green solutions for a blue planet

Tropical Horticulture and Sustainable Landscape Development

By Jeff Shimonski

2006 ASLA Annual Meeting & Expo and IFLA 43rd World Congress

GreenScapes
Environmentally Beneficial Landscaping

Green Design and sustainable landscape development are not just buzz-words for environmentalism but can be sold to owners and developers to be a value-added component of the construction process. Once the project is complete, sustainable landscaping will continue to add value to the property in time as the landscaping grows and matures.

Eco-efficiency is increased by "activities that create economic value while continuously reducing ecological impact and the use of natural resources."

De Simone, L. and F. Popoff. 1997. *Eco-efficiency: The business link to sustainable development.* Cambridge, MA: MIT Press.

Tropical Sustainable Landscapes are found worldwide.
Sabah, Malaysia

The tropical forest near Volcan Arenal, Costa Rica. Sustainable forests exist world-wide naturally,

Parrot Jungle Island, an 18 acre tropical man-made sustainable landscape in Miami, Florida

Watson Island and downtown Miami in 1999 photo before construction; now the home of Parrot Jungle Island.

Creating a tropical sustainable landscape at Parrot Jungle Island

- This 18 acre zoological theme park was built from the ground-up. Tree relocation and site work began in 2000 and the park opened in 2003.
- Existing on the site was 150 specimen size trees and palms. 80 of these were saved and relocated off site. As construction allowed, the trees were moved back onto the site.
- The landscape design, plant selection, installation methods, and the ongoing horticulture program was based upon IPM and Plant Health Care methods established at the original Parrot Jungle (which closed for relocation in 2002 after 66 years of operations).
- The design concept was to create and grow a tropical forest and garden without the use of commercial fertilizer, pesticides or fungicides.
- This holistic approach to landscape development is value-added and continues to save money in the maintenance of the Park without reducing the quality of the landscape.

The Site

Watson Island is an 86 acre spoil island that was created in the first part of the last century when the ship channels for the adjacent Port of Miami were dug. The top 10 feet of this island consists of sand with varying amounts of shell or limestone fragments. The first 4 feet contains an organic component of up to 13% that has accumulated over time on the island through the natural decomposition processes that accompany the growth of vegetation or naturally occurring ground cover. The site was approximately 8 feet above sea level. Since Watson Island is classified as a flood zone, buildings are mandated to be built at 12 feet above sea level. This necessitated the importation of almost 27,000 tons of structural fill to be placed under all of the park's structures. Before the structural fill was placed, the existing fill was removed down to 4 feet above the water table and stockpiled to be used as landscape soil.

The original Parrot Jungle was a licensed composting facility. For the new site, 800 tons of compost was brought over and used as a top-dressing for all newly planted trees.

The Planning Process

- What kind of soil was available? Soil condition was poor with very little biological activity that could promote healthy and active root growth.
- What is the year round climate?
- Since hurricanes are not uncommon and the site is exposed on the coast, planning and planting to mitigate hurricane damage will be necessary.
- What kind of plant material is available?
- What kind of horticultural maintenance will be available?
- What is the budget?

The Methods

- Plants were selected that grow in the type of soil already on the island.
- Species diversity was the goal. A monoculture is vulnerable to diseases and pathogenic insects; diversity promotes a healthy ecosystem.
- R-selected plant species were used as “quick” canopy and filler; K-selected species were planted below.
- The soil was cultivated and amended so the excess fill was not hauled off the site and new soil brought back. This saved a tremendous amount of money.
- Plants that evolved in hurricane or typhoon prone areas were utilized when possible.
- All of the root balls on planted trees were top-dressed with compost. A thin layer of partially decomposed mulch was added to all planted areas including composted root balls. Each extra kg of organic matter added to sandy soil will increase soil water storage capacity by approximately 2 L.
- Grade changes of several feet were created throughout the park. These berms mitigate wind damage.

The Soil

The indigenous soil was used as a landscaping medium for several reasons; the island never seemed to flood in a heavy rain therefore it had excellent drainage characteristics, with excellent drainage come excellent aeration, many different species of trees and palms were successfully growing in this soil already, and when a different soil type is layered onto another soil type a perched water table can be created that will not allow water percolation to take place until the upper layer of soil is totally saturated. This can be deadly to many species of plants. Finally, the cost savings of not exchanging the landscape soil was tremendous.

Early site work with structural fill being added in the foreground (3/01). The original top soil was returned to the site as landscape soil.

The lush 50’ high tropical Jungle canopy (10/06) has never been fertilized or sprayed with pesticides.

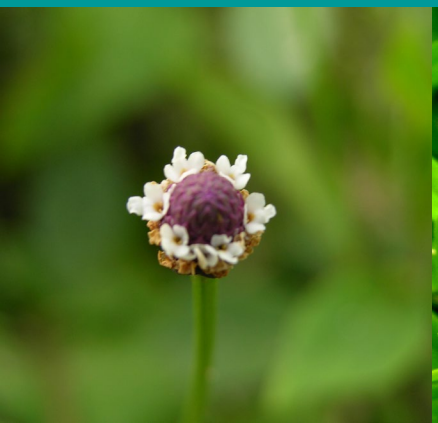
Relocating mature trees in spring 2001; immediately after planting the root balls were top-dressed with compost. Since then, thousands of yards of tree trimming mulch have been used on the entire site.

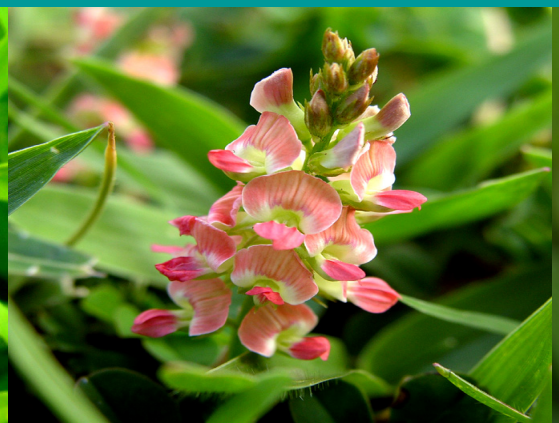
Flamingo Lake (10/06) with a pesticide and fertilizer free Environmental lawn.

The Bougainvillea in bloom at Flamingo lake (4/06) with the Miami Vice Flamingos.

The Environmental Lawn

This is a garden, and not a monoculture, that requires no input of fertilizers or pesticides. It can be home to many species of grasses, sedges, or even tiny dicots. One of the functions of an Environmental Lawn (aside from the aesthetic) is a place where beneficial insects can gather pollen and nectar from the tiny dicot flowers that abound in this habitat. Many of the tiny parasitic wasps that prey upon scale insects, caterpillars, and other plant pests take nectar from plants with tiny flowers that present small, open nectaries. Many species of wasps are very dependent upon food plants to realize their high reproductive potential thereby enabling them to control a greater percentage of our plant pests.

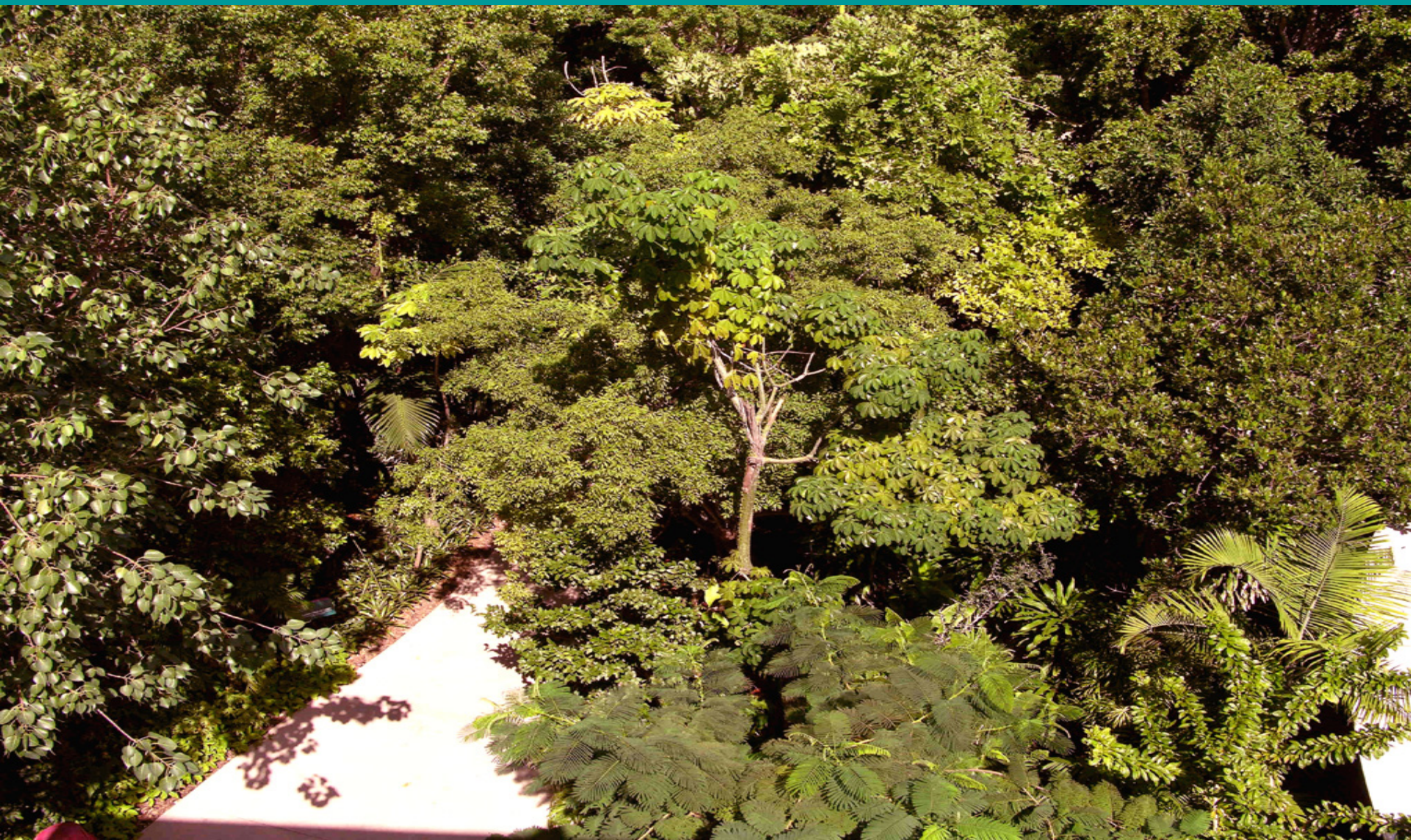





Root ball on a Live Oak when moved for the first time (2001). The soil on the entire site was lifeless without beneficial organisms. I never saw a single earthworm the first two years on the site. Now they are common and the soil is rich with organic matter.

The construction site (2/02) as viewed from the newly built 2nd floor of main building. Looking toward Flamingo Lake.

View of the tropical foliage from roof of main building (10/06). There are eight species of trees and three species of palms visible in this photo. There are many more hidden by the canopy.



Compost and mulch were utilized to secure the sides of berms to prevent erosion allowing the eventual vegetative cover to do the work of artificial stabilizing materials. This application alone saved PJI approximately $60,000 by not having to install ground cloth and “rip-rap” (large rocks used to stabilize slopes).

Successfully planted slope 5 months after initial grading.

Parrot Jungle Island has thousands of bromeliads. Many species of mosquitoes breed in the phytotelmata (water bodies). After a year of research funded by a grant from the Center of Agricultural Partnerships via the EPA Pesticide Environmental Stewardship Program, it was found that the onsite mosquitoes could be controlled by applications of environmentally safe biochemicals. Now aerial adulticiding is no longer done and a healthy population of beneficial insects has taken up residence at PJI.

The storm drains onsite at PJI were found to be a major source of mosquitoes. They are now treated in the same manner as the bromeliad collection. Spraying for mosquitoes is no longer necessary and environmentally safe larviciding has become a cornerstone of our integrated pest management program. The park visitors, employees, animals are no longer exposed to chemicals and potential disease vectoring insects. This is definitely value-added and eco-efficient; a major component of a sustainable landscape.

Center for Agricultural Partnerships

Sustainable tropical landscaping and hurricane horticulture by creating aerial roots on Ficus sp to withstand hurricanes

Eco-efficiency of production concerns the capability to produce goods and services while causing minimal environmental degradation. This is partly due to more rigorous environmental legislation, but even more importantly, firms' environmental actions influence their public image and their financial performance.

Konar, S. and M. Cohen. 1997. Information as regulation: The effect of community right to know laws on toxic emissions. *Journal of Environmental Economics and Management* 32(1):109-124

For further information on Sustainable Landscape Development please visit:

WWW.TROPICALDESIGNS.COM

Jeff Shimonski

Below: Lago de Apoyo, Nicaragua