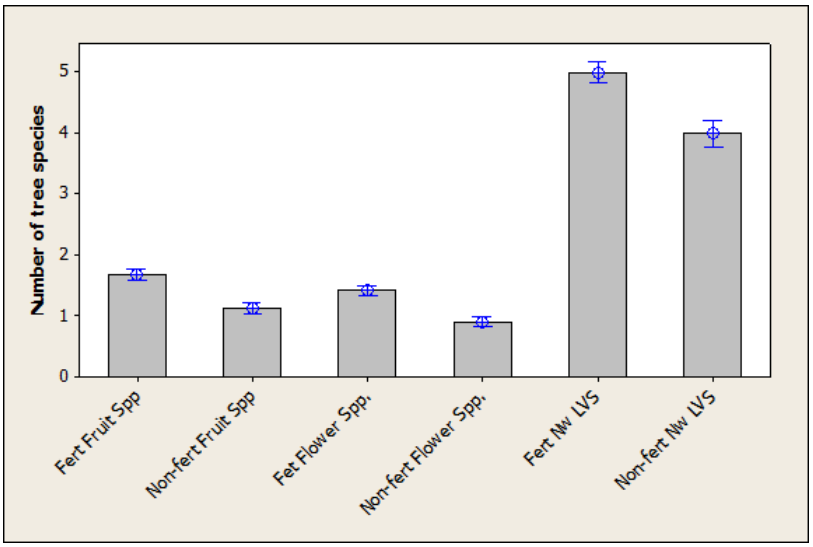

Figure 9: Comparison of mean number of tree species in flower, in fruit, or with new leaves, between fertilized and non-fertilized tree islands over the six month study season (June-December, 2010) in the Lake Ngardok Nature Reserve. Bars represent one SE of mean.

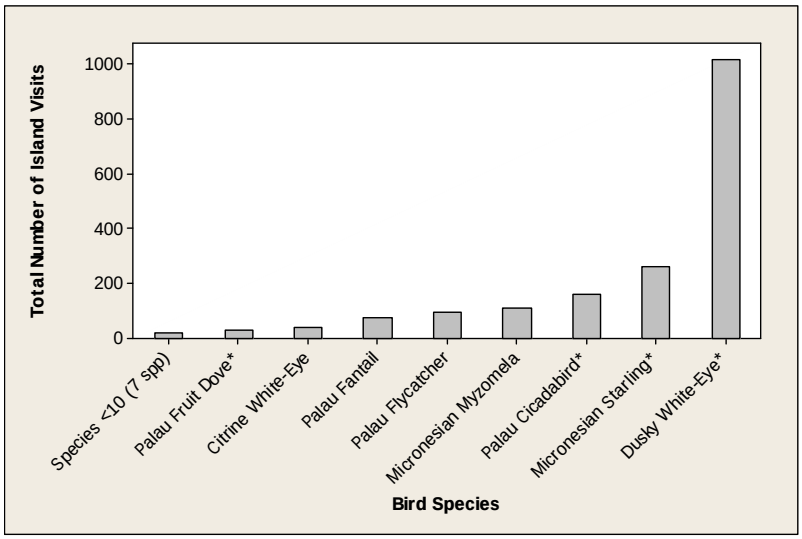

Figure 10: Total bird visits to marked tree islands from June to December, 2010, in the Lake Ngardok Nature Reserve savanna study site. Asterices indicate potential seed dispersing species.

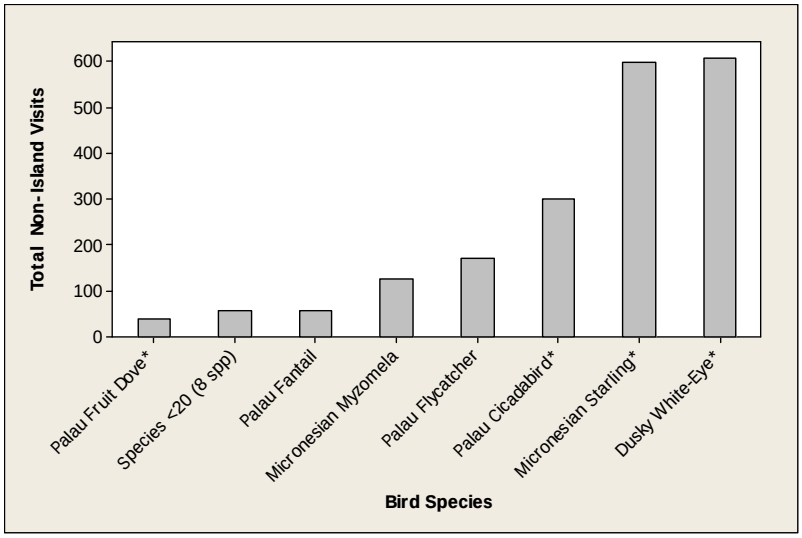

Figure 11: Total bird visits to trees and unmarked tree islands in the Lake Ngardok Nature Reserve savanna study site, from June to December, 2010. Asterices indicate potential seed dispersing species.

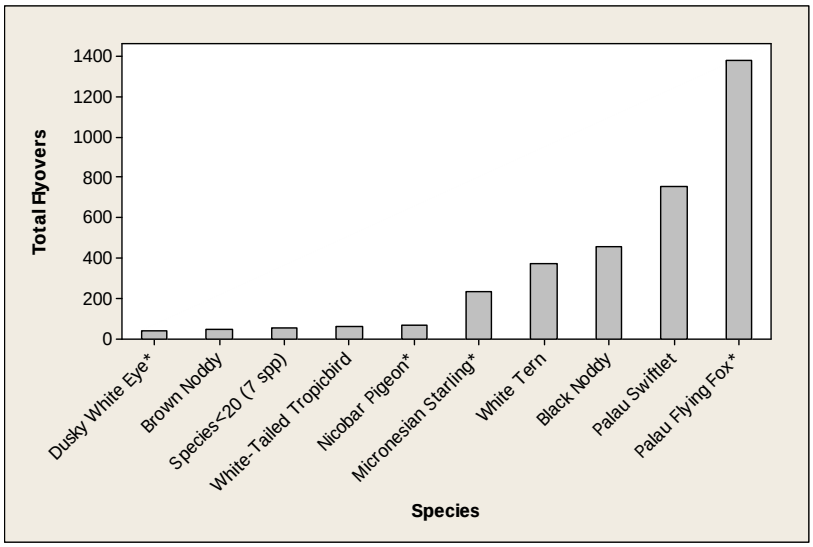

Figure 12: Total observed flyovers of the Lake Ngardok Nature Reserve savanna study site, from June to December, 2010. Asterices indicate potential seed dispersing species.

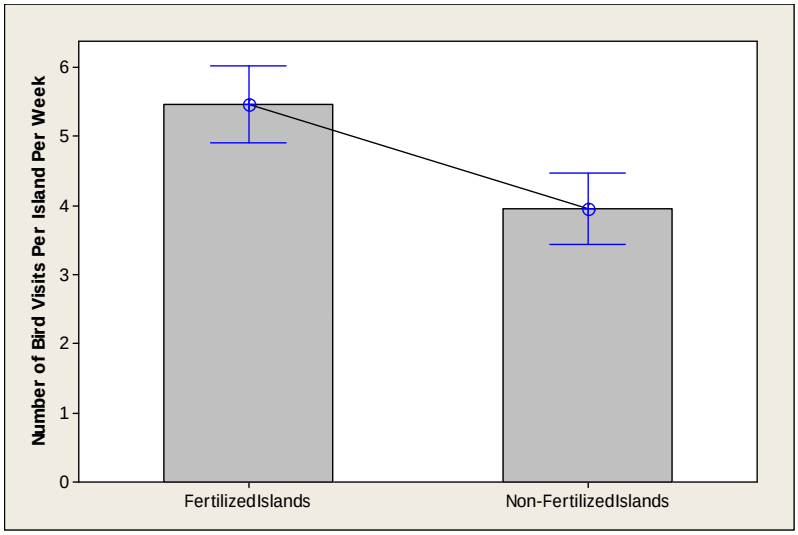

Figure 13: Comparison between mean number of visits to fertilized and non-fertilized islands in the Lake Ngardok Nature Reserve savanna study site, June-December, 2010. Bars represent one standard error of mean.

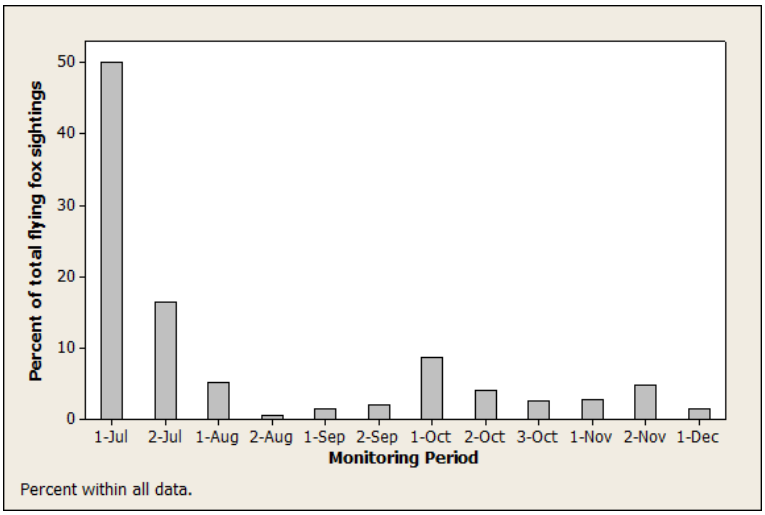

Figure 14: Time series showing relative percent of total flying fox flyovers per monitoring period, from June-December, 2010, in the Lake Ngardok Nature Reserve savanna study site.

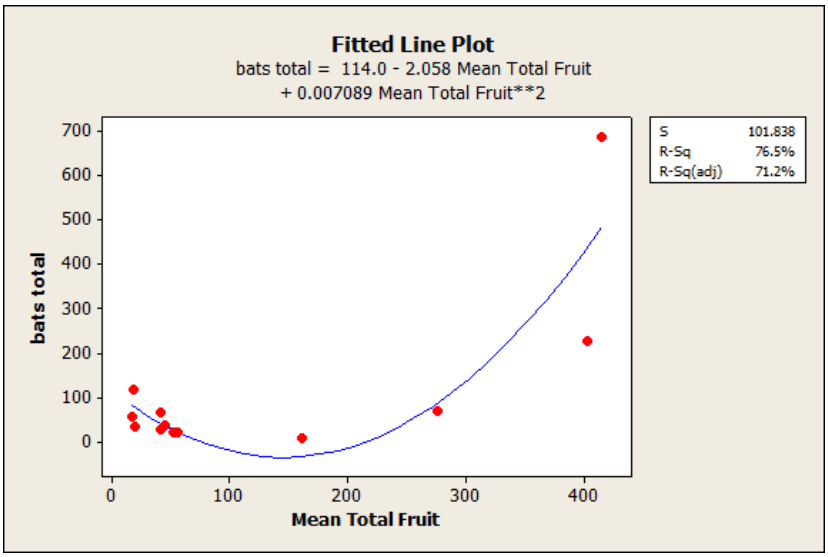

Figure 15: Fitted line plot showing quadratic regression between total number of flying foxes sighted and mean total number of fruits per tree island in the Lake Ngardok Nature Reserve savanna study site for the study season (June-December, 2010). N=13

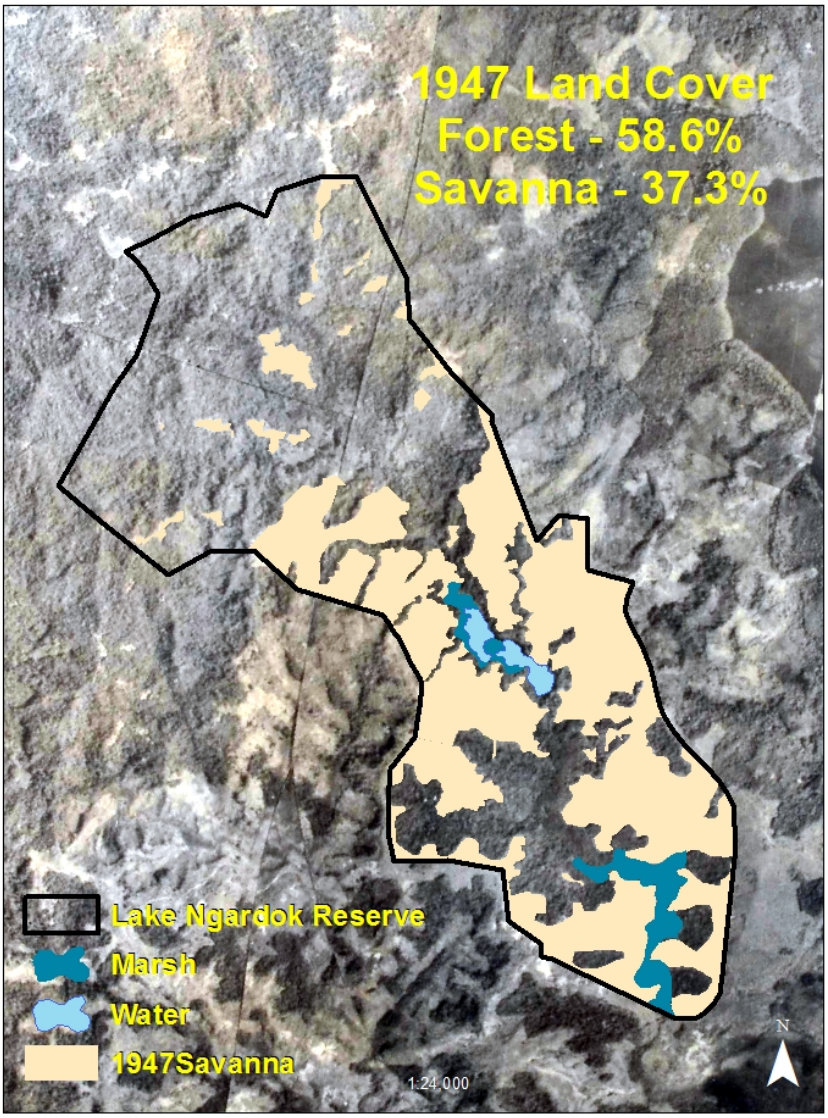

Figure 16. Land cover sumary for 1947 in the Lake Ngardok Nature Reserve, Palau.

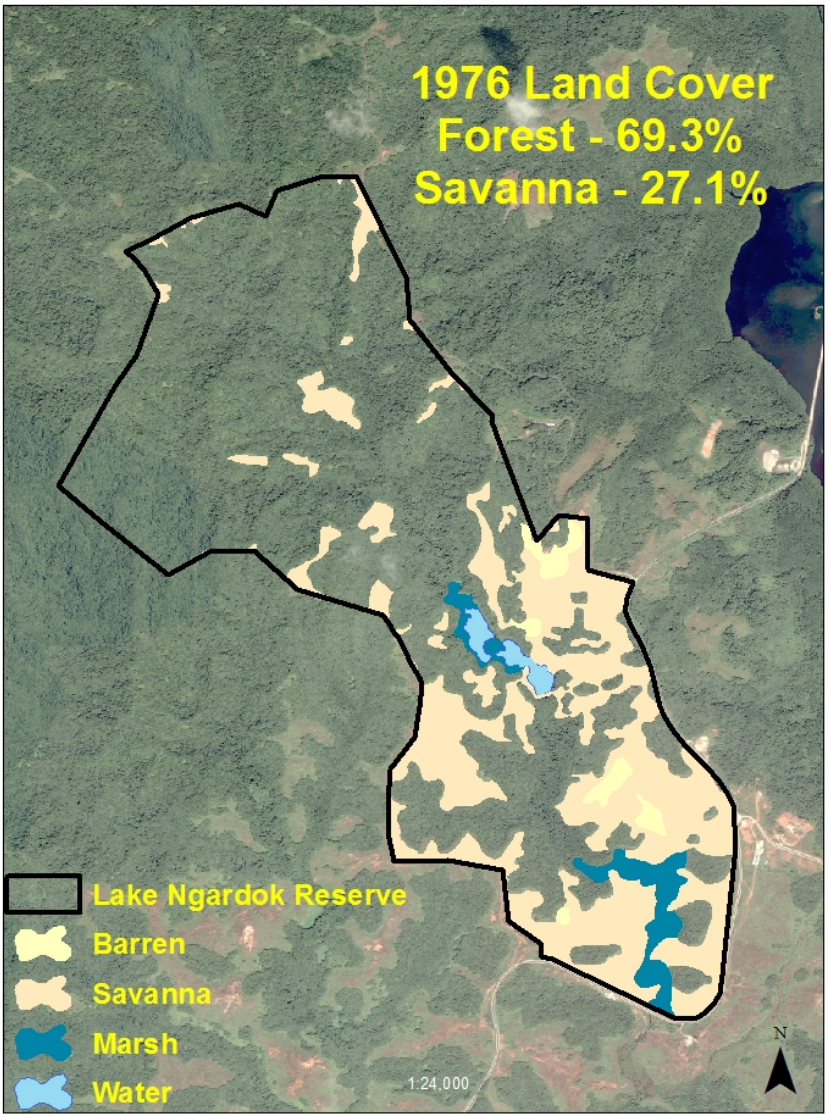

Figure 17: Land Cover summary for 1976 in the Lake Ngardok Nature Reserve.

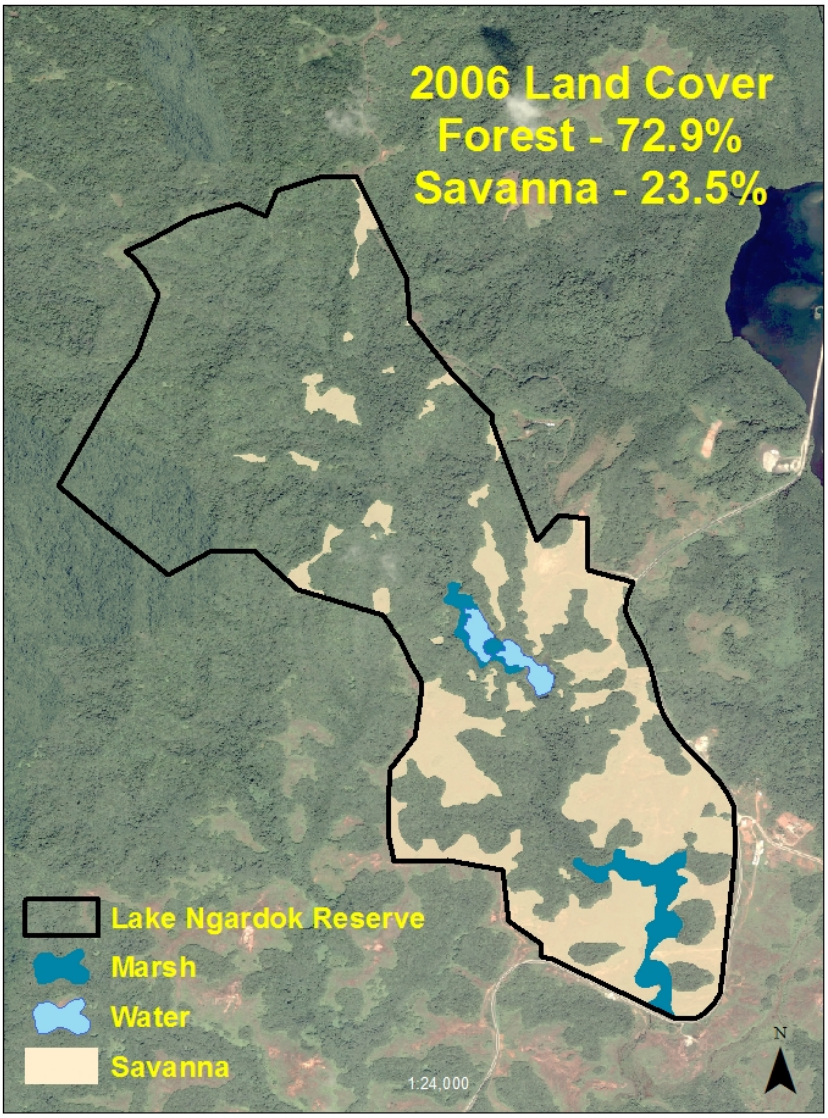

Figure 18: Land Cover summary for 2006 in the Lake Ngardok Nature Reserve.

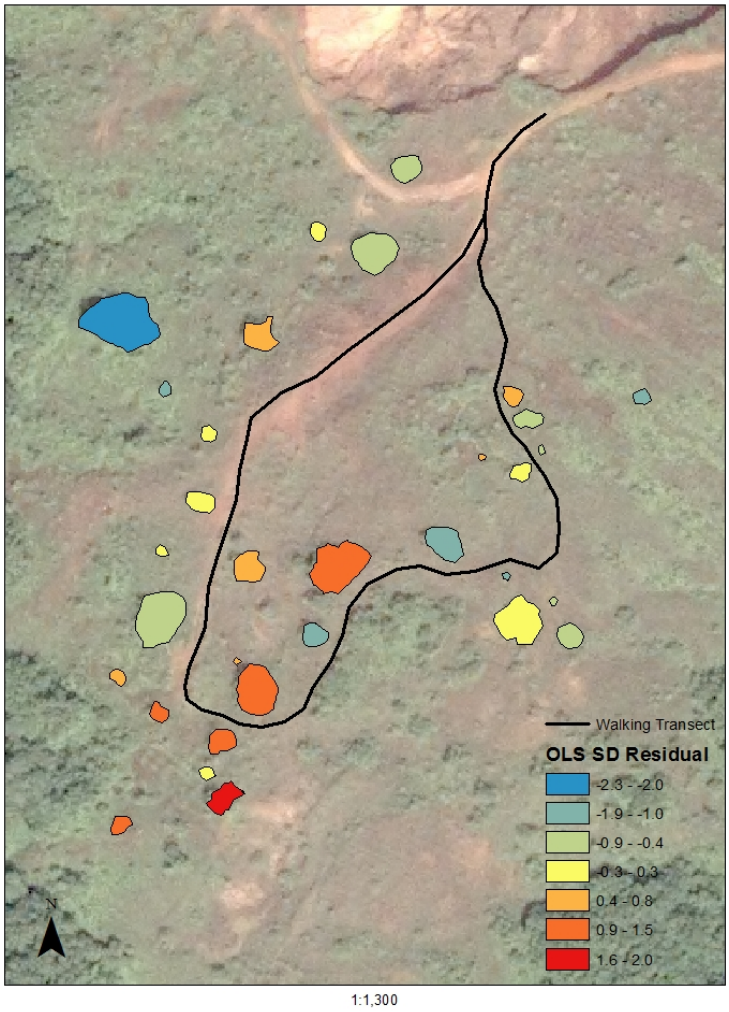

Figure 19: ArcMap™ Ordinary Least Squares output showing standard distribution of residuals for each island, from the model predicting the log of total bird visits to tree islands per monitoring period (3 predictors are log of island area, log of mean total number of fruit, and mean height of nearest neighbor trees). Values greater than ±2 indicate a significant deviation from the regression model prediction.

Table 1: List of tree island study plots in the Lake Ngardok Nature Reserve savanna study area, indicating island plot number, weight of fertilizer applied, area, tree species richness, and height and species of tallest tree.

Island Number	Fert Applied (kg)	Island Area (m2)	Species Richness	Height of Tallest Tree (m)	Species of Tallest Tree
22	0.1	3.7	3	2.0	*Pouteria obovata*
2	control	3.9	2	2.0	*Timonius subauritus*
24	0.2	5.1	1	1.7	*Pouteria obovata*
25	control	5.8	1	0.6	*Symplocos racemosa*
12	0.3	7.5	4	1.5	*Pouteria/Alphatonia*
23	control	7.7	2	2.5	*Rhus taetensis*
30	0.4	11.6	3	3.5	*Rhus taetensis*
14	control	12.6	6	4.5	*Pouteria obovata*
7	0.6	17.0	5	2.9	*Alphatonia carolinensis*
9	control	17.9	5	2.1	*Trichospermum ledermanni*
6	0.8	20.1	4	4.7	*Dracaena multiflora*
8	control	20.5	4	4.2	*Alphatonia carolinensis*
17	0.9	23.3	5	3.7	*Symplocos racemosa*
21	control	27.6	3	3.0	*Pouteria obovata*
15	1.2	31.1	3	2.5	*Eurya japonica*
20	control	33.7	5	3.8	*Rhus taetensis*
3	control	34.6	7	4.4	*Maranthes corymbosa*
4	1.3	40.1	6	4.6	*Calophyllum wakamatsui*
26	1.6	41.6	8	3.2	*Calophyllum wakamatsui*
29	control	48.4	6	5.5	*Calophyllum wakamatsui*
13	1.9	50.3	7	4.1	*Calophyllum wakamatsui*
19	control	70.2	9	4.5	*Dracaena multiflora*
11	2.8	74.9	10	5.7	*Maranthes corymbosa*
16	control	79.7	10	6.0	*Calophyllum wakamatsui*
5	3.4	92.0	8	3.6	*Calophyllum wakamatsui*
28	control	99.6	14	4.1	*Calophyllum wakamatsui*
18	5.3	143.1	12	4.8	*Calophyllum wakamatsui*
10	control	184.3	15	6.8	*Calophyllum wakamatsui*
32	7.4	154.3	11	10.0	*Maranthes corymbosa*
1	control	221.9	8	10.1	*Maranthes corymbosa*
27	9.9	266.5	13	8.5	*Maranthes corymbosa*
31	control	276.6	19	9.4	*Maranthes corymbosa*

Table 2: Growth summary (cm) of 5 native tree species for six month season (June-December, 2010) planted along tree island perimeters (0.5 m from dripline, 1 m between plantings), with local compost and burnt lime incorporated into planting hole, in the Lake Ngardok Nature Reserve savanna study area.

Comment [CS1]: Same comment as above

Planted Tree Species	Sample Size	Mean Growth (cm)	SE
Campnosperma brevipetiolata	52	10.5	0.9
Macaranga carolinensis	50	23.8	2.0
Pterocarpus indicus	48	42.4	4.1
Pouteria obovata	56	14.9	1.8
Rhus taetensis	38	10.6	1.3

Table 3: Total visits by species to marked tree islands in Lake Ngardok Nature Reserve savanna study area for the six month study period (June-December, 2010). Asterices indicate species endemic to Palau. Bold type indicates potentially seed dispersing species.

Species	Total Visits
Dusky White-Eye*	1017
Micronesian Starling	260
Palau Cicadabird*	163
Micronesian Myzomela	109
Palau Flycatcher*	95
Palau Fantail*	75
Citrine White-Eye	38
Palau Fruit Dove*	31
Rusty-Capped Kingfisher*	8
RAT	6
Gray Nightjar	2
Morningbird*	2
Palau Bush Warbler*	1
Palau Flying Fox	1
White Tern	1
TOTAL VISITS	**1809**

Table 4: Total bird visits to trees outside of marked tree islands, by tree species, in the Lake Ngardok Nature Reserve savanna study area, for the 6 month season June-December, 2010.

Tree Species Visited	**Total Visits**
Acacia auriculiformis	1324
Calophyllum wakamatsui	219
Snags	96
Alphitonia carolinensis	77
Rhus taetensis	48
Pouteria obovata	30
Symplocos obovata	27
Hedyotis korrorensis	22
Dracena multiflora	21
Unknown planted legume	13
Timonius subauritus	12
Gmelina palawensis	10
Fagrea ksid	9
Eurya japonica	7
Wikistroemia eliptica	6
Maranthes corymbosa	5
Pandanus aimiriikensis	4
Decaspermum parviflorum	3
Garcinia matsudai	3
Campnosperma brevipetiolata	2
Commersonia bartramia	2
Buchanania palawensis	1
Macaranga carolinensis	1
Morinda pedunculata	1
Trichospermum ledermannii	1
Total Visits	**1944**

Table 5 : List of bird and flying fox flybys (no observed tree island plot or tree visit, with bird flying below maximum tree height) and flyovers (flight above tallest trees, and directly above savanna study area) summarized by species for 6 month season (June-December, 2010) in the Lake Ngardok Nature Reserve savanna study area. Bold type indicates potential seed dispersers, and asterices indicate species endemic to Palau.

Comment [CS2]: Can you combine tables 8 and 9 by reporting total flybys below canopy and above canopy in separate columns?

Species	Total Flybys	Total Flyovers
Palau Swiftlet*	597	753
Micronesian Starling	**584**	**237**
Dusky White Eye*	**295**	**42**
Micronesian Myzomela	88	4
Palau Fruit Dove*	**28**	**9**
Palau Cicadabird*	**18**	**0**
Palau Flycatcher*	15	0
White Tern	14	375
Palau Fantail*	9	0
Palau Flying Fox	**8**	**1380**
Micronesian Imperial Pigeon	**5**	**14**
Rusty-Capped Kingfisher*	5	0
Black-Headed Munia	4	0
Citrine White-Eye	4	0
Red Junglefowl	2	0
Banded Rail	1	0
Brown Noddy	1	48
Gray Nightjar	1	0
Nicobar Pigeon	**1**	**67**
Pied Cormorant	1	5
Rufous Night-Heron	1	9
Black Noddy	0	460
White-Tailed Tropicbird	0	63
Little Tern	0	12
Cattle Egret	0	3
Total	**1682**	**3481**

Table 6: List of analyses performed, including statistical test, sample size (N) or degrees of freedom (DF), and resulting test statistic, for data from the study conducted at the Lake Ngardok Nature Reserve savanna study site (June-December, 2010).

Analysis	Test	N, DF	Test Statistic
Seedling Density: Before and After Thinning	Paired, Two-sample T-Test	32	p<0.001
Seeding Diversity: Before and After Thinning	Paired,Two-sample T-Test	32	p<0.001
Seedling Diversity: Before and After Thinning	Paired, Two-sample T-Test	32	p<0.001
Seedling Density: By Aspect	One Way ANOVA: 4 levels	DF=127	not significant
Seedling Density: Inside Drip Line vs. Out	Two-sample T-Test	128	p<0.05
Seedling Density Change: By Block Treatment	One Way ANOVA: 4 levels	DF=63	P<0.05
Seedling Density Change: Fertilizer vs. Control	Two-sample T-test	16	not significant
Seedling Diversity Change: Fertilizer vs. Control	Two-sample T-test	16	not significant
Seedling Density Change: Inside vs. Out	Two-sample T-test	DF=57	not significant
Seedling Diversity Change: Inside vs. Out	Two-sample T-test	DF=57	p<0.001
Sapling Height: Inside Drip Line vs. Out	Two-sample T-test	DF=422	p<0.01
Sapling Growth: Inside Drip Line vs. Out	Two-sample T-test	DF=540	not significant
Sapling Growth: Fertilizer vs. Control	Two-sample T-Test	DF=431	p<0.001
Saplings Growth: By Block Treatment	One Way ANOVA: 4 levels	DF=160	not significant
Sapling Growth: By Aspect	One Way ANOVA: 4 levels	DF=160	not significant
Planted Tree Growth: Mulch vs. Control	Two-sample T-test	DF=240	not significant
Planted Tree Growth: By Aspect	One Way ANOVA: 4 Levels	DF=243	not significant
Planted Tree Growth: By Species	One Way ANOVA: 5 Levels	DF=243	p<0.001
Species in Flower: Fertilizer vs. Control	Paired, Two-sample T-Test	192	p<0.001
Number of Fruits: Fertilizer vs. Control	Paired, Two-sample T-Test	192	p <0.05
Number of Flowers: Fertilizer vs. Control	Paired, Two-sample T-Test	192	p<0.001
Species in Fruit: Fertilizer vs. Control	Paired, Two-sample T-Test	192	p<0.001
Species with New Leaves: Fertilizer vs. Control	Paired, Two-sample T-Test	192	p<0.001
Island Visits: Fertilizer vs. control	Paired, Two-sample T-Test	192	p<0.05
Island Visits: Regression on Season Totals	AIC, OLS, 3 predictors	32	R^2=84.3
Total Flying Fox Flyovers vs. Total Mean Island Fruit	Correlation	13	R^2=71.2

Table 7: Common (asterisk indicates migratory species), scientific, and Palauan names of birds seen in, or flying over, the Lake Ngardok savanna study site, from July-December, 2010 (Pratt & Etpison, 2008).

Common Name	**Scientific Name**	**Palauan Name**
Buff-Banded Rail	*Gallirallus philippensis pelewensis*	Terrid
Black Noddy	*Anous minutus*	Bedaoch
Black-Headed Munia	*Lonchura manacca*	Kanaria
Brown Noddy	*Anous stolidus*	Mechadelbedaoch
Cattle Egret*	*Bubulcus ibis coromandus*	Keremlal Sechou
Citrine White-Eye	*Zosterops semperi semperi*	Charmbedel
Dusky White-Eye	*Zoterops finschii*	Chetitalial
Gray Nightjar	*Camprimulgus indicus phalaena*	Chebacheb
Little Tern*	*Sterna albifrons*	
Micronesian Imperial Pigeon	*Ducula oceanica*	Belochel
Micronesian Myzomela	*Myzomela rubrata kobayashii*	Chesisebangiau
Micronesian Starling	*Aplonis opaca orii*	Kiuid
Morningbird	*Colluricincla tenebrosa*	Tutau
Nicobar Pigeon	*Caloenas nicobarica pelewensis*	Laib
Palau Bush Warbler	*Cettia annae*	Wuul
Palau Cicadabird	*Coracina tenuirostris monacha*	Kiuidukall
Palau Fantail	*Rhipidura lepida*	Melimdelebteb
Palau Flycatcher	*Myiagra erythrops*	Charmelachull
Palau Fruit Dove	*Ptilinopus pelewensis*	Biib
Palau Swiftlet	*Aerodramus pelewensis*	Chesisekiaid
Pied Cormorant	*Phalacrocorax melanoleucos*	Deroech
Red Junglefowl	*Gallus gallus*	Malkureomel
Rufous Night Heron	*Nycticorax caledonicus pelewensis*	Melabaob
Rusty-Capped Kingfisher	*Todiramphus cinnamominus pelewensis*	Cherosech
White Tern	*Gygis alba*	Sechosech
White-Tailed Tropicbird	*Phaethon lepturus*	Dudek