



**Year 11 report:
Biological monitoring for plant conservation
in Miami-Dade County natural areas**

Report to Miami-Dade County for
(1-year extension of)
Resolution #R-808-07

September 2013

FAIRCHILD TROPICAL BOTANIC GARDEN

**YEAR 11 REPORT:
BIOLOGICAL MONITORING FOR PLANT CONSERVATION
IN MIAMI-DADE COUNTY NATURAL AREAS**

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Cover photos top to bottom:

- (1) The Florida filmy fern, *Trichomanes punctatum* ssp. *floridanum* growing on a gumbo limbo root at Hattie Bauer Hammock, 1/25/13, by Jose Luis Perez Calo
- (2) Reflections of the hammock canopy in water restored to The Deering Estate's Cutler Slough, 9/5/13, by J. Possley
- (3) Larva of the yellow-banded wasp moth (*Syntomeida ipomoeae*) feeding on FL-Endangered *Ipomoea microdactyla* at Larry & Penny Thompson Park, 8/16/13, by J. Possley

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EXECUTIVE SUMMARY

The need for continued protection of natural areas in Miami-Dade County is clear. Our unique native plant communities and many of the species within are globally imperiled. As the County has grown to exceed 2.5 million residents (US Census Bureau 2010), the pine rockland and rockland hammock forests have been reduced to <2% of their historic cover (Bradley 2005). Despite this drastic reduction, our native flora comprises an impressive 1026 native and historic taxa (Gann et al. 2012), of which 68 (7%) are endemic to the state of Florida (Wunderlin and Hansen 2008). The remaining nature preserves in the Miami-Dade County system are botanical treasure chests, containing much of South Florida's native plant diversity, and in some cases, the only populations of rare species in existence.

Tools such as ex situ collections, long-term seed storage, rare plant reintroductions, and adaptive management in Miami-Dade County's natural areas are extremely important for preserving South Florida's native plant heritage. Through our cooperative agreement, Fairchild provides crucial feedback on the state of County preserves to Miami-Dade County land managers. We are proud to work with the County in this comprehensive program, with the goal of conserving native flora and assisting land stewards to evaluate the effectiveness of their management protocols.

This report summarizes research and monitoring conducted by Fairchild Tropical Botanic Garden in January through September of 2013 as part of the biological monitoring program for Miami-Dade County's natural areas. This program was created by cooperative agreement in 2002 (Resolution #R-841-02, with funding through 2007) and was renewed in 2007 (Resolution #R-808-07, with funding through 2012). Through September 30, 2013, funding was provided by an extension of Agreement #R-808-07 through the county's Environmentally Endangered Lands Program.

Major Accomplishments in 2013:

- Through rare plant surveys, we located a number of rare taxa that were previously unknown from the flora of that particular County preserve, including *Lomariopsis kunzeana* (FL-E, SF1) at Ross Hammock (gametophytes only) and *Croton lobatus* (SF1) at Navy Wells 39. The GIS maps we create from these surveys serve as valuable conservation and decision-making tools.
- We continued to census critically endangered plant populations in County preserves, focusing this year on the nine species included in the first section of this document. By keeping close watch on rare plant populations, we can provide timely management advice to preserve managers and work with NAM crews or volunteers to remove invasive species that directly threaten the rare species.
- The rehydration pumps at the Deering Estate's Cutler Slough began running in late December 2012, and we greatly increased monitoring frequency of the two critically imperiled fern species in the slough bed (*Thelypteris patens* and *Ctenitis submarginalis*). Over the subsequent 9 months we documented the extirpation of *T. patens* and decline of *C. submarginalis*, but we collected enough spores to create an ex situ collection of hundreds of young ferns of both species. We are currently seeking funding to reintroduce these ferns to more upland habitat at the Deering Estate, ensuring that these populations would not be lost forever.

- In this ninth year of our cooperative rare fern conservation program, we continued to build our ex situ collection and establish rare native ferns in several more locations throughout Fairchild Garden. Our target species are extremely rare in South Florida. The ex situ collections we are building—well over 500 individuals and growing— will ensure these unique species do not disappear from EEL preserves due to hurricanes, poaching, or other events.
- We continued to identify new and unusual plant invasions that threaten rare native plant populations. We alerted preserve managers to their presence, and in many cases participated in removal efforts. Taxa we focused on included, *Heteropterys brachiata*, *Lumnitzera racemosa*, *Phymatosorus* spp., *Nephrolepis* spp., and *Mikania micrantha*.
- The manuscript about our pine rockland monitoring program that we submitted in 2012 was accepted by Natural Areas Journal and is queued for printing. This work was a collaboration between Fairchild, NAM, EEL, and Pro Native Consulting.
- As the USFWS began reviewing the *Trichomanes punctatum* ssp. *floridanum* for the federal endangered species list, we provided information and expertise about this taxon in Miami-Dade County's preserves to the federal biologists.

We would like to sincerely thank Miami-Dade County's Environmentally Endangered Lands Program for their financial support over the past eleven years.

APPENDIX VI:

SUMMARY OF ALL RARE PLANT REINTRODUCTIONS AND AUGMENTATIONS IN MIAMI-DADE COUNTY PRESERVES, 2002-2013

During the eleven years of EEL funding with the Fairchild/Miami-Dade Agreements, Fairchild introduced **1595 plants** and **7100 seeds** of rare native plants to Miami-Dade County preserves.

- 191 *Tephrosia angustissima* var. *corallicola* to Ludlam Pineland (2003)
- 450 *Okenia hypogaea* to Crandon Park (2003 & 2004)
- 346 *Lantana canescens* to Camp Owaissa Bauer, Castellow Hammock, and Castellow 33 (2005)
- 200 seeds of *Linum carteri* var. *carteri* to R. Hardy Matheson Preserve (2006)
- 136 *Passiflora sexflora* to Hattie Bauer and Castellow Hammocks (2006)
- 345 *Amorpha herbacea* var. *crenulata* to Martinez Pineland (2006 & 2007)
- 10 *Pavonia paludicola* to Bill Sadowski Park (2008)
- 6000 seeds of *Dalea carthagenensis* var. *floridana* to R. Hardy Matheson (2009)
- 233 *Tectaria heracleifolia* to Hattie Bauer Hammock (2011 & 2012)
- 20 *Thelypteris reptans* to Hattie Bauer Hammock (2012)
- 900 seeds of *Tephrosia angustissima* var. *corallicola* to Ludlam Pineland (2013)

APPENDIX VI:

SUMMARY OF ALL PUBLICATIONS RELEVANT TO MIAMI-DADE COUNTY PRESERVES, 2002-2013

The publications listed below were written during the eleven years of EEL funding with the Fairchild/Miami-Dade Agreements. All of these publications either reference or exclusively focus on Miami-Dade County preserves, and all are available by request from jpossley@fairchildgarden.org or jmaschinski@fairchildgarden.org

Peer-reviewed manuscripts

1. Albrecht, M.A., E. O. Guerrant Jr., Kennedy, K., Maschinski, J. 2011. A long-term view of rare plant reintroduction. **Biological Conservation** 144: 2557-2558.
2. Benda, N., J. Possley, D. Powell, C. Buchanan-McGrath and J. Cuda. 2012. New host plant record for the poison ivy sawfly, *Arge humeralis* (Hymenoptera: Argidae), and its performance on two host plant species. **Florida Entomologist** 95(2):529-531.
3. Fisher, J.B. and K. Jayachandran. 2002. Arbuscular mycorrhizal fungi enhance seedling growth in two endangered plant species from South Florida. **International Journal of Plant Science** 163(4): 559-566.
4. Fourqurean, J.W., T.J. Smith, J. Possley, T.M. Collins, D. Lee and S. Namoff. 2009. Are mangroves in the tropical Atlantic ripe for invasion? Exotic mangrove trees in the forests of South Florida. **Biological Invasions**. Online First. DOI:10.1007/s10530-009-9660-8.
5. Lane, C., S.J. Wright, J. Roncal, and J. Maschinski. 2008. Characterizing environmental gradients and their influence on vegetation zonation in a subtropical coastal sand dune system. **Journal of Coastal Research** 24: 213-224.
6. Maschinski, J., S.J. Wright, S. Koptur, E. Pinto-Torres. 2013. When Is Local the Best Paradigm? Breeding history influences Conservation Reintroduction Survival and Trajectories in times of Extreme Climate Events. **Biological Conservation** 159:277-284.
7. Maschinski, J., E. Sirkin and J. Fant. 2010. Using genetic and morphological analysis to distinguish endangered taxa from their hybrids with the cultivated exotic pest plant *Lantana strigocamara* (syn: *Lantana camara*). **Conservation Genetics** 11:1607-1621.
8. Maschinski, J. and S. J. Wright. 2006. Using Ecological Theory to Plan Restorations of the Endangered Beach *Jacquemontia* in Fragmented Habitats. **Journal for Nature Conservation** 14:180-189.
9. Maschinski, J., J. Possley, M.Q.N. Fellows, C. Lane, A. Muir, K. Wendelberger, S. Wright and H. Thornton. 2005. Using thinning as a fire surrogate improves native plant diversity in pine rockland habitat (Florida). **Ecological Restoration** 23(2):116-117.
10. Pascarella, J., S.J. Wright, and J. Maschinski. 2011. Soil seed banks and long-term seed survival in the endangered Florida beach clustervine (*Jacquemontia reclinata* House: Convolvulaceae). **Native Plants Journal** 12:233-240.
11. Possley, J., J. Maschinski, J. Maguire and C. Guerra. *In press*. Vegetation monitoring to guide management decisions in Miami's urban pine rockland preserves. **Natural Areas Journal**.
12. Possley, J., J. Maschinski., C. Rodriguez and J. Dozier. 2009. Alternatives for reintroducing a rare ecotone species: mechanically thinned forest edge versus restored habitat remnant. **Restoration Ecology** 17(5):668-677.

13. Possley, J., Woodmansee, S., Maschinski, J. 2008. Patterns of plant diversity in fragments of globally imperiled pine rockland forest: effects of recent fire frequency and fragment size. **Natural Areas Journal** 28(4):379-394.
14. Possley, J., K. Hines, J. Maschinski, J. Dozier, and C. Rodriguez. 2007. A common passion: multiple agencies and volunteers unite to reintroduce goatsfoot passionflower to rockland hammocks of Miami, Florida. **Native Plants Journal** 8(3):252-258.
15. Possley, J. and J. Maschinski. 2006. Competitive effects of the invasive grass *Rhynchelytrum repens* (Willd.) C.E. Hubb. on pine rockland vegetation. **Natural Areas Journal** 26(4):391-395.
16. Powell, D and J. Maschinski. 2012. Connecting Fragments of the Pine Rockland Ecosystem of South Florida: The Connect to Protect Network. **Ecological Restoration** 30:285-288.
17. Roncal, J., J. Maschinski, B. Schaffer, S. M. Gutierrez, and D. Walters. 2012. Testing Appropriate Habitat Outside of Historic Range: The Case of *Amorpha herbacea* var. *crenulata* (Fabaceae). **Journal for Nature Conservation** 20:109
18. Roncal, J., J. Fisher, M.Q.N. Fellows, K. Wendelberger, J. Maschinski, and M.W. Fidelibus. 2006. Propagation protocol for the endangered crenulate lead plant, *Amorpha herbacea* Walter var. *crenulata* (Rydberg) Isely. **Native Plants Journal** 7:89-93.
19. Roncal, J., J. Fisher, S.J. Wright, A. Frances, K. Griffin, J. Maschinski, and M.W. Fidelibus. 2006. Propagation protocol for the endangered *Jacquemontia reclinata* House from South Florida. **Native Plants Journal** 7:301-306.
20. Thornton, H.E.B., J. Roncal, C. E. Lewis, J. Maschinski, and J. Francisco-Ortega. 2008. Genetic structure and diversity of *Jacquemontia reclinata*, an endangered coastal morning glory species from Southern Florida: Implications for conservation management. **Biotropica** 40: 507-514.
21. Wendelberger, K.S., J. Maschinski. 2009. Linking GIS, observational and experimental studies to determine optimal seedling microsites of an endangered plant in a subtropical urban fire-adapted ecosystem. **Restoration Ecology** 17: 845-853.
22. Wendelberger, K. S., M. Q.N. Fellows and J. Maschinski. 2008. Rescue and restoration: Experimental translocation of *Amorpha herbacea* Walter. var. *crenulata* (Rybd.) Isley into a novel urban habitat. **Restoration Ecology** 16:542-552.
23. Wright, S.J. and M. Fidelibus. 2004. Shade limited root mass and carbohydrate reserves of the endangered beach clustervine (*Jacquemontia reclinata*) grown in containers. **Native Plants Journal** 5(1).

Book Chapters

1. Albrecht, M.A. and J. Maschinski. 2012. Influence of founder population size, propagule stages, and life history on the survival of reintroduced plant populations. In J. Maschinski and K. E. Haskins (editors). *Plant Reintroduction in a Changing Climate: Promises and Perils*. Island Press, Washington DC.
2. Kennedy, K., M.A. Albrecht, E.O. Guerrant Jr., S.E. Dalrymple, J. Maschinski, and K.E. Haskins. 2012. Synthesis and Future Directions. In J. Maschinski and K. E. Haskins (editors). *Plant Reintroduction in a Changing Climate: Promises and Perils*. Island Press, Washington DC.
3. Maschinski, J., D.A. Falk, S.J. Wright, J. Possley, J. Roncal, and K.S. Wendelberger. 2012. Optimal Locations for Plant Reintroductions in a Changing World. In J. Maschinski and K. E. Haskins (editors). *Plant Reintroduction in a Changing Climate: Promises and Perils*. Island Press, Washington DC.
4. Maschinski, J., S.J. Wright, C. Lewis. 2012. The Critical Role of the Public: Plant Conservation through Volunteer and Community Outreach Projects. In J. Maschinski and K. E. Haskins (editors). *Plant Reintroduction in a Changing Climate: Promises and Perils*. Island Press, Washington DC.

5. Maschinski, J., M.A. Albrecht, L. Monks, and K.E. Haskins. 2012. Center for Plant Conservation Best Reintroduction Practice Guidelines. *In* J. Maschinski and K. E. Haskins (editors). *Plant Reintroduction in a Changing Climate: Promises and Perils*. Island Press, Washington DC.
6. Maschinski, J. and K.E. Haskins (editors). 2012. *Plant Reintroduction in a Changing Climate: Promises and Perils*. Island Press, Washington DC.
7. Maschinski, J. 2006. Implications of population dynamic and metapopulation theory for restoration. *In*: Foundations of Restoration Ecology, D. Falk, M. Palmer, and J. Zedler (editors). Island Press, Washington, DC.

Popular Articles

1. Burgess, H. and J. Possley. 2009. Reconciling Plant Introduction and Conservation at Fairchild Tropical Botanic Garden. **Wildland Weeds** 13(1):4-6.
2. Fellows, M. 2003. 118 Endangered plants released! **Garden Views** 58(1):8-9.
3. Freedman, M. and J. Possley. 2013 . **The Tropical Garden** 68(3):53-56.
4. Maschinski, J. 2013. Seeds: A Sensible Conservation Solution, **The Tropical Garden**, Spring 2013.
5. Maschinski, J. 2012. Where can a species go when its habitat is gone? **The Tropical Garden** 67(4):45-47.
6. Maschinski, J. and J. Possley. 2005. Fairchild restores rare populations of *Lantana canescens*. **The Tropical Garden** 60(3):19.
7. Maschinski, J., S. Lewis, D. Walters, J. Possley, S.J. Wright, J. Roncal, and C. Lewis. 2009. The Connect to Protect Network: Botanical Gardens working to Restore Habitats and Conserve Rare Species. **BG Journal** 6(1):6-9.
8. Possley, J. 2012. Pining for fire: managing Miami's endangered pine rocklands. **The Tropical Garden**. 67(4):19-22.
9. Possley, J. 2011. Conserving Miami's Treasured Ferns. **The Tropical Garden** 66(4): 30-32.
10. Possley, J. 2011. Hammock shrubverbena – still going strong with a little help from some friends. **Tillandsia**. February 2011.
11. Possley, J. 2006. DCFNPS members work to keep *Lantana canescens* in the flora of south Florida. **Tillandsia**. January 2006.
12. Possley, J. 2006. Goatsfoot- *Passiflora sexflora*. **Tillandsia**. May 2006.
13. Possley, J. 2004. Notes on five of South Florida's lesser-known invasive ferns. **Tillandsia**. October: 4-7.
14. Possley, J. 2004. Able-bodied volunteers give rare Florida native plants a lift. **Garden Views** 59(3):9.
15. Possley, J. 2004. FL-EPPC species affect Miami-Dade County's rare ferns. **Wildland Weeds**. 7(3):12-15.
16. Possley, J. 2003. Up to my neck in South Florida's ferns and loving it! **Garden Views** 58(3):8-9.
17. Possley, J. 2002. Invasives: Reports from the regions. Report from Florida. **Public Garden** 17(4):30-31.
18. Weekley, C.W., D.R. Gordon, J. Maguire, J. Maschinski, E.S. Menges, V.C. Pence and C.L. Peterson. 2008. Florida's endangered and threatened plant conservation grants program: Saving Florida's rarest plants. **The Palmetto** 25(2):8-13.

APPENDIX VIII:

FERNS OF MIAMI-DADE COUNTY PRESERVES FIELD ID SHEETS

The following three pages were created by Fairchild for aid in identifying ferns in Miami-Dade County Preserves:

1. Common native ferns
2. Common non-native invasive ferns
3. Rare native ferns

Photos were taken by Jennifer Possley unless otherwise indicated. Not all ferns present in Miami-Dade County are included in these three sheets.



Some of the **common native** ferns
in Miami-Dade County preserves



Southern shield fern (*Thelypteris kunthii*)
Fronds hairy, soft to touch



Brittle maidenhair (*Adiantum tenerum*)
FL-End, but common in Miami



Resurrection fern (*Pleopeltis polypodioides*)
Epiphyte, usually on live oaks



Bracken fern (*Pteridium aquilinum*)
Can be dense invader in pine rocklands



Sword fern (*Nephrolepis exaltata*)
Narrower than *N. biserrata*, usu more upland



Giant sword fern (*Nephrolepis biserrata*)
Wetlands, can form monocultures



Pineland fern (*Anemia adiantifolia*)
Thick-leaved, present in hammocks too



Leather fern (*Acrostichum* spp.)
Wetlands. Very large; to >2m tall



Golden polypody (*Phlebodium aureum*)
Cabbage palm epiphyte, gold fuzzy rhizome



Some of the **non-native** ferns
in Miami-Dade County Preserves



Asian sword fern (*Nephrolepis brownii*)
Dark scales at base with pale margins



Opulent maiden fern (*Thelypteris opulenta*)
Golden glands on underside of frond, need lens



Tuberous sword fern (*Neph. cordifolia*)
Tubers sometimes present, pinnae overlap



Chinese ladder brake (*Pteris vittata*)
Found in most preserves, rarely dense



Giant brake (*Pteris tripartita*)
Tree fern to >2m tall.. Castellow, Deering, Matheson



Wart fern (*Phymatosorus* spp.)
Green creeping rhizome, landscape favorite



Staghorn fern (*Platycerium bifurcatum*)
Increasingly naturalizes



Incised halberd fern (*Tectaria incisa*)
Could confuse with rare native *T. heracleifolia*



Some of the **endangered native** ferns
in Miami-Dade County Preserves



Toothed spleenwort
(*Asplenium dentatum*)



Modest spleenwort
(*Asplenium verecundum*)



Fragrant maidenhair
(*Adiantum melanoleucum*)



Filmy ferns
(*Trichomanes* spp.)



Creeping Star-Hair Fern
(*Thelypteris reptans*)



Stiff Star-Hair Fern
(*Thelypteris sclerophylla*)



Wedget fern
(*Odontosoria clavata*)



Brown hair comb fern
(*Ctenitis submarginalis*)



Florida tree fern
(*Ctenitis sloanei*)



Least Halberd Fern
(*Tectaria fimbriata*)



Grid scale maiden fern
(*Thelypteris patens*)