Status and Monitoring of Biodiversity on the Florida Gulf Coast University Campus

July 10, 2017

Brian Bovard, Edwin M. Everham III, C.W. Gunnels IV, John Herman, and Kara Lefevre

CAMPUS OVERVIEW

Florida Gulf Coast University opened in 1997 on a 307. 5 ha (760 a) site which included approximately 170 ha (420 a) of potential preserve land (52.6% of the total campus), consisting of 49 ha (121 a) of upland preserve and 121 ha (298 a) of wetlands (Appendix A, Figure 1). Development to date has resulted in 25.5 ha (63 a) of wetland impacts, with 13.4 ha (33 a) of wetland creation, 95.5 ha (236 a) of wetland restoration and 52.2 ha (129 a) of upland restoration and preservation. A 13.4 ha (33 a) portion of the campus was moved from ‘undeveloped’ and potentially preserve to future development under the current Master Plan. Three additional adjacent parcels have been added to the main campus: a 4.9 ha (12 a) parcel, planned for future development, to the northwest (Appendix A, Figure 2); a 16 ha parcel (40 a) to the north and east, also planned for development; and a 43 ha parcel (106 a) to the east that was off-site mitigation for the Gulf Coast Town Center, but is deeded to the University and will remain preserved. These changes prodcued a campus with 51.5% of conservation area (191.4 ha out of 371.5 ha) in our current Master Plan at build-out (Table 1). The main campus, currently, has development concentrated in a central academic core and three outlying areas, (housing development to the northeast and southeast, and academic building to the southwest). The 5.5 ha (14 a) campus solar array is to the northwest of the campus (Appendix A, Figure 3).

The campus site was vegetated by a mosaic of communities composed of upland and wetland habitats. These communities represent both native habitats and areas significantly altered by past and current human activities. The major upland community on the campus site was disturbed pine flatwoods (FLUCFCS Code 4119) and the major wetland community was disturbed cypress (FLUCFCS Code 6219). Both wetlands and uplands experienced exotic invasive plant infestation to varying degrees, principally from Melaleuca (*Melaleuca quinquenervia)* and to a lesser extent Brazilian pepper (*Schinus terebinthifolius*) (2015-2015 Campus Master Plan Update).

As part of the site selection and campus planning processes, an extensive ecological inventory was conducted and documented in the 1995 Campus Master Plan Inventory report. Preliminary surveys included a general delineation and characterization of the site’s major upland and wetland plant communities, a general review of the Natural Resource Conservation Service (NRCS) soils survey, and a survey for threatened and endangered plant and wildlife species. Each phase of the campus development has required additional examination of the possible impact on listed species and any requirements for wetland impact minimization or mitigation. In addition, faculty and staff have made significant effort to integrate curriculum requirements with monitoring, research, restoration, and management opportunities on the campus, and within the larger watershed. This effort was originally supported by the National Science Foundation as our Campus Ecosystem Model (CEM). These projects have included faculty and staff research, as well as graduate and undergraduate research projects (APPENDIX D).

The University has off-campus facilities that include: The Vester Marine Field Station in Bonita Springs (<http://www.fgcu.edu/vestermarine/>), The Kapnick Center and Everglades Wetland Research Park (<http://www.fgcu.edu/swamp/kapnickcenter.html>) in association with the Naples Botanical Garden, the Emergent Technologies Institute (ETI) in Estero (<http://www.fgcu.edu/Eng/eti.html>), and The Buckingham Center in Buckingham (<http://www.fgcu.edu/Facilities/buckinghamcomplex.html>). Each provides additional opportunities for research and conservation, but this report focuses on the status and activities on the main campus.

**Table 1** – Summary of habitat and acreage changes with campus development (data from 2015-2015 Campus Master Plan Update). Areas reported in acreage.

|  |  |  |  |
| --- | --- | --- | --- |
| **Action** | **Impact** | **Mitigation** | **Total**  **(% preserved)** |
| Site Selection |  |  | 307.5 ha (52.6%)  148.2 ha conservation &  13.6 ha lakes |
| Basin 1 and 2 | 12 ha of wetland impact | -16 ha of wetland and upland restoration \*  -7.7 ha of pond and wetland creation |  |
| Basin 3 – student housing | 5 ha of wetland impact | -1.6 ha of wetland creation  -8.5 ha of upland preservation  -15.8 ha of wetland enhancement |  |
| Road construction – entrance roads | 3.6 ha of wetland impact | -2.4 ha wetland creation  -15.8 ha of wetland restoration |  |
| Athletic fields | 1.2 ha of wetland impact | -1.2 ha of wetland creation  -5.3 ha of wetland restoration  -5.3 ha of upland restoration |  |
| Road construction- loop road | 1.6 ha of wetland impact | -< 1 ha of wetland creation  -10.5 ha of wetland restoration  -5.7 ha of upland restoration |  |
| Basin 5 – student housing | 1.6 ha of wetland impact | -35 ha of wetland restoration  -19 ha of upland restoration |  |
| Solar Filed | <1 ha of wetland impact | -4.9 ha of wetland restoration  -5.7 ha of upland restoration |  |
| South Campus recreation facility | Moved 13.4 hato developable | *To be determined* | 307.5 ha (48.3%) |
| Northwest addition | ha added to campus – to be developed | *To be determined* | 312.4 (47.5%) |
| Eastern addition | 42.9 ha to be added to the campus – all preserve land |  | 355.3 ha (53.9%) |
| Northeast addtion | 16.2 ha to be developed | *To be determined* | 371.5 ha (51.5%) |
| **Totals** | **Wetland loss 63 a** | **Wetland creation 33 a (30 a net loss)**  **Wetland restoration 236 a**  **Upland restoration 129 a** | **371.5 ha (51.5%)**  **191.4 ha of lakes and conservation areas** |

\* to estimate totals, this value was assumed to be evenly split between wetland and upland

Our Master Planning process includes one component on Conservation (Element 13) and is revised every five years. In addition, our internal governance structure includes the Environmental Sustainability Committee. This group of administrators, faculty, staff, and students engage issues related to sustainability on campus, including management of conservation lands. In 2103 this committee developed the FGCU Campus Land Use Report. (http://www.fgcu.edu/Provost/files/Final\_Campus\_Land\_Use\_Report.pdf)

CAMPUS ECOSYSTEMS

The Campus Ecosystem Model at FGCU identifies the following major natural ecosystems that comprise our main campus. Additional ecosystems, such as Pine-Oak Scrub, Mangrove, Estuary, and Salt Marsh ecosystems are located at auxiliary campuses in Lee and Collier counties. Our on-campus research includes viewing the developed areas as also potential habitats for nurturing biodiversity, following the concept of reconciliation ecology. These studies should impact how we develop the campus, in particular the landscaping, and how those developed lands are managed, long-term (*e.g*. minimizing pesticide use).

*Pine Flatwoods* (<http://www.fgcu.edu/CAS/CEM/pine.html>)

A pine flatwoods can be most easily recognized by pine trees forming a canopy that is more open than, for example, the canopy in a cypress slough. A common species association in this ecosystem is pine-gallberry-saw palmetto. Areas considered pine flatwoods are found from the Carolinas sweeping down into the peninsular Florida. Plants in this habitat are adapted to a frequent fire regime. In northern parts of the state long leaf pine may appear more often than in the southern and southwestern parts of Florida where the upland pines are dominated by slash pine. Florida slash pine (*Pinus elliottii* var. *densa*) is common to uplands in southwest Flroida, including the FGCU campus. Saw palmetto (*Serenoa repens*) is a typical understory species, well-adapted to fire-dominated systems, easily identified by large, fan-shaped leaves and trunks that tend to grow horizontally along the ground. Other common understory and groundcover species include wax myrtle (*Myrica cerifera*), tarflower (*Befaria racemosa*), gallberry (*Ilex glabra*), and a wide variety of grasses and herbs. Fetterbush (*Lyonia lucida*) and bay trees (*Persia* sp.) are found near ponds within pine flatwood areas; while saw palmetto, gallberry, and rusty lyonia (*Lyonia ferruginea*) occupy slash pine flatwoods sites.

*Hardwood Hammocks*

Hardwood hammocks in Florida are defined as forests of principally broad-leaved hardwood trees. These ecosystems are typically dominated by oak trees (*Quercus* sp.), red maples (*Acer rubra*) and/or mahogany trees (Swietenia mahagoni) in southern Florida. There are several different types of hardwood hammocks in southern Florida such as Maritime, Tropical, or Temperate Hardwood Hammocks, and each hammock type has a unique species composition that is partially determined by the environmental conditions of the location. On the FGCU campus, the hardwood hammocks are more temperate in nature with an overstory that tends to be dominated by live oaks (*Quercus virginiana*), laurel oaks (*Quercus laurifolia*) oaks and red maples (*Acer rubrum*). The understory in these systems is often more dense than the pine flatwoods described above and includes species such as marlberry (*Ardisia escallonioides*), wild coffee (*Psychotria nervosa*) and myrsine (*Myrsine guianensis*). The environmental conditions within the canopy tend to be relatively humid, lower in radiation due to shading by the overstory trees and have cooler temperatures compared to pine flatwoods. These conditions tend to reduce fire frequency, which is important since hardwood hammocks are less adapted to fire than many other Florida ecosystems. The soils tend to have a dominant humus layer over a limestone or sand substrate. This humus is dominated by decomposing plant material that serves as an important source of nutrients.

Cypress Swamp (<http://www.fgcu.edu/CAS/CEM/cypress.html>)

These regularly inundated wetlands form a forested border along large rivers, creeks, and lakes, or occur in depressions as circular domes or linear strands. Cypress swamp communities are strongly dominated by either bald cypress (*Taxodium distichum*) or pond cypress (*Taxodium ascendens*, with very low numbers of scattered red maple and swamp bay (*Persia* *palustris*) . Understory and ground cover are usually sparse due to frequent flooding and shading but may include such species as buttonbush (*Cephalanthus occidentalis*), lizard's-tail (*Saururus cernuus)*, and various ferns. The canopy of a cypress swamp is dense, and is produced by cypress and other trees as well as epiphytic plants.

Wet Prairie (http://www.fgcu.edu/CAS/CEM/prairie.html)

The transitional zone between land and water is referred to as a wetland, and marshes make up one third of Florida’s wetlands. "Marshes are wetlands dominated by herbaceous plants rooted in and generally emergent from shallow water that stands at or above the ground surface for much of the year" (Myers & Ewel, 1990). There are nine types of marshes in Florida, with the wet prairie being the most common type of marsh found on Florida Gulf Coast University’s campus. A wet prairie ecosystem can be identified by its lack of trees, sparse to dense ground cover of grasses and herbs, and flat terrain. The timing and length of the dry season, relative to the seed types available in the substrate, determine which flora germinate and flourish. Some examples of plant species found in marshes are maidencane *(Panicum hemitomon*), cordgrass (*Spartina bakeri*), beakrush (*Rhynchospora* spp.), and muhly (*Muhlenbergia fillipes*). Subtropical locations, fluctuating water levels, recurring fires, and hard water also shape marshes. Wetland preservation and restoration on the FGCU campus has embraced the ecological reality of the critical ecological role of associated upland systems.

Retention Ponds (http://www.fgcu.edu/CAS/CEM/lakes.html)

In addition to being surrounded by water on three sides, Florida is also home to some 10,400 freshwater lakes, many of which are located in northern Florida. Of these, more than 7800 are larger than 0.4 hectares, covering a total of 9270 square kilometers, encompassing more than six-percent of Florida’s landscape (Myers & Ewel, 1990). Lakes are a common feature of the landscape in some areas of Florida due in part to the abundance of rainfall and the flat irregular surface that characterizes the state. Many of Florida’s lakes are highly diverse in their flora and fauna; for example, approximately 40 species of native fishes and 20 species of nonnative fishes inhabit these systems. Florida lakes are unusual in that underground tunnels often connect them; however, they are not as "systemic" as riverine and canal systems (Alden et al., 1998). Because of this, invasive exotics have not been as successful invading lake ecosystems. In addition to fish, many different species of invertebrates, amphibians, reptiles, and water birds may be found in association with these lakes. Lakes not only harbor great numbers of plants and animals, but they also mitigate the surrounding microclimate. For example,extended, gradual heat release by lakes helps protect surrounding crops from freezing. The FGCU campus includes no natural lakes, but retention ponds are a required feature for stormwater permitting, and southwest Florida is now home to approximately 10,000 of these human-created wetland systems. Currently twelve ponds have been constructed and are being managed to maximize native emergent and submerged vegetation.

**Campus Vegetation Inventories:**

During the initial site evaluation, 29 species of protected plants were observed on the project site: 1 endangered, 22 threatened, 5 commercially exploited, 1 candidate for listing. The most frequently encountered protected plants were dahoon holly (*Ilex cassine*), stiff-leaved wild-pine

(*Tillandsia fasciculata*), golden polypody (*Phlebodium aureum*), shoestring fern (*Vittaria lineata*), southern shield fern (*Thelypteris kunthii*), and brake fern (*Pteris vittata*). The least common, found at one or two locations, were: branded wild-pine (*Tillandsia flexuosa*), cigar orchid (*Cyrtopodium punctatum*), pine lily (*Lilium catesbaei*), giant ladies’ tresses (*Spiranthes praecox*), and strap fern (*Camplyloneuron pyllitidu*s). Bromeliads (*Bromeliaceae*) orchids (*Orchideceae*), and ferns and fern-allies (*Osmundaceae, Polypodiaceae, Psilotaceae, Pteridaceae, Schizaceae, Thlypteridaceae, and Vittariaeae*) were the most represented taxa (2015-2015 Campus Master Plan Update).

From 2002 to 2006, Dr. George Wilder conducted a floristic inventory of the FGCU campus for wild growing plant species. During this assessment, 564 taxa (species, subspecies, varieties, formas) of vascular plants were identified growing wild (not planted) on our campus. This count included species both native and non-native to Florida. At FGCU, these plants grow in natural areas, in disturbed areas, and in developed areas such as lawns, and shrub beds.

According to Wilder, one species identified “*Lipocarpha maculata*, had formerly been listed as extirpated in South Florida, by Gann *et al.* (2002). That species had been collected previously only once in South Florida, in Lee Co.; however, I recently located *L. maculata* at two locations within Lee Co., including FGCU. Gann et al. (2002) also listed six species and one variety of the present inventory as critically imperiled in South Florida: *Bartonia virginica, Burmannia biflora, Juncus repens, Rhynchospora fernaldii, Scleria ciliata* var. *curtissii, Spiranthes praecox*, and *Spiranthes torta*. For Lee Co., *Burmannia biflora* and *Spiranthes praecox* had each been collected previously only once (in 1964 and 1930, respectively), and there had been no previous collections of *Bartonia virginica, Juncus repens, Scleria ciliata* var. *curtissi*i, and *Spiranthes torta*. I have located minimal number(s) of additional localities for six of the seven species and for the one variety, aforementioned in this paragraph, in Lee Co. and/or in Collier Co (all taxa but *S. torta*). At FGCU, five species and the one variety grow within pine flatwoods situated within the eastern sector of the campus. These flatwoods – or portion(s) thereof – are being considered for development. I submit that the presence of rare native taxa and the high quality of these flatwoods render development inappropriate.” (Appendix B).

Wilder also noted the following regionally important species on the FGCU Campus: “six native species of *Tillandsia* (Bromeliaceae [*T. balbisiana, T. fasciculata, T. paucifolia, T. recurvata, T. setacea, T. usneoides*]), eight native species of Orchidaceae (*Bletia purpurea, Encyclia tampensis, Eulophia alta, Habenaria quinqueseta, Spiranthes praecox, Spiranthes torta, Spiranthes vernalis, Triphora gentianoides*), and two nonnative species of Orchidaceae (*Oeceoclades maculata, Zeuxine strateumatica*). For Florida, Coile and Garland (2003) listed *Spiranthes torta* and *Tillandsia fasciculata* as endangered and *Bletia purpurea* and *Tillandsia balbisiana* as threatened. At FGCU*,* *Bletia purpurea* inhabits the pine flatwoods discussed above. “(Appendix B).

Within this vegetation survey a number of the species found on the FGCU campus were new records for Lee County (Wilder 2006 and unpublished observations). There were also 14 species designated as Category I invasive exotic species and 10 species considered to be Category II invasive exotic species in this assessment. For a complete list of the 564 species identified in this assessment please see Appendix B.

MONITORING AND MANAGEMENT PRIORITIES

**Faculty Research and Expertise**

A number of faculty are involved in on-campus monitoring or research projects. The faculty research is disseminated to the campus community through research days, lectures, and their participation on university shared governance committees that inform the campus plans.

* M. Abercrombie is working with Environmental Health and Safety to integrate a Fall section of *Environmental Chemistry* to monitor water quality in our stormwater management system.
* B. Bovard has on-going projects to examine carbon dynamics in forest ecosystems using measurement of photosynthesis. In addition, he has several course activities exploring invertebrate distributions on campus.
* E.M. Everham III has established a long-term 1 ha forest dynamics plot on campus, monitoring the effect of invasive plants, and their removal, on the growth and survival of native trees. He has several course activities focused on stormwater ponds, monitoring aquatic invertebrates and fish communities. This Fall he will be teaching a graduate seminar focused on monitoring and CEM review.
* C.W. Gunnels IV has on-going projects exploring behavior of a variety of taxa including ring-necked snakes, sliders, and arthropods, including butterflies and social insects. These projects include examing the impacts of human development and landscaping.
* J.A. Herman is an urban wildlife ecologist with a variety on campus based projects including the impact of development on herpetofauna communities, macroinvertebrate communities in stormwater ponds, and an on-going campus study of habitat use and population dynamics of eastern diamondback rattlesnakes using radio telemetry.
* K. Lefevre is an ornithologist, has student projects quantifying habitat use and distribution of avian species on campus, and is leading the Motus tracking project.
* S. Thomas has developed a research program exploring the dynamics of stormwater ponds throughout southwest Florida. His work on campus has involved quantifying groundwater interactions with these aquatic systems.

We have several priorities for future initiatives to continue to monitor and nurture biological diversity and ecological function on the FGCU campus.

* This year we will be focus on revitalizing the Campus Ecosystem Model. These efforts will include offering a graduate seminar on ecological monitoring that will serve to review the overall monitoring effort and recommend modifications and additions. We will also update the CEM website.
* This year we will also attempt to build on the FGCU Wildlife Project – initiated by the Wildlife Club - and fully update the campus species lists. This project is intended to evolve into an on-line food web that evolves through time with input from student projects.
* In 2017 a radio tower for the Motus wildlife tracking system was installed on campus. This technology has been applied at a landscape scale to track migrating birds, but this radio technology allows extremely small transmitters that have been used for studying insect movement. We have two additional towers that we intent to install on campus and allow finer spatial resolution. This technology promises to support a plethora of possible student projects that explore habitat use and behavioral changes in response to human activity and development.
* Several of the campus habitats are adapted to periodic fire. The last prescribed burn on campus was conducted in 1998. A wildfire burned approximately 120 ha (300 a) of the campus in May of 2004. We have been managing the fire adapted ecosystems with mechanical harvest to reduce fuel loads. This year we plan to reintroduce prescribed fire on campus.
* Working through the Environmental Sustainability Committee we intend to reestablish the wildlife subcommittee to formalize policies on human wildlife interactions. We also will be evaluating pesticide use on campus toward minimizing use and impacts on non-target species.

LITERATURE CITED

Brooks-Solveson, B., M.G. Brown, M.K. Cassani, E.M. Everham III, **T. Matonis**, and **C. White**. 2004. Impact of wildfire on wetland and upland habitats restored from invasion of *Melaleuca quinquenervia*. In P.J. Cannizzaro (ed.) Proceedings of the Thirty First Annual Conference on Ecosystems Restoration and Creation. Hillsborough Community College. Tampa, Florida

FGCU Campus Land Use Report (http://www.fgcu.edu/Provost/files/Final\_Campus\_Land\_Use\_Report.pdf)

Coile, N. C. and M. A. Garland. 2003. Notes on Florida’s endangered and threatened plants. Bot. Contrib. No. 38, 4th ed. Florida Dept. Agric. & Cons. Serv., Div. Plant Industry, Gainesville, FL

Ewel, J. J., & Myers, R. L. (Eds.). (1990). *Ecosystems of Florida*. University of Central Florida Press.

Gann, G. D., K. A. Bradley, and S. W. Woodmansee. 2002. Rare plants of South Florida: their history, conservation, and restoration. The Institute for Regional Conservation, Miami, FL.

2015-2015 Campus Master Plan Update. <http://www.fgcu.edu/Facilities/MasterPlan2015.html>

APPENDICES

Appendix A – Campus Maps

Appendix B - Plant List

Appendix C - Wildlife List

Appendix D – Research and Presentations

Appendix A – Campus Maps

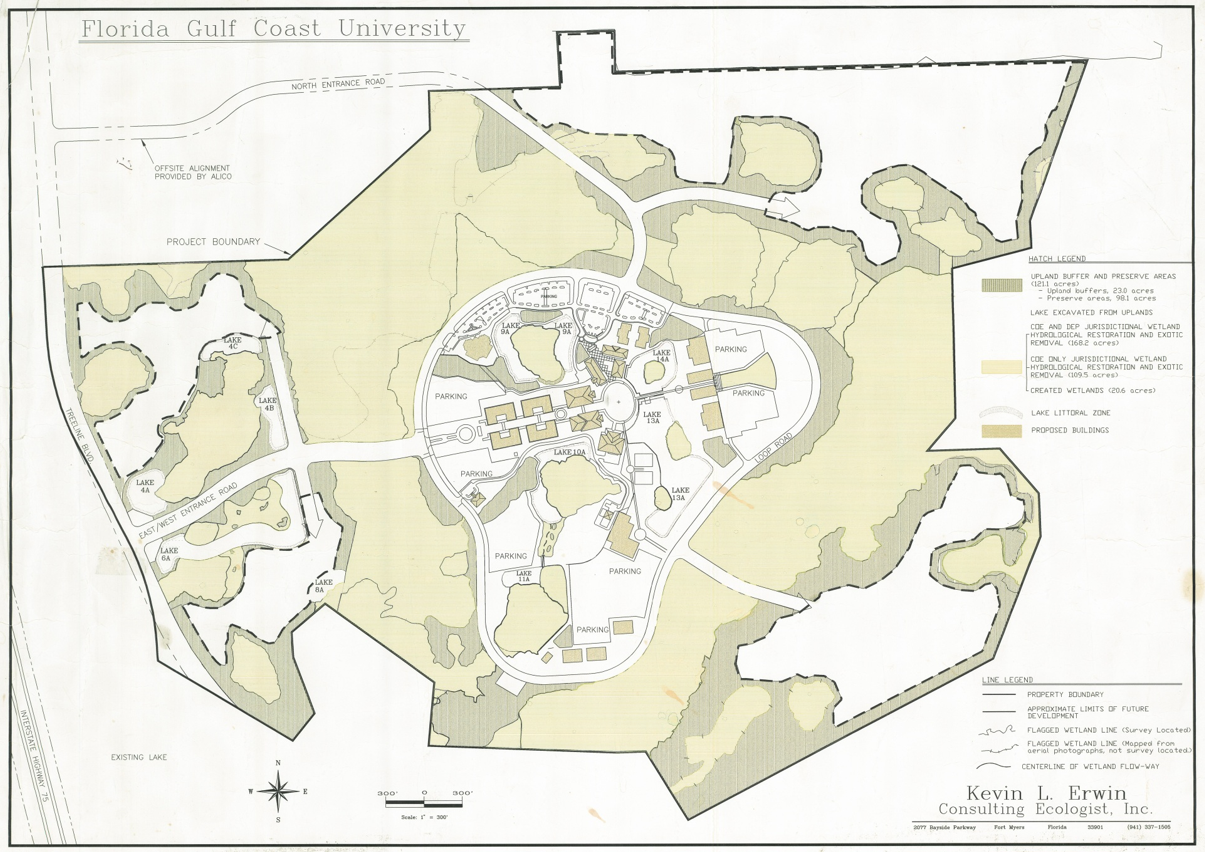


Figure 1 – Original campus plan from KLECE 1995



Figure 2 – Current Master Plan Update

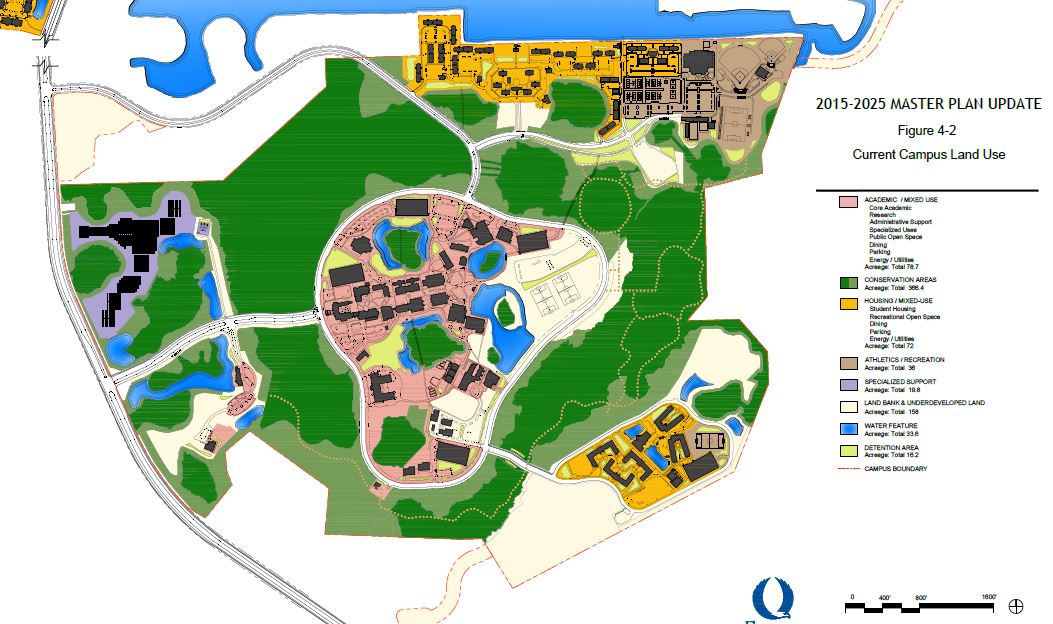


Figure 3 –Current landuse from the 2015-2015 Master Plan

Appendix B – Floral Inventory

AN UPDATED INVENTORY OF THE TAXA OF VASCULAR PLANTS GROWING WILD AT FLORIDA GULF COAST UNIVERSITY (FORT MYERS, FLORIDA)

Dr. George J. Wilder – Sept. 5, 2006

**INTRODUCTION**

Attached, are two copies of an updated inventory that I have compiled of 502 taxa (species, subspecies, varieties, formas) of vascular plants growing wild (not planted) on the campus of Florida Gulf Coast University (FGCU). This inventory replaces the preliminary inventory that I submitted to faculty members at FGCU, during April 2006. That preliminary inventory listed 400 taxa for FGCU.

The present inventory is not final and I desire to update the inventory at least one more time. After its final update I will submit the inventory for publication. In one copy of the present inventory the names of taxa are arranged alphabetically by species; in the second copy they are arranged alphabetically by family.

At FGCU, vascular plants grow wild in natural areas, in disturbed places, and within developed areas (lawns, shrub beds, etc). The individual taxa are native or alien to Florida.

I began working on the inventory in September, 2002, and I have continued the work sporadically, thereafter. For each taxon represented in the inventory, I have deposited a voucher specimen within the herbarium at FGCU. Information about taxa (collection dates, habitats, etc.) is available from the labels of voucher specimens and from the computerized database for the herbarium (which currently records ca. 25,500 collections). Coile and Garland (2003), Flora of North America Editorial Committee, ed. (2002, 2003), Gann et al. (2002), Godfrey and Wooten (1979, 1981), Hitchcock and Chase (1950), Nelson (1994, 1996), Small (1933), Taylor (1998), Wilder and McCombs (2006), and Wunderlin and Hansen (2003, 2004) also characterized the taxa. Nomenclature within the inventory generally follows Wunderlin and Hansen (2003).

In the past, personnel planted native species within nondeveloped portions of the FGCU campus – perhaps, a laudable undertaking. Unfortunately, I lack thorough records of which species were planted and where plantings were made. That circumstance has made problematical my decisions as to whether or not to inventory particular species.

Excluded, from this inventory are species that seem to grow wild at FGCU, but which I believe were solely planted there: Annona glabra, Chrysobalanus icaco, Hamelia patens, Liquidambar styraciflua, Nymphaea odorata, Nuphar advena, Spartina bakeri, and Tripsacum dactyloides. Certain of these species are suspect, based on one or more of the following circumstance(s): (1) actual information that plants were introduced at FGCU, (2) the localization of atypical soil where plants are rooted, (3) the spacing of individuals or clumps of individuals in unexpected positions or at unexpectedly regular distances from one another, and (4) the actual presence of labels on plants. Also, L. styraciflua is suspect because plants are young and occur outside of the published geographic range of this species.

For Acer rubrum, Muhlenbergia capillaris, and Taxodium distichum sensu lato within nondeveloped areas at FGCU, I interpret some plants as wild and other individuals as planted. These species are inventoried, based on the wild specimens. I also inventory the following species, despite my uncertainty/doubt that any individuals grow wild on campus: Canna flaccida, Eleocharis interstincta, and Ficus citrifolia. I do so for want of evidence that they were planted at FGCU.

Comment is necessary for the genus Dichanthelium (Poaceae). Classification and nomenclature are in flux for Dichanthelium. Too, it is common knowledge that certain specimens of the genus do not match very well the taxonomic keys to species of Dichanthelium. Because of these circumstances the names for certain Dichanthelium specimens in the present version of the inventory may be changed in future versions.

One species inventoried, Lipocarpha maculata, had formerly been listed as extirpated in South Florida, by Gann et al. (2002). That species had been collected previously only once in South Florida, in Lee Co.; however, I recently located L. maculata at two locations within Lee Co., including FGCU. Gann et al. (2002) also listed six species and one variety of the present inventory as critically imperiled in South Florida: Bartonia virginica, Burmannia biflora, Juncus repens, Rhynchospora fernaldii, Scleria ciliata var. curtissii, Spiranthes praecox, and Spiranthes torta. For Lee Co., Burmannia biflora and Spiranthes praecox had each been collected previously only once (in 1964 and 1930, respectively), and there had been no previous collections of Bartonia virginica, Juncus repens, Scleria ciliata var. curtissii, and Spiranthes torta. I have located minimal number(s) of additional localities for six of the seven species and for the one variety, aforementioned in this paragraph, in Lee Co. and/or in Collier Co (all taxa but S. torta). At FGCU, five species and the one variety grow within pine flatwoods situated within the eastern sector of the campus. These flatwoods – or portion(s) thereof – are being considered for development. I submit that the presence of rare native taxa and the high quality of these flatwoods render development inappropriate.

The present inventory also represents six native species of Tillandsia (Bromeliaceae [T. balbisiana, T. fasciculata, T. paucifolia, T. recurvata, T. setacea, T. usneoides]), eight native species of Orchidaceae (Bletia purpurea, Encyclia tampensis, Eulophia alta, Habenaria quinqueseta, Spiranthes praecox, Spiranthes torta, Spiranthes vernalis, Triphora gentianoides), and two nonnative species of Orchidaceae (Oeceoclades maculata, Zeuxine strateumatica). For Florida, Coile and Garland (2003) listed Spiranthes torta and Tillandsia fasciculata as endangered and Bletia purpurea and Tillandsia balbisiana as threatened. At FGCU, Bletia purpurea inhabits the pine flatwoods discussed above.

An ample number of species within the inventory represents new records for Lee County (Wilder 2006 and unpublished observations).

The Florida Exotic Pest Plant Council (2005) designated fourteen inventoried species as category I invasive exotic species (Acacia auriculiformis, Bischofia javanica, Cupaniopsis anacardioides, Eugenia uniflora, Lantana camara, Lygodium microphyllum, Melaleuca quinquenervia, Nephrolepis cordifolia, Nephrolepis multiflora, Panicum repens, Rhodomyrtus tomentosa, Rhynchelytrum repens, Schinus terebinthifolius, Solanum viarum) and ten inventoried species as category II invasive exotic species (Blechum pyramidatum, Cyperus involucratus, Hemarthria altissima, Leucaena leucocephala, Panicum maximum, Pteris vittata, Ricinus communis, Wedelia trilobata, Stachytarpheta urticifolia, Urena lobata).

Many persons facilitated the development of this inventory. Especially, contributory were Dr. Edwin Everham III, Dr. Bill Hammond, Dr. Bruce Hansen, Mr. Michael Ilczszyn, Mr. Brad Kolhoff, Ms. Martha McCombs, Ms. Debbie Preston, Ms. Jean Roche, and Dr. Richard Wunderlin. To them, I extend deep thanks. Responsibility for plant identifications is solely my own.

**LITERATURE CITED**

Coile, N. C. and M. A. Garland. 2003. Notes on Florida’s endangered and threatened plants. Bot. Contrib. No. 38, 4th ed. Florida Dept. Agric. & Cons. Serv., Div. Plant Industry, Gainesville, FL

Flora of North America Editorial Committee, ed. 2002. Flora of North America north of Mexico. Vol. 23. Magnoliophyta: Commelinidae (in part): Cyperaceae. Oxford University Press, NY.

\_\_\_\_\_. 2003. Flora of North America north of Mexico. Vol. 25. Magnoliophyta: Commelinidae (in part): Poaceae, part 2. Oxford University Press, NY.

Florida Exotic Pest Plant Council. 2005. Florida Exotic Pest Plant Council’s 2005 list of invasive species. Wildland Weeds 8(3): 13-16.

Gann, G. D., K. A. Bradley, and S. W. Woodmansee. 2002. Rare plants of South Florida: their history, conservation, and restoration. The Institute for Regional Conservation, Miami, FL.

Godfrey, R.. K., and Wooten, J. W. 1979, 1981. Aquatic and wetland plants of southeastern United States. The University of Georgia Press, Athens, GA

Hitchcock, A. S., and A. Chase. 1950. Manual of the grasses of the United States. 2nd ed. [Reprint]. Dover Publications, Inc. New York

Nelson, G. 1994. The trees of Florida. Pineapple Press, Inc. Sarasota, FL

\_\_\_\_\_. 1996. The shrubs and woody vines of Florida. Pineapple Press, Inc. Sarasota, FL

Small, J. K. 1933. Manual of the southeastern flora. Published by the author, New York.

Taylor, W. K. 1998. Florida wildflowers in their natural communities. University Press of Florida, Gainesville, FL

Wilder, G. J., and M. R. McCombs. 2006. New and significant records of vascular plants for Florida and for Collier County and Lee County, Florida. Sida. 22(1): 787-799.

Wunderlin, R. P. and B. F. Hansen. 2003. Guide to the vascular plants of Florida, 2nd ed. University Press of Florida, Gainesville, FL.

Wunderlin, R. P. and B. F. Hansen. 2004. Atlas of Florida vascular plants. <http://www.plantatlas.usf.edu/isb/>. Institute for Systematic Botany, University of South Florida, Tampa

GJ – add Sacoila lanceolata to the listing and enumeration of orchid species.

|  |  |  |  |
| --- | --- | --- | --- |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Acacia* | *auriculiformis* |  | Fabaceae |
| *Acalypha* | *setosa* |  | Euphorbiaceae |
| *Acer* | *rubrum* |  | Aceraceae |
| *Acmella* | *oppositifolia* |  | Asteraceae |
| *Acrostichum* | *aureum* |  | Pteridaceae |
| *Aeschynomene* | *americana* |  | Fabaceae |
| *Agalinis* | *purpurea* |  | Scrophulariaceae |
| *Ageratum* | *houstonianum* |  | Asteraceae |
| *Aletris* | *lutea* |  | Liliaceae |
| *Alysicarpus* | *ovalifolius* |  | Fabaceae |
| *Amaranthus* | *blitum* |  | Amaranthaceae |
| *Amaranthus* | *spinosus* |  | Amaranthaceae |
| *Amaranthus* | *viridis* |  | Amaranthaceae |
| *Ambrosia* | *artemisiifolia* |  | Asteraceae |
| *Ammannia* | *latifolia* |  | Lythraceae |
| *Ammannia* | *coccinea* |  | Lythraceae |
| *Ampelopsis* | *arborea* |  | Vitaceae |
| *Amphicarpum* | *muhlenbergianum* |  | Poaceae |
| *Anagallis* | *minima* |  | Primulaceae |
| *Anagallis* | *pumila* |  | Primulaceae |
| *Andropogon* | *glomeratus* |  | Poaceae |
| *Andropogon* | *virginicus* | *glaucus* | Poaceae |
| *Andropogon* | *virginicus* |  | Poaceae |
| *Aristida* | *patula* |  | Poaceae |
| *Aristida* | *spiciformis* |  | Poaceae |
| *Aristida* | *purpurascens* | *tenuispica* | Poaceae |
| *Aristida* | *stricta* |  | Poaceae |
| *Aristida* | *palustris* |  | Poaceae |
| *Asclepias* | *curassavica* |  | Asclepiadaceae |
| *Asclepias* | *lanceolata* |  | Asclepiadaceae |
| *Asimina* | *reticulata* |  | Annonaceae |
| *Aster* | *simmondsii* |  | Asteraceae |
| *Aster* | *subulatus* |  | Asteraceae |
| *Aster* | *dumosus* |  | Asteraceae |
| *Aster* | *carolinianus* |  | Asteraceae |
| *Aster* | *concolor* |  | Asteraceae |
| *Aster* | *adnatus* |  | Asteraceae |
| *Axonopus* | *fissifolius* |  | Poaceae |
| *Axonopus* | *furcatus* |  | Poaceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Azolla* | *caroliniana* |  | Azollaceae |
| *Baccharis* | *glomeruliflora* |  | Asteraceae |
| *Baccharis* | *halimifolia* |  | Asteraceae |
| *Bacopa* | *caroliniana* |  | Scrophulariaceae |
| *Bacopa* | *innominata* |  | Veronicaceae |
| *Bacopa* | *monnieri* |  | Scrophulariaceae |
| *Bartonia* | *virginica* |  | Gentianaceae |
| *Bejaria* | *racemosa* |  | Ericaceae |
| *Bigelowia* | *nudata* |  | Asteraceae |
| *Bischofia* | *javanica* |  | Euphorbiaceae |
| *Blechnum* | *serrulatum* |  | Blechnaceae |
| *Blechum* | *pyramidatum* |  | Acanthaceae |
| *Bletia* | *purpurea* |  | Orchidaceae |
| *Boehmeria* | *cylindrica* |  | Urticaceae |
| *Boerhavia* | sp. |  | Nyctaginaceae |
| *Boltonia* | *diffusa* |  | Asteraceae |
| *Buchnera* | *americana* |  | Scrophulariaceae |
| *Burmannia* | *biflora* |  | Burmanniaceae |
| *Burmannia* | *capitata* |  | Burmanniaceae |
| *Callicarpa* | *americana* |  | Verbenaceae |
| *Calyptocarpus* | *vialis* |  | Asteraceae |
| *Campyloneurum* | *phyllitidis* |  | Polypodiaceae |
| *Canna* | *flaccida* |  | Cannaceae |
| *Caperonia* | *castaneifolia* |  | Euphorbiaceae |
| *Cardamine* | *flexuosa* |  | Brassicaceae |
| *Carex* | *longii* |  | Cyperaceae |
| *Carex* | *verrucosa* |  | Cyperaceae |
| *Carphephorus* | *corymbosus* |  | Asteraceae |
| *Carphephorus* | *odoratissimus* |  | Asteraceae |
| *Cassythia* | *filiformis* |  | Lauraceae |
| *Cenchrus* | *echinatus* |  | Poaceae |
| *Cenchrus* | *gracillimus* |  | Poaceae |
| *Centella* | *asiatica* |  | Araliaceae |
| *Cephalanthus* | *occidentalis* |  | Rubiaceae |
| *Chamaecrista* | *fasciculata* |  | Fabaceae |
| *Chamaecrista* | *nictitans* |  | Fabaceae |
| *Chamaesyce* | *blodgettii* |  | Euphorbiaceae |
| *Chamaesyce* | *hirta* |  | Euphorbiaceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Chamaesyce* | *hypericifolia* |  | Euphorbiaceae |
| *Chamaesyce* | *maculata* |  | Euphorbiaceae |
| *Chamaesyce* | *opthalmica* |  | Euphorbiaceae |
| *Chamaesyce* | *prostrata* |  | Euphorbiaceae |
| *Chaptalia* | *tomentosa* |  | Asteraceae |
| *Chenopodium* | *album sensu lato* |  | Chenopodiaceae |
| *Chenopodium* | *ambrosioides* |  | Chenopodiaceae |
| *Chiococca* | *alba* |  | Rubiaceae |
| *Chromolaena* | *odorata* |  | Asteraceae |
| *Chrysopogon* | *pauciflorus* |  | Poaceae |
| *Cirsium* | *horridulum* |  | Asteraceae |
| *Cirsium* | *nuttallii* |  | Asteraceae |
| *Citrus* | *aurantium* | grapefruit group | Rutaceae |
| *Cladium* | *jamaicense* |  | Cyperaceae |
| *Clematis* | *baldwinii* |  | Ranunculaceae |
| *Cnidoscolus* | *stimulosus* |  | Euphorbiaceae |
| *Commelina* | *diffusa* |  | Commelinaceae |
| *Commelina* | *gambiae* |  | Commelinaceae |
| *Conoclinium* | *coelestinum* |  | Asteraceae |
| *Conyza* | *canadensis* |  | Asteraceae |
| *Crassocephalu* | *cepidioides* |  | Asteraceae |
| *Crotalaria* | *rotundifolia* |  | Fabaceae |
| *Crotalaria* | *spectabilis* |  | Fabaceae |
| *Crotalaria* | *pallida* |  | Fabaceae |
| *Croton* | *glandulosus* | var. *glandulosus* | Euphorbiaceae |
| *Cucumis* | *anguria* |  | Fabaceae |
| *Cupaniopsis* | *anacardioides* |  | Sapindaceae |
| *Cuphea* | *carthagenensis* |  | Lythraceae |
| *Cyclospermum* | *leptophyllum* |  | Apiaceae |
| *Cynanchum* | *scoparium* |  | Asclepiadaceae |
| *Cynodon* | *dactylon* |  | Poaceae |
| *Cyperus* | *compressus* |  | Cyperaceae |
| *Cyperus* | *croceus* |  | Cyperaceae |
| *Cyperus* | *difformis* |  | Cyperaceae |
| *Cyperus* | *distinctus* |  | Cyperaceae |
| *Cyperus* | *esculentus* |  | Cyperaceae |
| *Cyperus* | *flavescens* |  | Cyperaceae |
| *Cyperus* | *haspan* |  | Cyperaceae |
| *Cyperus* | *involucratus* |  | Cyperaceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Cyperus* | *iria* |  | Cyperaceae |
| *Cyperus* | *ligularis* |  | Cyperaceae |
| *Cyperus* | *odorataus* |  | Cyperaceae |
| *Cyperus* | *polystachyos* |  | Cyperaceae |
| *Cyperus* | *pumilus* |  | Cyperaceae |
| *Cyperus* | *retrorsus* |  | Cyperaceae |
| *Cyperus* | *rotundus* |  | Cyperaceae |
| *Cyperus* | *sphacelatus* |  | Cyperaceae |
| *Cyperus* | *surinamensis* |  | Cyperaceae |
| *Dactyloctenium* | *aegyptium* |  | Poaceae |
| *Dalbergia* | *sissoo* |  | Fabaceae |
| *Dalea* | *carnea* | var. *carnea* | Fabaceae |
| *Descurainia* | *pinnata* |  | Brassicaceae |
| *Desmodium* | *incanum* |  | Fabaceae |
| *Desmodium* | *paniculatum* |  | Fabaceae |
| *Desmodium* | *tortuosum* |  | Fabaceae |
| *Desmodium* | *triflorum* |  | Fabaceae |
| Desmodium | triflorum | white flrd. forma | Fabaceae |
| *Dichanthelium* | *aciculare* |  | Poaceae |
| *Dichanthelium* | *commutatum* | subsp. *joorii* | Poaceae |
| *Dichanthelium* | *dichotomum* | subsp. *microcarpon* | Poaceae |
| *Dichanthelium* | *dichotomum* | subsp. *roanokense* | Poaceae |
| *Dichanthelium* | *ensifolium* | var. *ensifolium* | Poaceae |
| *Dichanthelium* | *erectifolium* |  | Poaceae |
| *Dichanthelium* | *laxiflorum* |  | Poaceae |
| *Dichanthelium* | *portoricense* |  | Poaceae |
| *Dichanthelium* | *strigosum* | *glabrescens* | Poaceae |
| *Dichanthelium* | (?) *tenue* |  | Poaceae |
| *Dichanthelium* | *chamaelonche* |  | Poaceae |
| *Dichondra* | *caroliniensis* |  | Convolvulaceae |
| *Dichromena* | *colorata* |  | Cyperaceae |
| *Digitaria* | *longiflora* |  | Poaceae |
| *Digitaria* | *sanguinalis* |  | Poaceae |
| *Digitaria* | *filiformis* | var. *filiformis* | Poaceae |
| *Diodia* | *virginiana* |  | Rubiaceae |
| *Diospyros* | *virginiana* |  | Ebenaceae |
| *Drosera* | *capillaris* |  | Droseraceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Drymaria* | *cordata* |  | Caryophyllaceae |
| *Dyschoriste* | *oblongifolia* |  | Acanthaceae |
| *Echinochloa* | *paludigena* |  | Poaceae |
| *Echinochloa* | *walteri* |  | Poaceae |
| *Echinochloa* | *colona* |  | Poaceae |
| *Eclipta* | *prostrata* |  | Asteraceae |
| *Eleocharis* | *baldwinii* |  | Cyperaceae |
| *Eleocharis* | *flavescens* |  | Cyperaceae |
| *Eleocharis* | *geniculata* |  | Cyperaceae |
| *Eleocharis* | *interstincta* |  | Cyperaceae |
| *Eleocharis* | *nigrescens* |  | Cyperaceae |
| *Eleocharis* | *cellulosa* |  | Cyperaceae |
| *Elephantopus* | *elatus* |  | Asteraceae |
| *Eleusine* | *indica* |  | Poaceae |
| *Elionurus* | *tripsacoides* |  | Poaceae |
| *Elytraria* | *caroliniensis* | var. *angustifolia* | Acanthaceae |
| *Emilia* | *fosbergii* |  | Asteraceae |
| *Emilia* | *sonchifolia* |  | Asteraceae |
| *Encyclia* | *tampensis* |  | Orchidaceae |
| *Equisetum* | *hyemale* |  | Equisetaceae |
| *Eragrostis* | *atrovirens* |  | Poaceae |
| *Eragrostis* | *ciliaris* |  | Poaceae |
| *Eragrostis* | *elliottii* |  | Poaceae |
| *Eragrostis* | *gangetica* |  | Poaceae |
| *Eragrostis* | *virginica* |  | Poaceae |
| *Erechtites* | *hieracifolius* |  | Asteraceae |
| *Eremochloa* | *ophiuroides* |  | Poaceae |
| *Erigeron* | *quercifolius* |  | Asteraceae |
| *Erigeron* | *vernus* |  | Asteraceae |
| *Eriocaulon* | *compressum* |  | Eriocaulaceae |
| *Eriocaulon* | *decangulare* |  | Eriocaulaceae |
| *Eriocaulon* | *ravenelii* |  | Eriocaulaceae |
| *Eriochloa* | *michauxii* | var. *michauxii* | Poaceae |
| *Eryngium* | *baldwinii* |  | Apiaceae |
| *Eryngium* | *yuccifolium* |  | Apiaceae |
| *Erythrina* | *herbacea* |  | Fabaceae |
| *Eugenia* | *uniflora* |  | Myrtaceae |
| *Eulophia* | *alta* |  | Orchidaceae |
| *Eupatorium* | *capillifolium* |  | Asteraceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Eupatorium* | *leptophyllum* |  | Asteraceae |
| *Eupatorium* | *mikanioides* |  | Asteraceae |
| *Eupatorium* | *mohrii* |  | Asteraceae |
| *Eupatorium* | *serotinum* |  | Asteraceae |
| *Euphorbia* | *polyphylla* |  | Euphorbiaceae |
| *Euphorbia* | *pubentissima* |  | Euphorbiaceae |
| *Eustachys* | *glauca* |  | Poaceae |
| *Eustachys* | *petraea* |  | Poaceae |
| *Euthamia* | *minor* |  | Asteraceae |
| *Evolvulus* | *sericeus* |  | Convolvulaceae |
| *Ficus* | *aurea* |  | Moraceae |
| *Ficus* | *citrifolia* |  | Moraceae |
| *Fimbristylis* | *autumnalis* |  | Cyperaceae |
| *Fimbristylis* | *cymosa* |  | Cyperaceae |
| *Fimbristylis* | *dichotoma* |  | Cyperaceae |
| *Fimbristylis* | *puberula* |  | Cyperaceae |
| *Fimbristylis* | *schoenoides* |  | Cyperaceae |
| *Fimbristylis* | *spadicea* |  | Cyperaceae |
| *Fuirena* | *breviseta* |  | Cyperaceae |
| *Fuirena* | *pumila* |  | Cyperaceae |
| *Fuirena* | *scirpoidea* |  | Cyperaceae |
| *Galactia* | *elliottii* |  | Fabaceae |
| *Galactia* | *regularis* |  | Fabaceae |
| *Galium* | *tinctorium* |  | Rubiaceae |
| *Gaura* | *angustifolia* |  | Onagraceae |
| *Geranium* | *carolinianum* |  | Geraniaceae |
| *Gnaphalium* | *falcatum* |  | Asteraceae |
| *Gnaphalium* | *pensylvanicum* |  | Asteraceae |
| *Gnaphalium* | *obtusifolium* |  | Asteraceae |
| *Gomphrena* | *serrata* |  | Amaranthaceae |
| *Gratiola* | *ramosa* |  | Scrophulariaceae |
| *Gratiola* | *hispida* |  | Scrophulariaceae |
| *Habenaria* | *quinqueseta* |  | Orchidaceae |
| *Habenaria* | *floribunda* |  | Orchidaceae |
| *Harrisella* | *porrecta* |  | Orchidaceae |
| *Hedyotis* | *corymbosa* |  | Rubiaceae |
| *Hedyotis* | *procumbens* |  | Rubiaceae |
| *Helenium* | *pinnatifidum* |  | Asteraceae |
| *Helianthus* | *debilis* | *debilis* | Asteraceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Heliotropium* | *polyphyllum* |  | Boraginaceae |
| *Hemarthria* | *altissima* |  | Poaceae |
| *Heterotheca* | *subaxillaris* |  | Asteraceae |
| *Hieracium* | *megacephalon* |  | Asteraceae |
| *Hydrilla* | *verticillata* |  | Hydrocharitaceae |
| *Hydrocotlye* | *umbellata* |  | Apiaceae |
| *Hydrolea* | *corymbosa* |  | Hydroleaceae |
| *Hymenachne* | *amplexicaulis* |  | Poaceae |
| *Hypericum* | *cistifolium* |  | Hypericaceae |
| *Hypericum* | *fasciculatum* |  | Hypericaceae |
| *Hypericum* | *gentianoides* |  | Hypericaceae |
| *Hypericum* | *hypericoides* |  | Hypericaceae |
| *Hypericum* | *mutilum* |  | Hypericaceae |
| *Hypericum* | *reductum* |  | Hypericaceae |
| *Hypericum* | *tetrapetalum* |  | Hypericaceae |
| *Hypoxis* | *juncea* |  | Amarylidaceae |
| *Hyptis* | *alata* |  | Lamiaceae |
| *Ilex* | *cassine* |  | Aquifoliaceae |
| *Ilex* | *glabra* |  | Aquifoliaceae |
| *Indigofera* | *hirsuta* |  | Fabaceae |
| *Indigofera* | *spicata* |  | Fabaceae |
| *Ipomoea* | *quamoclit* |  | Convoluvlaceae |
| *Ipomoea* | *sagittata* |  | Convoluvlaceae |
| *Ipomoea* | *triloba* |  | Convolvulaceae |
| *Ipomoea* | *hederifolia* |  | Convolvulaceae |
| *Iresine* | *diffusa* |  | Amaranthaceae |
| *Iris* | *hexagona* |  | Iridaceae |
| *Iva* | *microcephala* |  | Asteraceae |
| *Juncus* | *effusus* | subsp. *solutus* | Juncaceae |
| *Juncus* | *marginatus* |  | Juncaceae |
| *Juncus* | *megacephalus* |  | Juncaceae |
| *Juncus* | *polycephalos* |  | Juncaceae |
| *Juncus* | *repens* |  | Juncaceae |
| *Juncus* | *scirpoides* |  | Juncaceae |
| *Kyllinga* | *brevifolia* |  | Cyperaceae |
| *Kyllinga* | *hyalina* |  | Cyperaceae |
| *Kyllinga* | *odorata* | *cyperus sesquifolia* | Cyperaceae |
| *Lachnanthes* | *caroliana* |  | Haemodoraceae |
| *Lachnocaulon* | *anceps* |  | Eriocaulaceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Lantana* | *camara* |  | Verbenaceae |
| *Lechea* | *torreyi* |  | Cistaceae |
| *Leersia* | *hexandra* |  | Poaceae |
| *Lemna* | *aequinoctialis* |  | Lemnaceae |
| *Lepidium* | *virginicum* |  | Brassicaceae |
| *Leptochloa* | *fusca* | subs. *fascicularis* | Poaceae |
| *Leptochloa* | *virgata* |  | Poaceae |
| *Leucaena* | *leucocephala* |  | Fabaceae |
| *Liatris* | *garberi* |  | Asteraceae |
| *Liatris* | *gracilis* |  | Asteraceae |
| *Liatris* | *tenuifolia* |  | Asteraceae |
| *Licania* | *michauxii* |  | Chrysobalanaceae |
| *Lilium* | *catesbaei* |  | Liliaceae |
| *Linaria* | *canadensis* |  | Scrophulariaceae |
| *Lindernia* | *crustacea* |  | Scrophulariaceae |
| *Lindernia* | *dubia* | var. *anagallidea* | Scrophulariaceae |
| *Lindernia* | *grandiflora* |  | Scrophulariaceae |
| *Linum* | *medium* |  | Linaceae |
| *Lipocarpha* | *aristulata* |  | Cyperaceae |
| *Lipocarpha* | *maculata* |  | Cyperaceae |
| *Lipocarpha* | *micrantha* |  | Cyperaceae |
| *Lobelia* | *feayana* |  | Lobeliaceae |
| *Lobelia* | *glandulosa* |  | Lobeliaceae |
| *Lobelia* | *paludosa* |  | Lobeliaceae |
| *Ludwigia* | *erecta* |  | Onagraceae |
| *Ludwigia* | *maritima* |  | Onagraceae |
| *Ludwigia* | *microcarpa* |  | Onagraceae |
| *Ludwigia* | *octovalvis* |  | Onagraceae |
| *Ludwigia* | *peruviana* |  | Onagraceae |
| *Ludwigia* | *repens* |  | Onagraceae |
| *Ludwigia* | *linifolia* |  | Onagraceae |
| *Ludwigia* | *curtissii* |  | Onagraceae |
| *Lycopus* | *rubellus* |  | Lamiaceae |
| *Lygodesmia* | *aphylla* |  | Asteraceae |
| *Lygodium* | *microphyllum* |  | Schizaeaceae |
| *Lyonia* | *fruticosa* |  | Ericaceae |
| *Lythrum* | *alatum* |  | Lythraceae |
| *Macroptilium* | *lathyroides* |  | Fabaceae |
| *Macrothelypteris* | *torresiana* |  | Thelypteridaceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Malvastrum* | *corchorifolium* |  | Malvaceae |
| *Manisuris* | *rugosa* |  | Poaceae |
| *Mecardonia* | *acuminata* | subsp.*peninsularis* | Scrophulariaceae |
| *Medicago* | *lupulina* |  | Fabaceae |
| *Melaleuca* | *quinquenervia* |  | Myrtaceae |
| *Melanthera* | *nivea* |  | Asteraceae |
| *Melilotus* | *albus* |  | Fabaceae |
| *Melochia* | *spicata* |  | Sterculiaceae |
| *Melothria* | *pendula* |  | Cucurbitaceae |
| *Micranthemum* | *glomeratum* |  | Scrophulariaceae |
| *Mikania* | *scandens* |  | Asteraceae |
| *Mitreloa* | *petiolata* |  | Loganiaceae |
| *Mitreola* | *sessilifolia* |  | Loganiaceae |
| *Mollugo* | *verticillata* |  | Molluginaceae |
| *Momordica* | *charantia* |  | Cucurbitaceae |
| *Muhlenbergia* | *capillaris* | var. *filipes* | Poaceae |
| *Murdannia* | *nudiflora* |  | Commelinaceae |
| *Murdannia* | *spirata* |  | Commelinaceae |
| *Myrica* | *cerifera* |  | Myricaceae |
| *Najas* | *guadalupensis* |  | Najadaceae |
| *Nephrolepis* | *cordifolia* |  | Nephrolepidaceae |
| *Nephrolepis* | *exaltata* |  | Nephrolepidaceae |
| *Nephrolepis* | *multiflora* |  | Nephrolepidaceae |
| *Neptunia* | *pubescens* |  | Fabaceae |
| *Nymphaea* | *elegans* |  | Nymphaeaceae |
| *Nymphoides* | *aquatica* |  | Gentianaceae |
| *Oeceoclades* | *maculata* |  | Orchidaceae |
| *Oenothera* | *laciniata* |  | Onagraceae |
| *Oldenlandia* | *uniflora* |  | Rubiaceae |
| *Osmunda* | *regalis* |  | Osmundaceae |
| *Oxalis* | *corniculata* |  | Oxalidaceae |
| *Oxypolis* | *filiformis* |  | Apiaceae |
| *Panicum* | *dichotomiflorum* | var. *bartowense* | Poaceae |
| *Panicum* | *hemitomon* |  | Poaceae |
| *Panicum* | *hians* |  | Poaceae |
| *Panicum* | *maximum* |  | Poaceae |
| *Panicum* | *repens* |  | Poaceae |
| *Panicum* | *rigidulum* |  | Poaceae |
| *Panicum* | *tenerum* |  | Poaceae |
| *Panicum* | *virgatum* |  | Poaceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Panicum* | *anceps* |  | Poaceae |
| *Parietaria* | *floridana* |  | Urticaceae |
| *Parthenium* | *hysterophorus* |  | Asteraceae |
| *Parthenocissus* | *quinquefolia* |  | Vitaceae |
| *Paspalidium* | *geminatum* |  | Poaceae |
| *Paspalum* | *conjugatum* |  | Poaceae |
| *Paspalum* | *floridanum* |  | Poaceae |
| *Paspalum* | *monostachyum* |  | Poaceae |
| *Paspalum* | *nicorae* |  | Poaceae |
| *Paspalum* | *notatum* | var. *notatum* | Poaceae |
| *Paspalum* | *repens* |  | Poaceae |
| *Paspalum* | *setaceum* | var. *ciliatifolium* | Poaceae |
| *Paspalum* | *setaceum* | var. *supinum* | Poaceae |
| *Paspalum* | *urvillei* |  | Poaceae |
| *Paspalum* | *vaginatum* |  | Poaceae |
| *Passiflora* | *suberosa* |  | Passifloraceae |
| *Pectis* | *glaucescens* |  | Asteraceae |
| *Pectis* | *prostrata* |  | Asteraceae |
| *Persea* | *palustris* |  | Lauraceae |
| *Phlebodium* | *aureum* |  | Polypodiaceae |
| *Phragmites* | *australis* |  | Poaceae |
| *Phyla* | *nodiflora* |  | Verbenaceae |
| *Phyllanthus* | *caroliniensis* | *saxicola* | Euphorbiaceae |
| *Phyllanthus* | *urinaria* |  | Euphorbiaceae |
| *Physalis* | *angulata* |  | Solanaceae |
| *Physalis* | *arenicola* |  | Solanaceae |
| *Physalis* | *walteri* |  | Solanaceae |
| *Physostegia* | *purpurea* |  | Scrophulariaceae |
| *Phytolacca* | *americana* |  | Phytolaccaceae |
| *Pilea* | *microphylla* |  | Urticaceae |
| *Piloblephis* | *rigida* |  | Lamiaceae |
| *Pinguicula* | *pumila* |  | Lentibulariaceae |
| *Pinus* | *elliottii* |  | Pinaceae |
| *Piriqueta* | *cistoides* |  | Turneraceae |
| *Pityopsis* | *graminifolia* |  | Asteraceae |
| *Plantago* | *virginica* |  | Plantaginaceae |
| *Pleopeltis* | *polypodiodes* |  | Polypodiaceae |
| *Pluchea* | *carolinensis* |  | Asteraceae |
| *Pluchea* | *odorata* |  | Asteraceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Pluchea* | *rosea* |  | Asteraceae |
| *Poinsettia* | *heterophylla* |  | Euphorbiaceae |
| *Polygala* | *balduinii* |  | Polygalaceae |
| *Polygala* | *grandiflora* |  | Polygalaceae |
| *Polygala* | *lutea* |  | Polygalaceae |
| *Polygala* | *nana* |  | Polygalaceae |
| *Polygala* | *setacea* |  | Polygalaceae |
| *Polygonum* | *densiflorum* |  | Polygonaceae |
| *Polygonum* | *lapathifolium* |  | Polygonaceae |
| *Polygonum* | *punctatum* |  | Polygonaceae |
| *Polygonum* | *hydropiperoides* |  | Polygonaceae |
| *Polypremum* | *procumbens* |  | Buddlejaceae |
| *Pontederia* | *cordata* |  | Pontederiaceae |
| *Portulaca* | *amilis* |  | Portulacaceae |
| *Portulaca* | *oleracea* |  | Portulacaceae |
| *Portulaca* | *pilosa* |  | Portulacaceae |
| *Potamogeton* | *illinoensis* |  | Potamogetonaceae |
| *Proserpinaca* | *palustris* |  | Haloragaceae |
| *Proserpinaca* | *pectinata* |  | Haloragaceae |
| *Psilocarya* | *nitens* |  |  |
| *Psilotum* | *nudum* |  | Psilotaceae |
| *Pteridium* | *aquilinum* | var. *caudatum* | Dennstaedtiaceae |
| *Pteridium* | *aquilinum* | var. *pseudocaudatum* | Dennstaedtiaceae |
| *Pteris* | *tripartita* |  | Pteridaceae |
| *Pteris* | *vitattata* |  | Pteridaceae |
| *Pterocaulon* | *pycnostachyum* |  | Asteraceae |
| *Ptilimnium* | *capillaceum* |  | Apiaceae |
| *Quercus* | *laurifolia*  *sensu lato* |  | Fagaceae |
| *Quercus* | *minima* |  | Fagaceae |
| *Quercus* | *virginiana* |  | Fagaceae |
| *Rapanea* | *punctata* |  | Myrsinaceae |
| *Rhexia* | *mariana* |  | Melastomataceae |
| *Rhodomyrtus* | *tomentosa* |  | Myrtaceae |
| *Rhus* | *copallinum* |  | Anacardiaceae |
| *Rhynchelytrum* | *repens* |  | Poaceae |
| *Rhynchospora* | *corniculata* |  | Cyperaceae |
| *Rhynchospora* | *divergens* |  | Cyperaceae |
| *Rhynchospora* | *fascicularis* |  | Cyperaceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Rhynchospora* | *fernaldii* |  | Cyperaceae |
| *Rhynchospora* | *filifolia* |  | Cyperaceae |
| *Rhynchospora* | *globularis* | var. *globularis* | Cyperaceae |
| *Rhynchospora* | *inundata* |  | Cyperaceae |
| *Rhynchospora* | *microcarpa* |  | Cyperaceae |
| *Rhynchospora* | *odorata* |  | Cyperaceae |
| *Rhynchospora* | *plumosa* |  | Cyperaceae |
| *Rhynchospora* | *tracyi* |  | Cyperaceae |
| *Richardia* | *brasiliensis* |  | Rubiaceae |
| *Richardia* | *grandiflora* |  | Rubiaceae |
| *Ricinus* | *communis* |  | Euphorbiaceae |
| *Rorippa* | *teres* |  | Brassicaceae |
| *Rotala* | *ramosior* |  | Lythraceae |
| *Rubus* | *trivialis* |  | Rosaceae |
| *Rudbeckia* | *hirta* | var. *angustifolia* | Asteraceae |
| *Rumex* | *obovatus* |  | Polygonaceae |
| *Sabal* | *palmetto* |  | Arecaceae |
| *Sabatia* | *bartramii* |  | Gentianaceae |
| *Sabatia* | *brevifolia* |  | Gentianaceae |
| *Sabatia* | *grandiflora* |  | Gentianaceae |
| *Sabatia* | *stellaris* |  | Gentianaceae |
| *Sabatia* | *stellaris* | white flrd. forma | Gentianaceae |
| *Saccharum* | *gigantium* |  | Poaceae |
| *Sacciolepis* | *indica* |  | Poaceae |
| *Sacciolepis* | *striata* |  | Poaceae |
| *Sagittaria* | *graminea* | var. *chapmanii* | Alismataceae |
| *Sagittaria* | *lancifolia* |  | Alismataceae |
| *Salix* | *caroliniana* |  | Salicaceae |
| *Salvia* | *misella* |  | Lamiaceae |
| *Salvinia* | *minima* |  | Salviniaceae |
| *Samolus* | *ebracteatus* |  | Primulaceae |
| *Samolus* | *floribundus* |  | Primulaceae |
| *Sarcostemma* | *clausum* |  | Asclepiadaceae |
| *Schinus* | *terebinthifolius* |  | Anacardiaceae |
| *Schizachyrium* | *scoparium* |  | Poaceae |
| *Schoenus* | *nigricans* |  | Cyperaceae |
| *Scirpus* | *validus* |  | Cyperaceae |
| *Scleria* | *baldwinii* |  | Cyperaceae |
| *Scleria* | *ciliata* | var. *ciliata* | Cyperaceae |
| *Scleria* | *ciliata* | var. *curtissii* | Cyperaceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Scleria* | *distans* |  | Cyperaceae |
| *Scleria* | *georgiana* |  | Cyperaceae |
| *Scleria* | *reticularis* |  | Cyperaceae |
| *Scleria* | *verticillata* |  | Cyperaceae |
| *Scoparia* | *dulcis* |  | Veronicaceae |
| *Senecio* | *glabellus* |  | Asteraceae |
| *Senna* | *obtusifolia* |  | Fabaceae |
| *Senna* | *occidentalis* |  | Fabaceae |
| *Serenoa* | *repens* |  | Arecaceae |
| *Sesbania* | *herbacea* |  | Fabaceae |
| *Setaria* | *parviflora* |  | Poaceae |
| *Sida* | *acuta* |  | Malvaceae |
| *Sida* | *rhombifolia* |  | Malvaceae |
| *Sideroxylon* | *reclinatum* |  | Sapotaceae |
| *Sisyrinchium* | *nashii* |  | Iridaceae |
| *Smilax* | *auriculata* |  | Smilacaceae |
| *Smilax* | *bona-nox* |  | Smilacaceae |
| *Smilax* | *laurifolia* |  | Smilacaceae |
| *Solanum* | *americanum* |  | Solanaceae |
| *Solanum* | *viarum* |  | Solanaceae |
| *Solidago* | *fistulosa* |  | Asteraceae |
| *Solidago* | *leavenworthii* |  | Asteraceae |
| *Solidago* | *odora* |  | Asteraceae |
| *Solidago* | *sempervirens* |  | Asteraceae |
| *Solidago* | *stricta* |  | Asteraceae |
| *Sonchus* | *asper* |  | Asteraceae |
| *Sonchus* | *oleraceus* |  | Asteraceae |
| *Sorghastrum* | *secundum* |  | Poaceae |
| *Spermacoce* | *assurgens* |  | Rubiaceae |
| *Spermacoce* | *verticillata* |  | Rubiaceae |
| *Spigelia* | *anthelmia* |  | Strychnaceae |
| *Spiranthes* | *praecox* |  | Orchidaceae |
| *Spiranthes* | *torta* |  | Orchidaceae |
| *Spiranthes* | *vernalis* |  | Orchidaceae |
| *Spiranthes* | *odorata* |  | Orchidaceae |
| *Spirodela* | *polyrhiza* |  | Lemnaceae |
| *Sporobolus* | *indicus* |  | Poaceae |
| *Sporobolus* | *junceus* |  | Poaceae |
| *Stachytarpheta* | *urticifolia* |  | Verbenaceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Stillingia* | *aquatica* | forma with red inflorescences | Euphorbiaceae |
| *Stillingia* | *aquatica* |  | Euphorbiaceae |
| *Stillingia* | *sylvatica* |  | Euphorbiaceae |
| *Stylosanthes* | *biflora* |  | Fabaceae |
| *Syngonanthus* | *flavidulus* |  | Eriocaulaceae |
| *Taxodium* | *distichum*  *sensu lato* |  | Taxodiaceae |
| *Thalia* | *geniculata* |  | Marantaceae |
| *Thelypteris* | *dentata* |  | Thelypteridaceae |
| *Thelypteris* | *kunthii* |  | Thelypteridaceae |
| *Thelypteris* | *palustris* |  | Thelypteridaceae |
| *Tillandsia* | *balbisiana* |  | Bromeliaceae |
| *Tillandsia* | *fasciculata* |  | Bromeliaceae |
| *Tillandsia* | *paucifolia* |  | Bromeliaceae |
| *Tillandsia* | *recurvata* |  | Bromeliaceae |
| *Tillandsia* | *setacea* |  | Bromeliaceae |
| *Tillandsia* | *usneoides* |  | Bromeliaceae |
| *Toxicodendron* | *radicans* |  | Anacardiaceae |
| *Tridax* | *procumbens* |  | Asteraceae |
| *Triphora* | *gentianoides* |  | Orchidaceae |
| *Typha* | *domingensis* |  | Typhaceae |
| *Urena* | *lobata* |  | Malvaceae |
| *Urochloa* | *ramosa* |  | Poaceae |
| *Urochloa* | *subquadripara, distachya* |  | Poaceae |
| *Urtica* | *chamaedryoides* |  | Urticaceae |
| *Utricularia* | *cornuta* |  | Lentibulariaceae |
| *Utricularia* | *foliosa* |  | Lentibulariaceae |
| *Utricularia* | *gibba* |  | Lentibulariaceae |
| *Utricularia* | *inflata* |  | Lentibulariaceae |
| *Utricularia* | *purpurea* |  | Lentibulariaceae |
| *Utricularia* | *radiata* |  | Lentibulariaceae |
| *Utricularia* | *resupinata* |  | Lentibulariaceae |
| *Utricularia* | *simulans* |  | Lentibulariaceae |
| *Utricularia* | *subulata* |  | Lentibulariaceae |
| *Verbesina* | *virginica* |  | Asteraceae |
| *Vernonia* | *blodgettii* |  | Asteraceae |
| *Vernonia* | *cinerea* |  | Asteraceae |
| *Vicia* | *acutifolia* |  | Fabaceae |
| GENUS | SPECIES | FOR-SUBS-VAR | FAMILY |
| *Vigna* | *luteola* |  | Fabaceae |
| *Viola* | *lanceolata* |  | Violaceae |
| *Vitis* | *cinerea* |  | Vitaceae |
| *Vitis* | *rotundifolia* |  | Vitaceae |
| *Vitis* | *shuttleworthii* |  | Vitaceae |
| *Vittaria* | *lineata* |  | Vittariaceae |
| *Waltheria* | *indica* |  | Sterculiaceae |
| *Wedelia* | *trilobata* |  | Asteraceae |
| *Woodwardia* | *virginica* |  | Blechnaceae |
| *Xyris* | *caroliniana* |  | Xyridaceae |
| *Xyris* | *elliottii* |  | Xyridaceae |
| *Xyris* | *longisepala* |  | Xyridaceae |
| *Youngia* | *japonica* |  | Asteraceae |
| *Zamia* | sp. |  | Zamiaceae |
| *Zephyranthes* | *simpsonii* |  | Amaryllidaceae |
| *Zeuxine* | *strateumatica* |  | Orchidaceae |
| *Sacoila* | *lanceolata* | *lanceolata* | Orchidaceae |
| *Dichanthelium* | *ensifolium* | var. *unciphyllum* | Poaceae |
| *Rhexia* | *cubensis* |  | Melastomataceae |

In addition, from Will Sanders collections on campus, including the community-based *Fungus Foray* project:

Fungal species:

*Boletellus ananas*

*Boletus rubricitrinus*

*Clathrus ruber*

*Cyathus stercorius*

*Lentinus crinitus*

*Pisolithus tinctorius*

*Phylloporous rhodoxanthus*

*Pycnoporous cinnabarinus*

*Tremella fuciformis*

*Tremellodendron sp.*

Appendix C – Wildlife List

This is a preliminary list that is under development. These species have been identified through a variety of course and student projects, and through the Wildlife Club’s FGCU Campus Wildlife Project on inaturalist.org (<http://www.inaturalist.org/projects/fgcu-campus-wildlife>). One priority for next year is more focused efforts to consolidate all of the animal species lists. Many taxa have not been identified down to species level. Listed or protected species are identified in bold. Each taxa category has a separate section for exotics.

***Invertebrates***

Grass shrimp Ostrocoda, Cyprididae

Everglades crayfish (*Procambarus alleni)*

Pond snails Limnaeidae

Regal Darner (Coryphaeschna ingens)

Halloween Pennant (Celithemis eponina)

Damselfly *Ischnura* sp.

Water beetle (*Hydrocanthus oblongus)*

Water scorpion (*Ranatra* sp.)

Water strider Gerridae

Water bugs (*Belostoma* sp.)

Midge larvae Chironomidae

Eastern Lubber Grasshopper (Romalea microptera)

Polydamas Swallowtail (Battus polydamas)

Cloudless Sulphur (Phoebis sennae)

Orange-barred Sulphur (Phoebis philea)

Cassius Blue (Leptotes cassius)

Gulf Fritillary (Agraulis vanillae)

Zebra Heliconian (Heliconius charitonius)

Monarch (Danaus plexippus)

White Peacock (Anartia jatrophae)

Queen (Danaus gilippus)

Streaked Sphinx (*Protambulyx strigilis)*

Banded Sphinx (*Eumorpha fasciatus)*

Green Lynx Spider (*Peucetia viridans*)

Spotted Orbweaver (*Neoscona crucifera*)

Whitebanded Crab Spider (*Misumenoides formosipes*)

Arrowshaped Micrathena (*Micrathena sagittata*)

Gray Wall Jumper (*Menemerus bivittatus*)

Orchard Orbweaver ([*Leucauge venusta)*](http://www.spiders.us/species/leucauge-venusta/) [Southern Black Widow](http://www.spiders.us/species/latrodectus-mactans/) (*Latrodectus mactans)* [Carolina Wolf Spider](http://www.spiders.us/species/hogna-carolinensis/) (*Hogna carolinensis)* [Six-spotted Fishing Spider](http://www.spiders.us/species/dolomedes-triton/) (*Dolomedes triton)* [Dark Fishing Spider](http://www.spiders.us/species/dolomedes-tenebrosus/) (*Dolomedes tenebrosus*)

**Exotic:**

Zebra jumping spider (*Salticus scenicus*)

New Guinea flatworm (Platydemus manokwari)

European honey bee (*Apis mellifera*)

Yellow-banded millipede (Anadenobolus monilicornis)

**Fish**

Largemouth Bass (*Micropterus salmoides*)

Bluegill (*Lepomis macrochirus*)

Eastern Mosquitofish (*Gambusia holbrooki)*

Sailfin molly (*Poecilia latipinna)*

Least killifish (*Heterandria formosa)*

Golden top minnow (*Fundulus chrysotus)*

Florida flagfish (*Jordanella floridae)*

Florida gar (*Lepisosteus platyrhyncus)*

Spotted sunfish (*Lepomis punctatus)*

Warmouth (*Lepomis gulosus)*

**Exotics:**

Grass carp (*Ctenopharyngodon idella)*

Silver Tilapia (*Oreochromis niloticus)*

Spotted tilapia (Tiliapia mariae)

Walking catfish (*Clarias batrachus)*

Brown hoplo (*Hoplosternum littorale)*

Jewel Cichlid (*Hemichromis bimaculatus)*

**Birds**

Wild Turkey (*Meleagris gallopavo*)

Mottled Duck (*Anas fulvigula*)

Double-crested Cormorant (*Phalacrocorax auritus*)

Anhinga (*Anhinga anhinga*)

Pied-billed Grebe (*Podilymbus podiceps*)

Great Blue Heron (*Ardea herodias*)

Great Egret (*Ardea alba*)

Snowy Egret (*Egretta thula)*

Little Blue Heron (*Egretta caerulea*)

Tricolored Heron (*Egretta tricolor*)

Green Heron (*Butorides striatus*)

White Ibis (*Eudocimus albus*)

**Wood Stork (*Mycteria americana*)**

American Bittern (*Botaurus lentiginosus*)

Turkey Vulture (*Cathartes aura*)

Black Vulture (*Coragyps atratus*)

Osprey (*Pandion haliaetus*)

Swallow-tailed Kite (*Elanoides forficatus*)

**Peregrine Falcon (*Falco peregrinus*)**

**Snail Kite (*Rostrhamus sociabilis*)**

**Bald Eagle (*Haliaeetus leucocephalus*)**

Red-shouldered Hawk (*Buteo lineatus*)

Red-tailed Hawk (*Buteo jamaicensis*)

American Kestrel (*Falco sparvarius*)

Eastern Screech-Owl (*Megascops asio*)

Great Horned Owl (*Bubo virginianus*)

Barred Owl (*Strix varia*)

Purple Gallinule (*Porphyrio martinica*)

Common Moorhen (*Gallinula chloropus*)

Killdeer (*Charadrius vociferus*)

Mourning Dove (*Zenaida macroura*)

Common Ground-Dove (*Columbina passerina*)

Common Nighthawk (*Chordeiles minor*)

Chuck-will’s-widow (*Caprimulgus carolinensis*)

Belted Kingfisher (*Megaceryle alcyon*)

Red-headed Woodpecker (*Melanerpes erythrocephalus*)

Red-bellied Woodpecker (*Melanerpes carolinus*)

Downy Woodpecker (*Picoides pubescens*)

Hairy Woodpecker (*Picoides villosus*)

Northern Flicker (*Colaptes auratus*)

Pileated Woodpecker (*Dryocopus pileatus*)

Eastern Phoebe (*Sayornis phoebe*

Great Crested Flycatcher (*Myiarchus crinitus*)

Loggerhead Shrike (*Lanius ludovicianus*)

Blue Jay (*Cyanocitta cristata*)

American Crow (*Corvus brachyrhynchos*)

Fish Crow (Corvus ossifragus)

Purple Martin (*Progne subis*)

Tree Swallow (*Tachycineta bicolor*)

Carolina Wren (*Thryothorus ludovicianus*)

Blue-gray Gnatcatcher (*Polioptila caerulea*)

Eastern Phoebe (Sayornis phoebe)

Eastern Bluebird (*Sialia sialis*)

American Robin (*Turdus migratorius*)

Gray Catbird (*Dumetella carolinensis*)

Northern Mockinbird (*Mimus polyglottos*)

Brown Thrasher (*Toxostoma rufum*)

Cedar Waxwing (*Bombycilla cedrorum*)

Yellow-rumped Warbler (*Dendroica coronata*)

Palm Warbler (*Dendroica palmarum*)

Common Yellowthroat (Geothlypis trichas)

Northern Cardinal (*Cardinalis cardinalis*)

Red-winged Blackbird (*Agelaius phoeniceus*)

Brown-headed Cowbird (*Molothrus ater*)

Common Grackle (*Quiscalus quiscula*)

**Exotic:**

Cattle Egret (*Bulbulcus ibis*)

European Starling (*Sturnus vulgaris*)

**Herpetofauna**

**Amphibians**

Green treefrog (*Hyla cinerea)*

Squirrel treefrog (*Hyla squirella)*

Pine Woods Tree Frog (*Hyla femoralis)*

Pig frog (*Rana grylio)*

Bull frog (*Rana catesbeiana)*

Southern Leopard frog (*Rana sphenocephala)*

Southern Cricket frog (*Acris gryllus)*

Eastern Narrow-mouth toad (*Gastrophryne carolinensis)*

Oak toad (*Bufo quercicus)*

Southern toad (*Bufo terrestris)*

Pennisula newt (*Notophthalmus viridescens)*

Greater siren (*Siren lacertian)*

Two-toed amphiuma (*Amphiuma means)*

**Reptiles**

Green anole (*Anolis caroliniana)*

Southeastern five-lined skink (Plestiodon inexpectatus)

Black racer (*Coluber constrictor)*

Florida bandedwater snake (*Nerodia fasciata pictiventris)*

Green water snake (*Nerodia floridana)*

Eastern diamondback (*Crotalus adamanteus)*

Eastern Mud snake (*Farancia abacura)*

Ringneck Snake (*Diadophis punctatus)*

Corn snake (*Pantherophis guttatus*)

Yellow rat snake ([*Pantherophis alleghaniensis*](https://www.floridamuseum.ufl.edu/herpetology/fl-snakes/list/pantherophis-alleghaniensis/)*)*

Scarlet snake (*Cemophora coccinea*)

Scarlet knigsnake (Lampropeltis elapsoides)

Common Garter Snake (Thamnophis sirtalis)

**American Alligator (*Alligator mississippiensis)***

**Gopher Tortoise (*Gopherus polyphemus*)**

Florida Box Turtle (*Terrapene carolina bauri*)

Striped mud turtle (*Kinosternon baurii)*

Florida redbelly turtle (*Pseudemys nelson)*

Florida Softshell Turtle (*Apalone ferox)*

Peninsular Cooter (*Pseudemys peninsularis*)

Pond Slider (*Trachemys scripta)*

**Exotics:**

Cuban treefrog (*Osteopilus septentrionalis)*

Greenhouse frog (*Eleuthrodactylus planirostris)*

Brown anole (*Anolis sagraei)*

Knight Anole (*Anolis equestris)*

Mediterranean House Gecko (*Hemidactylus turcicus*)

Brahminy blind snake (*Indotyphlops braminus*)

*Mammals*

Common Raccoon (*Procyon lotor)*

Nine-banded Armadillo (*Dasypus novemcinctus*)

**Florida Black Bear (*Ursus americanus floridanus*)**

**Florida Panther (*Puma concolor coryi*)**

River Otter (*Lontra canadensis*)

Bobcat (*Lynx rufus*)

White-tailed Deer (*Odocoileus virginianus*)

Human (*Homo sapiens*)

**Shermans’s fox squirrel (*Sciurus niger shermani*)**

Eastern Gray squirrel (*Sciurus carolinensis)*

Eastern cottontail (*Sylvilagus floridanus)*

Marsh Rabbitt (Sylvilagus palustris)

Virginia opossum (*Didelphus marsupialis)*

Hispid cotton rat (*Sigmodon hispidus)*

Cotton mouse (*Peromyscus gossypinus*)

Southern short-tailed shrew (*Blarina carolinensis*)

**Exotics:**

Rats (*Rattus* sp.)

Feral hog (*Sus scrofa)*

Coyote (Canis latrans)

Appendix D – Research and Presentations

(undergraduate co-authors in **bold**)

Publications

Everham III, E.M., D.W. Ceilley, D.A. Croshaw, **J. Firth**, C.W. Gunnels IV, D.D. Hanson**, S. Mariolan**, R.J. Spear, B. Thomas, D.E. Van Norman, **B.M. Whitmore**, and J.R. Cassani. 2013.Ten Years of the Southwest Florida Frog Monitoring Network: Natural Variation and Human-driven Changes. *Florida Scientist.*  76(2): 138-149.

<http://www.frogwatch.net/Files/10year%20summary%20Everham.pdf>

Pieterson, E.C., L.M. Addison, J.N. Agobian, B. Brooks-Solveson, J. Cassani, and E.M. Everham III. 2006. Five years of the southwest Florida frog monitoring network: changes in frog communities as an indicator of landscape change. *Florida Scientist.* 69(supple. 2): 117-126.

Brooks-Solveson, B., M.G. Brown, M.K. Cassani, E.M. Everham III, **T. Matonis**, and **C. White**. 2004. Impact of wildfire on wetland and upland habitats restored from invasion of *Melaleuca quinquenervia*. In P.J. Cannizzaro (ed.) Proceedings of the Thirty First Annual Conference on Ecosystems Restoration and Creation. Hillsborough Community College. Tampa, Florida.

Tolley, S.G., M.R. McDonald, E.M. Everham III, and M. Savarese. 2002. The Campus Ecosystem Model: Teaching Students Environmental Stewardship. *Journal of College Science Teaching*. 31(6): 364-369. <http://www.nsta.org/main/news/stories/college_science.php?news_story_ID=46684>

Presentations and posters

[Swamp Walks: Connecting People to the Landscape of Southwest Florida.](https://docs.wixstatic.com/ugd/252fd8_8442c60a60da46cdb707f9275c385573.pdf) Co-authored with B. Thomas. Charlotte Harbor Watershed Summit: Showcasing Our Accomplishments Punta Gorda, March 28-30, 2017

[Cross-curricular integration of the Florida Gulf Coast University campus as a living laboratory](https://docs.wixstatic.com/ugd/252fd8_359cbe49701e4331adb31cfbc22d6001.pdf). Oral presentation by Brian Bovard. Co-authors: M.I. Abercrombie, K. Byrne-Bailey, N. Creagan, D, A. Croshaw, R. E. Cross, N. E. Demers, E. M. Everham III, C. Evers, L. Frost, A. Goebel, C.W. Gunnels IV, J. Herman, R. Holtzclaw, J. Kakareka, S. Komisar, K. Lefevre, K. Leone, J. H. MacDonald, V. McConnell, J. Phillips, R. Pires, M. Savarese, H. Skaza-Acosta, B. Thomas, S.Thomas, S.G. Tolley, H. Urakawa, H. Urakawa, M. Voytek, H. Walsh-Haney 2017 Charlotte Harbor Watershed Summit: Showcasing Our Accomplishments. March 28-30, 2017. Punta Gorda, Florida.

FGCU Campus as a Living Laboratory. Co-presented with C.W. Gunnels IV. League of Environmental Educators in Florida. March 21, 2015 Spring Mini-conference. Archbold Field Station.

Ecological State of the Florida Gulf Coast University Campus 1994-2014. Edwin M. Everham III, invited presentation. Florida Native Plant Society Annual Meeting. May, 2014. Ft. Myers, Florida.

[Ecological State of the Florida Gulf Coast University Campus 1994-2014](https://www.youtube.com/watch?v=5bxoHQw7HnM). Oral presentation, Edwin M. Everham III. Charlotte Harbor Watershed Summit: Our Vision in Action.  March 25-27, 2014. Punta Gorda, Florida.

Bovard, B.D. 2011. Ecology of the leafless orchid, *Harrisella porrecta*: Where does it grow and why?. Florida Native Plant Society Oral Presentation. Naples, FL.

Bovard, B.D. 2011. Plant Ecological Research at FGCU and the Naples Botanical Garden: The Classroom, Undergraduate Research, and Graduate Research. Naples Botanical Garden Foundation Presentation. Naples, FL

Impacts of aeration on deep and shallow wet detention ponds southwest Florida. Oral presentation: T. Denison and E. M. Everham III. Co-authors: D.W. Ceilley and M. Lohr. StormCon: North American Surface Water Quality Conference. August 5, 2008. Orlando, Florida.

The Campus Ecosystem Model: A Framework for Campus-based Undergraduate Research. Co-authors: S.G. Tolley, J. Kakareka, and M. Savarese. Engagement in Undergraduate Research Symposium. University of Central Florida. September 26-27, 2008. Orlando, Florida.

Bovard, B.D. 2008. The Burning of Fossil Fuels: A Plant’s Perspective. The FGCU Focus the Nation Climate Change Teach-In. Fort Myers, FL.

Impact of wildfire on wetland and upland habitats restored from invasion of *Melaleuca quinquenervia*. Oral presentation E.M. Everham III. Co-authors: B. Brooks-Solveson, M.G. Brown, and M.K. Cassani. The Annual Conference on Ecosystems Restoration and Creation. Hillsborough Community College. October, 2004. Tampa, Florida.

Florida Gulf Coast University’s Campus Ecosystem Model: A framework of interdisciplinary learning.. Co-authored with: G. Tolley, M. Savarese, and J. Kakareka. 15th National Conference on Undergraduate Research, NCUR 2001. March 15, 2001. Lexington, Kentucky.

The Campus Ecosystem Model. Co-authored with Greg Tolley. 21st Annual Association for Integrative Studies Conference. September 30, 1999. Naperville, Illinois.

Anuran Community Changes in Southwest Florida Over Seventeen Years. Poster. M. Bonness, J. Cassani, D.W. Ceilley, J. Conrad, D.A. Croshaw, A. Cutler, **A. Elliott**, E.M. Everham III, C.W. Gunnels IV, **V. Fields**, S.B. Jackson, D. Kern, **K. Koszela, K. Secco**, A. Shaw, **M. Sleeper**, D. Van Norman, and M. Whitmer. 2017 FGCU Research Day. April 18, 2017.

[Sixteen years of the southwest Florida frog monitoring network](https://docs.wixstatic.com/ugd/252fd8_9d37085fc5944385a504688de3d380f3.pdf). Oral presentation by **K. Koszela**. Co-authors: M. Bonness, J. Cassani, D.W. Ceilley, J. Conrad, D.A. Croshaw, **A. Cutler, A. Elliott**, E.M. Everham III, C.W. Gunnels IV, **V. Fields**, S.B. Jackson, D. Kern**, K. Secco,** A. Shaw, **M. Sleeper**, D. Van Norman, and M. Whitmer. 2017 Charlotte Harbor Watershed Summit: Showcasing Our Accomplishments. March 28-30, 2017. Punta Gorda, Florida.

The impact of removal of *Melaleuca quinquenervia* on the growth of native trees: slash pine (*Pinus elliotii*) and pond cypress (*Taxodium ascendens*). Poster. **I. Sanchez, M. Da Costa, J.A. Shelton, V. Adams**, M.K. Cassani, G. Brown, E.M. Everham III. 2017 Charlotte Harbor Watershed Summit: Showcasing Our Accomplishments. March 28-30, 2017. Punta Gorda, Florida.

Changes in Anuran Populations and Communities in Southwest Florida over 17 years (2000-2016). Poster. **A. Elliot**, M. Bonness, J. Cassani, J. Conrad, D.A. Croshaw, **A. Cutler, A. DeBarr**. E.M. Everham III. **V. Fields,** C.W. Gunnels IV, S.B. Jackson, D. Kern, **K. Koszela, K. Secco**, A. Shaw, **M. Sleeper**, D. Van Norman, and M. Whitmer. FGCU Biodiversity Conference. March 7-10. 2017. Ft. Myers, Florida.

Preliminary results from the SWF Frogwatch database 2000-2016. **A. Cutler, A. Elliot, K. Koszela**, A. Shaw, **M. Sleeper**, M. Whitmer and W. Everham. Poster. Third Annual Corkscrew Watershed Science Forum. January 27, 2017.

Longterm forest growth plots in southwest Florida. Poster. **I. Sanchez, M. DaCosta, J.A. Selton, V. Adams**, and W. Everham. Third Annual Corkscrew Watershed Science Forum. January 27, 2017.

Ecological State of the FGCU Campus: 1996-2016. Poster. K. Lefevre and E,M, Everham III. University Colloquium Chatauqua, September 30, 2017. Ft. Myers, Florida.

Reconnecting students to the land through shelter building. Poster: co-author **T. Faatz.** Florida Gulf Coast University Research Day. April 18, 2014. Ft. Myers, Florida.

Florida Gulf Coast University Service Learning: Facilitating Undergraduate Environmental Community Projects in Southwest Florida. Co-authors: Rhea, J. Allman, P, Bovard, B., A. Chomey, J. Cudjoe, S. Davis, N. Demers, K. DeWelde, J. Drummond, A. Elgart, N. Foote, and D. Green. Charlotte Harbor Watershed Summit: Our Vision in Action.  March 25-27, 2014. Punta Gorda, Florida.

Ecological State of the Florida Gulf Coast University Campus 1994-2014. Florida Gulf Coast University Research Day. April 18, 2014. Ft. Myers, Florida

Ten Years of the southwest Florida Frog Monitoring Network: natural cycles and human-driven changes. Co-author: J. Cassini. Florida Gulf Coast University Research Day. April 21, 2011. Ft. Myers, Florida.

Establishment of a long-term study plot for old-field succession at the Buckingham Center, Florida Gulf Coast University. Co-authors: **Kiley Revel, Lindsay Castret, John Garafola, Lara Collier, Andrea Grace, Meghan Lauer, Arielle Taylor-Manges, Jonathan Maile, Scott Anderson, David Pittman, Drew Morris, Joan Firth**. Florida Gulf Coast University Research Day. April 21, 2011. Ft. Myers, Florida.

Water quality evaluation of the impacts of Best Management Practices on wet detention ponds in southwest Florida. Co-authors: T.J. Denison, M.L. Lohr, and D.W. Ceilley. Florida Gulf Coast University Research Day. April 21, 2011. Ft. Myers, Florida.

Initiating a baseline population study of the American Alligator (*Alligator mississippiensis*) on the Florida Gulf Coast University Campus. Co-authors: **S. Wilkinson and G. Kosik**. Florida Gulf Coast University Research Day. April 21, 2011. Ft. Myers, Florida.

Water quality evaluation of the impacts of aeration on wet detention ponds in southwest Florida. Co-authors: T.J. Denison, M.L .Lohr, and D.W. Ceilley. Charlotte Harbor Watershed Summit: State of Our Watersheds and Estuaries. March 30-31, 2011. Punta Gorda. Florida.

Ten years of the southwest Florida frog monitoring network: natural cycles and human-driven changes. Co-author: J. Csssani. Charlotte Harbor Watershed Summit: State of Our Watersheds and Estuaries. March 30-31, 2011. Punta Gorda. Florida.

Population genetic analysis reveals the lack of two distinct populations of *Melaleuca quinquenervia* on the East and West coasts of Florida. Co-authors: Cruz-Alvarez, **J. Duncan, J. Morgan, L. Tomasello, L. Valenzuela.** Florida Gulf Coast University Research Day. April 23, 2010. Ft. Myers, Florida.

How trails influence the prevalence of invasive species. Authors: **D. Shepard, J. Regelmann, O. Ochoa.** Florida Gulf Coast University Research Day. April 23, 2010. Ft. Myers, Florida

Differential Melaleuca Treatment Effects on Native Seedling Recovery. Authors: **K. Gazzo, K. Coykendall, M. Lauer, H.Tirpak**. Florida Gulf Coast University Research Day. April 23, 2010. Ft. Myers, Florida.

Impacts of differential *Melaleuca quinquenervia* removal on native tree growth in a pine upland to wetland ecotone at Florida Gulf Coast University. Authors: J. Ferlita, S. Jackson, J. Talbott, S. Funck, K. Ross. Florida Gulf Coast University Research Day. April 23, 2010. Ft. Myers, Florida.

A. Goebel, B. Bovard, and E. Everham III. 2009. Participation in Authentic Science: Research in the Classroom as a Teaching Tool. Undergraduate Research Conference, Orlando, FL.

Quantitative Water-use Comparison of an Invasive Tree Species, *Melaleuca quinquenervia*, and two Native Tree Species, *Taxodium distichum* and *Pinus elliottii*. Co-authors: **T. Knight**, **R. Leisure III**, B. Bovard. Florida Gulf Coast University Research Day. April 24, 2009. Ft. Myers, Florida.

*Melaleuca* research at Florida Gulf Coast University a multi-disciplined approach to understanding its impacts in SW Florida. Presentation by P. Julian. Co-authors: B. Bovard, B. Brooks, M. K. Cassani, D.W. Ceilley, M. Cruz-

Alvarez, N. Demers, A. Hartley, **T. Knight, R. Liesure III**, J. Burch, and M. Main. 13th Annual Exotic Species Workshop for Southwest Florida. Florida Gulf Coast University. December 2, 2008. Ft. Myers, Florida.

Water-use Comparison of the Invasive Tree Species, *Melaleuca quinquenervia*, and two Native Tree Species, *Taxodium distichum* and *Pinus elliottii*, in Southwest Florida. Co-authors: [**Knight, T. M.**](http://adsabs.harvard.edu/cgi-bin/author_form?author=Knight,+T&fullauthor=Knight,%20T.%20M.&charset=UTF-8&db_key=PHY)**;** [**Leisure, R. M**.](http://adsabs.harvard.edu/cgi-bin/author_form?author=Leisure,+R&fullauthor=Leisure,%20R.%20M.&charset=UTF-8&db_key=PHY) and [Bovard, B. D.](http://adsabs.harvard.edu/cgi-bin/author_form?author=Bovard,+B&fullauthor=Bovard,%20B.%20D.&charset=UTF-8&db_key=PHY) American Geophysical Union, Fall Meeting 2008, [abstract #B31A-0280](http://adsabs.harvard.edu/abs/2008AGUFM.B31A0280K)

Is Melaleuca really drying up Florida wetlands? Water use in *Melaeluca quinquenervia*, *Pinus elliottii*, and *Taxodium distichium*. Co-authors: B.D. Bovard, and **R.M. Liesure**. 6th Annual Florida Gulf Coast University Research Day. April 18, 2008. Ft. Myers, Florida

Is Melaleuca really drying up Florida wetlands? Water use in *Melaeluca quinquenervia*, *Pinus elliottii*, and *Taxodium distichium*. Co-authors: B.D. Bovard, and **R.M. Liesure**. Everglades Coalition Annual Conference. January 10, 2008. Captiva, Florida

Bovard, B.D. and W.B. Shoemaker. 2008. Bald Cypress Contributions to Total Evapotranspiration in a Dwarf Cypress Ecosystem in Big Cypress National Preserve. American Geophysical Union, Annual Meeting. San Francisco, CA.

Nutrient dynamics in human-created wetlands in southwest Florida. Co-author: **Jeff Key.** 4th Annual Florida Gulf Coast University Research Day. April 21, 2006. Ft. Myers, Florida.

Impacts of Hurricane Wilma on the Florida Gulf Coast University campus ecosystem. 4th Annual Florida Gulf Coast University Research Day. April 21, 2006. Ft. Myers, Florida.

Quantification of nutrient Dynamics in human-created wetlands in southwest Florida. Co-author: **Jeff Key**. Estero Bay Agency on Bay Management. Southwest Florida Regional Planning Council. April 4, 2006. Ft. Myers, Florida

Impact of Wildfire on *Melaleuca* Survival and recolonization in restored habitats. Co-authors: M.K. Cassani, B. Brooks-Solveson, M.G. Brown, **A. Matonis, C. White**. 3rd Annual Florida Gulf Coast University Research Day. April 22, 2005. Ft. Myers, Florida.

Analysis of a large data set from a citizen science frog monitoring program. Co-authors: E.C. Pieterson, L. Addison, J. Agobian, B. Brooks-Solveson. 3rd Annual Florida Gulf Coast University Research Day. April 22, 2005. Ft. Myers, Florida.

Adapting Restoration to Disturbance: Wildfire impacts on wetland and upland restoration and invasive exotic control. M.K. Cassani. Co-authors: B. Brooks-Solveson, M.G. Brown, **A. Matonis, C. White**, and E.M. Everham III. First National Conference on Ecosystem Restoration. December, 2004. Orlando, Florida..

The impact of the invasive exotic *Melaleuca quinquenervia* on the recruitment of native tree species. Poster, with M.K. Cassani, and B. Brooks-Solveson. 2nd Annual FGCU Research Symposium. April 25, 2003. Ft. Myers, Florida.

Dynamics of an exotic invaded south Florida forest: a long-term study plot of the Florida Gulf Coast University campus. Poster, with M.K. Cassani, and **H. Wegis**. 1st Annual FGCU Research Symposium. April 26, 2002. Ft. Myers, Florida.