Vegetation structure and diversity on the Caribbean island of St. John, U.S. Virgin Islands

Structure de la végétation et diversité sur l'île Caribéenne de Saint John, dans les Iles Vierges US.

Diversidad y estructura de la vegetación en la isla Caribeña de St. John, Islas Virgenes, USA.

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INTRODUCTION

The vegetation of the Caribbean island of St. John has been dramatically impacted by anthropogenic disturbance, beginning with Taino culture and extending to modern times. Following acquisition by the United States, approximately 65 percent of the island was donated to the National Park Service for conservation as the Virgin Islands National Park. Building on an island-wide forest inventory framework, we investigated the structure and diversity of the forest vegetation on St. John.

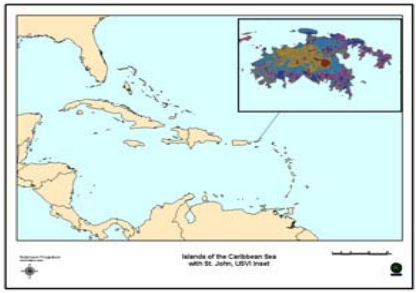
OBJECTIVES

- **Measure the composition, relative abundance, and vertical position of all vascular plants on forested plots**
- **Quantify populations of native and introduced vegetation occurring on forestland**
- **Identify environmental variables important in structuring the distribution of vascular plants on the island**

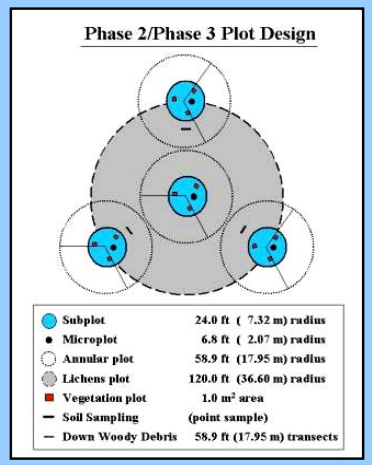
METHODS

The study was conducted on the island of St. John, U.S. Virgin Islands, located at 13°22'N latitude and 64°40'W longitude in the Caribbean Sea, approximately 30 km east of the island of Puerto Rico.

Data collection methods followed protocols outlined by the USDA Forest Service Forest Inventory and Analysis program. Detailed descriptions of methods may be found at http://fia.fs.fed.us/.



Data source: Conservation Data Center, University of the Virgin Islands, 2001.



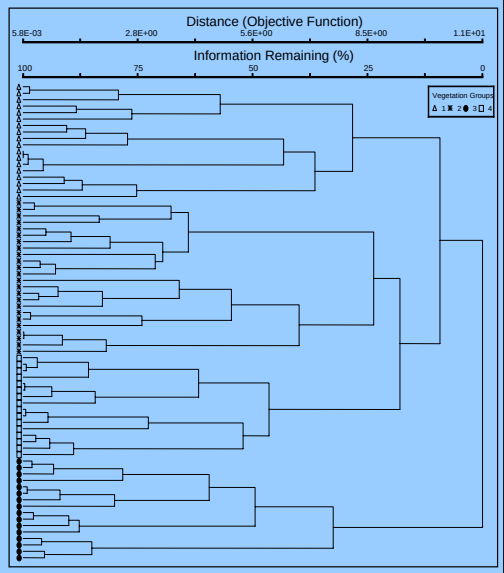
- 26 plots containing 4 subplots each were located on an unbiased, systematic grid across the island.
- Only 100% forested subplots were sampled
- Subplots were analyzed as independent samples to satisfy statistical requirements, particularly species-area relationship assumptions, though some degree of spatial autocorrelation was expected.
- Vascular plant composition and structure, soil characteristics, and environmental variables were collected on each subplot.
- Clustering was performed using Sorenson distance measures with flexible beta set at 0.25. Nonmetric multidimensional scaling (NMS) and Multi-response permutation procedure (MRPP) were used to relate vegetation to environmental axes.

RESULTS

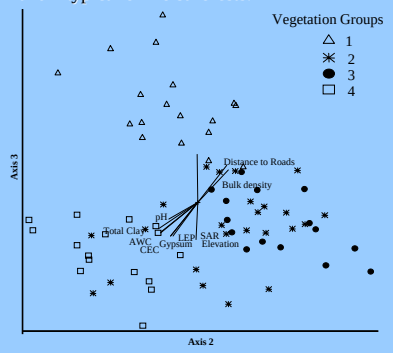
- We recorded 2415 individuals of 203 species (63 families) on St. John forestland (21 percent of all vascular species described on the island) (Acevedo-Rodriquez, P. 1996).
- First-order jackknife estimates indicated the true species richness was 255.3 (± 12.15 SD).
- 5% of recorded species were introduced
- 79% of subplots contained at least 1 introduced species; 39% contained 2 or more.
- *Guapira fragrans* was the most common vascular plant, occurring on 91% of subplots.
- Cluster analysis yielded maximum results at 4 groups.

Group Number	Scientific Name	Indicator Value
1	*Plumeria alba* L.	75.7
	Acacia muricata (L.) Willd.	63.9
	Eugenia cordata (Sw.) DC.	63.8
2	*Morisonia americana* L.	61.3
	Cordia alliodora (Ruiz & Pavon) Oken	46.4
	Chionanthus compactus Sw.	45.9
3	*Opuntia repens* Bello	69.7
	Leucaena leucocephala (Lam.) de Wit	65.0
	Schaefferia frutescens Jacq.	60.7
4	*Sabinea florida* (Vahl) DC.	61.2
	Ardisia obovata Desv. Ex Hamilton	60.7
	Guettarda scabra (L.) Vent.	60.6

- Group 1 = Rocky, low to mid-elevation dry scrub forest on soils with low productivity
- Group 2 = Low-productivity, high elevation moist basin forests on steep slopes
- Group 3 = Disturbed communities on a wide range of elevations with gentle or no slope, range of soil types
- Group 4 = Mid-elevation moist forests across a range of steep slopes on highly productive soils



- The major division occurred between Group 3 and Groups 1, 2, and 4 along a disturbance gradient, with Group 3 indicative of past and present severe disturbance and colonization by "weedy" and introduced species.
- Groups 1, 2, and 4 were divided along a moisture gradient, with species in Group 1 typical of dry forests, and species in Groups 2 and 4 typical of moist forests.



CONCLUSIONS

Introduced species, though widespread, do not dominate plant communities. Past and present site disturbance plays an important role in defining the species present and dominant in the communities on the island. Vascular plant communities are structured primarily on the basis of moisture, soil structure and productivity, elevation, slope, and aspect.

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