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The Quarterly Journal of the Florida Native Plant Society

Palmetto

Bog Gardening with Carnivorous Plants • The Struggle with Cogongrass • Florida's Ranchlands

Keynote Speakers Announced for FNPS 29th Annual Conference

FNPS has two exciting keynote speakers lined up for the FNPS Annual Conference to be held May 21-24, 2009 in West Palm Beach.

Doug Tallamy, Ph.D.
Professor and Chair of Entomology and Wildlife Ecology, University of Delaware.

Dr. Tallamy has authored over 68 research articles and taught courses such as Insect Taxonomy, and Behavioral Ecology for 27 years. Chief among his research goals is to better understand the many ways insects interact with plants and how these interactions determine the diversity of animal communities. His book "*Bringing Nature Home; How Native Plants Sustain Wildlife in Our Gardens*" was published by Timber Press in 2007.

Daniel F. Austin, Ph.D.

Dan Austin is a Research Associate at the Arizona-Sonora Desert Museum in Tucson, Arizona, and at Fairchild Tropical Botanic Garden and Florida International University in Miami, Florida. He is Adjunct Professor in the Department of Plant Sciences at the University of Arizona, Tucson. He taught in the Florida State University System for 31 years, and is Emeritus Professor at Florida Atlantic University, Boca Raton. Dr. Austin has received four awards from the Florida Native Plant Society. His 324 publications include the monumental volume *Florida Ethnobotany*.

Florida Native Plant Society
29th Annual Conference
May 21-24, 2009
West Palm Beach Marriott

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Contact Stephanie Brown,
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Call for Scientific Papers and Posters

The Science Track of the 2009 Florida Native Plant Society Conference will include presented papers. Researchers are invited to submit abstracts of not more than 200 words related to native plants and plant communities of Florida on topics such as preservation, conservation, and restoration. Presentations will be 20 minutes in length.

Submit an MS Word file by email to: Paul A. Schmalzer – paul.a.schmalzer@nasa.gov by February 15, 2009. Include title, affiliation, and address. Indicate whether you plan to present a paper or a poster.

Palmetto is in need of articles on native plant species and related conservation topics, as well as high-quality botanical illustrations and photographs. Contact the editor for guidelines, deadlines and other information at pucpuggy@bellsouth.net, or visit www.fnps.org and follow the links to Publications/Palmetto.

The purpose of the Florida Native Plant Society is to preserve, conserve, and restore the native plants and native plant communities of Florida.

Official definition of native plant: For most purposes, the phrase *Florida native plant* refers to those species occurring within the state boundaries prior to European contact, according to the best available scientific and historical documentation. More specifically, it includes those species understood as indigenous, occurring in natural associations in habitats that existed prior to significant human impacts and alterations of the landscape.

Organization: Members are organized into regional chapters throughout Florida. Each chapter elects a Chapter Representative who serves as a voting member of the Board of Directors and is responsible for advocating the chapter's needs and objectives. See **www.fnps.org**.

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Palmetto

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ON THE COVER:
The soft pinkish flowers of the Gulf pitcher plant *(Sarracenia rosea)* are a diagnostic field mark. Photo by Gil Nelson.

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Editorial Content: We have a continuing interest in articles on specific native plant species and related conservation topics, as well as high-quality botanical illustrations and photographs. Contact the editor for submittal guidelines, deadlines and other information.

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Bog Gardening with Carnivorous Plants

By Gil Nelson

Top left: The little hooded pitcher plant (*Sarracenia minor*) is widespread in the Florida peninsula from about Lake Okeechobee northward to Jacksonville and the Big Bend. **Top right:** Yellow trumpet (*S. flava*) is one of the Panhandle's more common and showy pitcher plants. **Bottom left:** White-top pitcher plant (*S. leucophylla*) is most common in the western Panhandle and is distinguished by its attractive two-toned leaves. **Bottom right:** This small garden is built in a shallow prefabricated pond about 12 inches deep. All photos by Gil Nelson.

A thorough reading of McPherson's *Pitcher Plants of the Americas** – especially the relatively short chapter on horticulture and cultivation – is likely to enamor at least some readers with the prospect of growing these plants in the garden. You know how gardeners are – especially those of us already fascinated with thematic and mini-habitat gardens, or who just like digging around in sloppy, soggy soils.

Carnivorous plants are best grown in in-ground bogs – small or large peat-filled depressions that remain reasonably wet but provide little in the way of nutrients. In-ground bogs are easy to build, can be small or very large, and provide the perfect place to enjoy native carnivores and insectivores in residential landscapes. But be forewarned – there are about as many recipes for building a bog as there are people who build them. It seems that all active bog gardeners have at least one favorite formula; some have several.

At least five ingredients are common to most successful artificial bogs – peat, sand, plastic, water, and placement. Quality, type, proportion, and quantity of these ingredients are another matter.

Some bog gardeners use commercial mixes of Canadian sphagnum peat moss, perlite, vermiculite, and other minor disease resistant ingredients as their source of peat. Promix is one option. Others prefer unblended Canadian sphagnum peat (not to be confused with sphagnum moss). Actually, sphagnum is the key here and just about any good commercially available sphagnum peat will work.

The preferred type of sand is also variable. Many agree that playground, sandbox, and beach sands are all too fine and should be avoided. However, Peter D'Amato, writing in *The Savage Garden* (another book every bog gardener should own), recommends "washed 'play sand' meant for use in children's sandboxes" because it is clean and likely to contain no contaminating particles. River sand and builders' sand are mentioned most often by successful bog gardeners, either of which is satisfactory as long as it is well washed and free of impurities. FNPS member Lee Norris recommends pool filter sand because it is uniform in grain size, lacks impurities, is chemically inert, does not contain clay, and is

** See book review on page 7*

Above: Veteran bog builder Caroline Dean, of Opileka, Alabama, has learned that much more than carnivores grow well in an artificial bog.

Several of our native pitcher plants, including the white-top (*Sarracenia leucophylla*) have red flowers.

Above: The Georgia Perimeter College Botanical Garden features several 24 inch deep inground bogs surrounded by stones to hide the top of the liner.

Continued on page 6

readily accessible. Pool filter sand is somewhat expensive and may be best for smaller bogs, but is easily obtained from swimming pool supply outlets and large hardware stores.

The proportion of peat to sand also varies. Many gardeners use a 50–50 mix but some recommend much higher proportions of peat. George Sanko, director of the Georgia Perimeter College Native Plant Garden in Atlanta, recommends 75-80% peat, pointing out that the more peat in your mixture, the less quickly the bog will dry out in hot summers. Hal Massie, who has built numerous bogs in the Georgia Piedmont, also recommends slightly more peat than sand – 2 parts peat to 1 part sand – to prevent the bog from appearing unnaturally sandy. A few bog gardeners, such as Darwin Thomas of Cullowhee, North Carolina, who builds very successful 2 foot deep bogs, uses peat exclusively with no sand at all. Thomas cautions that saturating this much peat is challenging and should be done one thin layer at a time. Otherwise, you are likely to end up with lots of peat floating on 18 inches of water.

Garden pond liners, children's swimming pools, prefabricated backyard pond containers, or concrete-mixing tubs serve well as belowground bog containers. If you are fortunate enough to have a constant natural water supply and poor drainage, you may not need a liner. For most situations, however, a water-holding barrier of some sort is essential.

Whether to provide extra drainage for your bog depends largely on soil type and bog depth. Some gardeners recommend cutting slits or punching holes in the bottom of the liner to allow for drainage. If your bog has a sloping bottom, these slits or holes can be located on the downhill end. Others recommend punching holes in the side of the container, nearer to the ground surface. And still others recommend no holes at all. Hal Massie, for example, who has built bogs in such watertight containers as old wheelbarrows, says that drainage is not needed.

Deciding to provide drainage slits or holes may also depend upon the quality of your water. Mineralized water may leave residues that build up in the soil with evaporation. Drainage can retard, but probably not eliminate, this build up.

Shallow bogs tend to dry out rapidly, especially when situated in full sun, and may perform better if allowed to dry by evaporation rather than by drainage holes. This is especially true for small container gardens. Shadier bogs, on the other hand, may remain too soggy without extra drainage. Bogs built over clay or poorly drained soils may require more drainage punctures than those built over well-drained, porous soils.

For those who lack sufficient space (or energy) for a belowground bog, most carnivores are easily grown in peat-filled containers. Aboveground or container bogs can be fashioned from a variety of vessels – small and large – ranging from old dish pans and plastic tubs to wheelbarrows, old wash tubs, concrete-mixing tubs, and small pre-formed pond liners. They should be carefully observed over time to determine how quickly they dry and whether additional drainage should be provided.

Water is a bog garden's life source. A natural seepage with a continuous flow of fresh ground water is preferred but is not possible in most home landscapes. An artificial seepage with a timed flow of tap water is also possible, but is often complicated, expensive, and requires careful adjustment to ensure consistency. In the absence of natural or artificial seepages and regular rain, most bog gardeners irrigate their bogs from above with stored rainwater or tap water, or with a soaker hose buried a few inches deep on the upslope end of the bog. During the heart of a hot dry summer, small, shallow bogs may need to be replenished once per week or more, whereas deeper bogs may do well with only occasional backyard watering.

How deep an inground bog garden should be is an open question. Recommended depths of 18 to 24 inches are most common. However, Hal Massie, writing in the July 2006 issue of *BotSoc News* (the publication of the Georgia Botanical Society), suggests that a depth of 6 to 8 inches is adequate, noting that bog plants often "thrive in shallow soil," and Rob Sacilotto, in an online article *Making a Bog Garden* (www.pitcherplant.com/bog_making.html) recommends 12 to 14 inches. Although a depth of 24 inches is generally considered maximum, a few bog builders suggest depths to nearly three feet. Some of the best bogs I've seen are 8 to12 inches deep. Regardless of the depth you choose, the sides of your excavation should be straight or only slightly sloping.

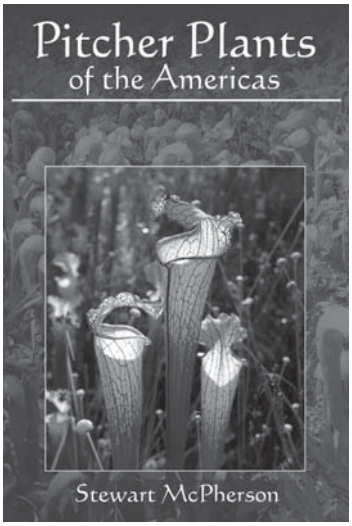
Bogs 18 to 24 inches deep seem to be the norm for ensuring adequate moisture in the absence of excessive irrigation. According to Georgia Native Plant Society members Kathryn Gable and Paula Reith, who manage the bogs at the Georgia Perimeter College (GPC) Native Plant Garden in Atlanta, bogs can be much drier than one might think. The GPC bogs are irrigated regularly, but only along with the garden's normal watering regimen, and receive no special irrigation treatment. The key factor, according to Gable – the garden's undisputed "bog queen" – is the combination of depth and method of construction; she cautions against over watering.

Gable prefers her in-ground bogs to be at least two feet deep. After excavation, she lines the hole with a layer of sand to prevent roots and other debris from puncturing the liner from below. The liner is installed above this initial layer and filled to a depth of about eight inches (one third the depth of the hole) with pure sand. In some of her bogs, Gable cuts four-inch horizontal slits every three feet or so along the sides of the liner, just above the first layer of sand. This allows the sand to retain moisture while ensuring efficient drainage of excess rain and irrigation. The remaining sand and peat are mixed and watered thoroughly in a wheelbarrow, then spread one load at the time in a 2 to 3 inch layer across the surface of the developing bog. Each layer is compacted tightly by repeated stomping

(admittedly the most enjoyable part of bog building for those of who like to come home dirty!). "You should stomp until the water oozes out the side," Kathryn says, "to ensure that the composition is mixed thoroughly, completely wet, and the sand does not rise to the surface."

Site selection is critical. For bogs to perform best, they should receive plenty of sunlight. Best is a western exposure with full sun all day; 5 to 6 hours of full sun is probably a minimum. If shaded part of the day, afternoon shade is probably best in most Florida environments.

The bottom line on bog building is experimentation. Build a bog, see how it works, and re-design to accommodate what you've learned. Most bogs begin to lose vitality after several years and plants can be easily removed and re-planted. Digging up your bog, rejuvenating the peat, and re-installing the plants will give you plenty of opportunity to try out new ideas and make your bog gardening experience an on-going adventure.



The cover of McPherson's book features our own white-top pitcher plant (*Sarracenia leucophylla*).

BOOK REVIEW: *Pitcher Plants of the Americas*

Review by Gil Nelson

Pitcher Plants of the Americas
by Stewart McPherson
McDonald & Woodward Publishing Company, Blacksburg, VA
320 pages.
Harcover: $44.95
Softcover: $34.95

Pitcher Plants of the Americas by Stewart McPherson is an excellent example of an increasingly popular genre of nature books that treat a small group of related organisms in greater detail than possible in the average field guide. The book features hundreds of excellent, high quality pictures (with only a few exceptions), several detailed and very helpful illustrations of pitcher plant morphology, and a number of range maps. The content begins with an introduction to the genera, ecology, and worldwide distributions of pitcher plants, followed by a global overview of the genera of carnivorous plants and a chapter on American pitcher plant evolution. McPherson then treats the five pitcher plant genera that occur in the Americas before turning to a chapter on habitat loss and the threat of extinction, and another on cultivation and horticulture. The chapter on pitcher plants horticulture includes recommended carnivorous plant vendors, all of which McPherson has hand selected because of their conservation ethic and their dedication to carnivorous plant preservation.

McPherson takes the broad view of pitcher plants, including within his circumscription any plant with "modified leaves that form hollow, water-containing vessels that are adapted to trapping and digesting animal prey." This is a rather expansive definition that incorporates genera not often tagged with the pitcher plant moniker. Florida plant lovers, for example, might be surprised to find our own powdery strap airplant (*Catopsis berteroniana*), an epiphytic tank bromeliad of tropical rockland hammocks and bayheads in southern Florida, among the plants in McPherson's species list. McPherson reports that there are 21 species of *Catopsis* worldwide and that the powdery strap airplant is the only one definitively known to rely on carnivory for a large part of its nutrition. Although insectivory is suspected in other species, McPherson points out that *Catopsis berteroniana* traps more than 20 times the number of insects of other tank bromeliads and derives much of its sustenance from trapped prey.

Of course, powdery airplant's insectivorous habit is not a new discovery. It was reported in the literature in the late 1970s and was extensively described by Dan Ward and Durland Fish in 1978 in *Rare and Endangered Biota of Florida, Volume 5, Plants*. Nevertheless, it is not a species that typically springs to mind with the mention of pitcher plants. McPherson's decision to include it underscores the breadth of his book.

Other genera treated include *Brocchinia*, another group of tank bromeliads from South America's Guiana Highlands, the Californian *Darlingtonia* (similar in many ways to our own *Sarracenia*), the relatively large and interesting genus *Heliamphora*, and, of course, *Sarracenia*.

Impatient readers might be tempted to hurry past the nearly 100 pages detailing the fifteen species of *Heliamphora*. This is a mostly South American genus that graces the summits of Argentinean and Brazilian *tepuis*, magnificent flat-topped mesas that rise hundreds of meters above the surrounding lowlands. However, skipping this section risks the loss of a delightful adventure. Few American pitcher plants have a more interesting or beautiful leaf and a more fascinating structural adaptation for ensuring that they stay upright when filled with rain water. One species – *Heliamphora sarracenioides* – is even named for the resemblance of its leaves to those of our own *Sarracenia*.

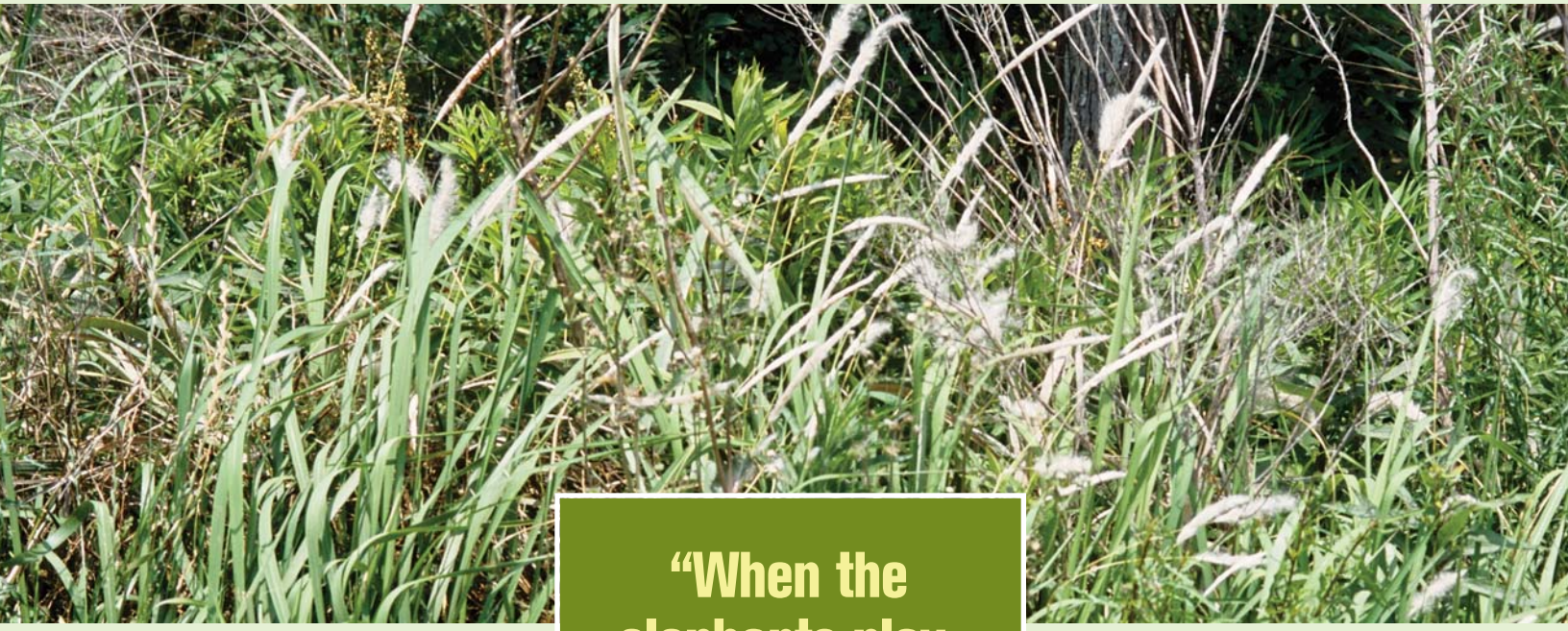
Heliamphora leaves are equipped with a small pore or slit about halfway up their length. In rainy weather these tiny pores serve to release excess rain water. As rising water in the leaf's interior reaches the level of the pores, it drains out the side of the leaf, preventing the leaves from becoming top heavy and toppling over.

My particular interest was the *Sarracenia* chapter, due to the preponderance of *Sarracenia* species in the East Gulf Coastal Plain and the Florida panhandle where I botanize. McPherson treats all of our taxa, including the numerous varieties, subspecies, and horticultural selections. His treatment of the *Sarracenia* is one of the few, if not the only, comprehensive sources of information about the numerous forms noted by horticulturists and carnivorous plant aficionados, and it will likely find a place among my favorite references to the southeastern *Sarracenia*.

My only disappointment in this section was the omission of our own little Gulf purple pitcherplant under its more recent name, *Sarracenia rosea*. McPherson includes the taxon as well as a nice image of it, but under the name *S. purpurea* subsp. *venosa* var. *burkii*. Rob Naczi of Delaware State University raised the plant to species level in the pages of *Sida* in 1999. McPherson's 2007 copyright date would seem to provide plenty of time to include at least a reference to Naczi's work, even if he didn't accept Naczi's argument.

Nevertheless, McPherson's book gets outstanding marks and is an excellent read: detailed and replete with useful information. No carnivorous plant enthusiast will want to be without it.

Florida's Struggle with Cogongrass and Native Plant Conservation



Above: Cogongrass infestation. Photo courtesy of James H. Miller, USDA Forest Service, Bugwood.org

"When the elephants play, the grass suffers"

(Chinese Proverb)

By Charles Cook with contributions from the FDEP Bureau of Mine Reclamation and the Florida Institute of Phosphate Research (FIPR).

Of all the many exotic weeds, cogongrass (*Imperata cylindrica*) is well known to be amongst the worst, especially if you value native plants. It is a plain grass, a bit coarse, not succulent or delicate. In fact it seems to be a fierce competitor forcing out delicate plants by the acre until it alone can be seen across a field. Tall, brown, boring, monostands of cogongrass steal thousands of acres of native wildlife habitat from the plants we love to see in the undisturbed woodlands and grasslands.

Cogongrass has clearly set up its dominion in the Florida landscape. It can be seen from here to the horizon in places where the native landscape has vanished. Although cogongrass can out-compete and spread even where there is a vegetation cover, initial establishment is most often on disturbed ground. We wonder how much hogs and fire ants contribute to creating disturbed sites for cogongrass invasion. We struggle to learn of all the mechanisms that enable it to dominate a Florida landscape.

Why the Struggle?

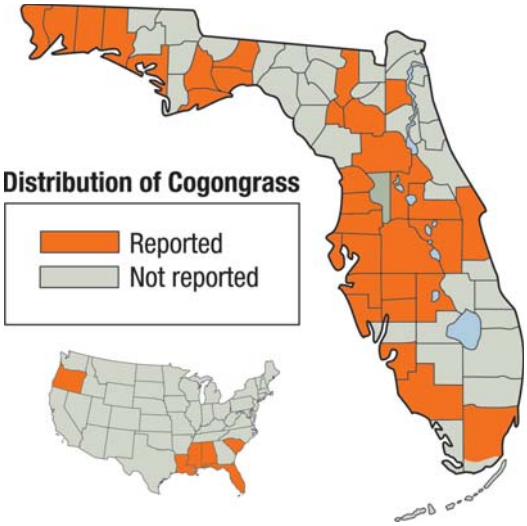
To worsen its reputation, cogongrass has fueled some disastrous wildfires across the Florida landscape. Intense, fast-running fires blaze through expanses of cogongrass scorching the native trees and plants that remain within it. The result is more cogongrass and fewer plants and animals. No wonder society has ascribed to cogongrass a position among the world's worst pest plants. According to the *Global Invasive Species Databank*, it is listed as one of the world's 100 worst invaders, another source listed it as among the world's 10 worst weeds, and the official ranking given by the Florida Exotic Pest Plant Council, is "Category One" pest plant.

What makes cogongrass so formidable is its ability to grow in so many different conditions. Climates hot and cold, soils wet or dry, soft or hard, areas in part shade or full sun. Cogongrass has stiff pointed root tips and growing buds that can puncture asphalt and hard plastic. A few years ago a blade of cogongrass was found growing through both sides of a 2 liter plastic soda bottle. The burrowing roots ensure its spread even after the top of the plant is removed or dies. Its downy white seed grows along a narrow tassel that stands among, or above, the yard long leaves. These seeds may be wind blown over great distances to colonize disturbed ground. In a matter of several years a new colony may completely cover an acre.

Getting energy from the sun, cogongrass seems to grow best in open savannahs. Cut or burned to the ground, a blade of cogongrass will grow back at an extremely fast rate. Six inches tall from blackened burnt fields, the young blades provide needed

green pasture to some Florida cattle in the winter months, sometimes as fast as five days after a fire.

Around seventy years ago when it was introduced into the United States from Southeast Asia, cogongrass was tried as a cattle forage and soil stabilizer. The cattle shunned the coarseness of the grass and found it palatable only in its early stages of growth. It was however successful erosion control material and was used by road builders to stabilize embankments. Since its release into the Florida environment it found its way to disturbed roadsides, agricultural fields, stripmines and utility easements. It has been found growing on top of office buildings in Central Florida.



Source: 2007 Map from U.S. Army Corp of Engineers Web site

Environmental Agencies and Public/Private Involvement

For years now, a standard prescription has been used for the control of cogongrass infestations. The method was developed by a scientist who studied the known ways used to eradicate it, thereby validating a recommended prescription (FIPR Publication #03-107-140 May 1997, Donn G. Shilling, et al.). This involves the use of some mechanical plowing and the application of herbicides in the right amounts and at the right times. Although burning by itself will not control cogongrass (in fact burning reduces woody competition and encourages cogongrass spread), burning is also a preliminary part of the eradication program that D. G. Shilling developed for controlling cogongrass, and his prescription remains the standard. According to Dr. Steve Richardson, Director of Reclamation Research for the Florida Institute of Phosphate Research, burning in the late summer to remove thatch and standing dead grass, followed by application of glyphosate (Roundup) or imazapyr (Arsenal/Habitat) to the more-lush and more-herbicide-susceptible regrowth in the fall, is the most effective timing. This is because the herbicides are carried into the rhizomes (underground stems) as the plant tries to store food (carbohydrates) for the winter.

Recently, as has happened on occasion in past years, talks about the tragedy of the cogongrass infestations took an upswing. Renewed interest in adding to the valuable research done by Shilling stimulated researchers to look again at what was being done to preserve the Florida landscape from the dreadful weed.

In one creative effort to control cogongrass the Florida Department of Environmental Protection, Bureau of Mine Reclamation attempted to mash it down with agricultural equipment. This mashing was followed by applications of herbicide, and the grass became so depressed it allowed a variety of weeds to grow over it. One day a wildfire hit at the edge of the mashed field of cogongrass and burned into the unmashed portions of the adjacent area. Amazingly, the fire traveled about a tenth as quickly through the mashed cogongrass as it

Above: Cogongrass seeds caught in barbed wire fence.
Photo courtesy of John D. Byrd, Mississippi State University, Bugwood.org

Below: *Imperata cylindrica.* Photo courtesy of James H. Miller, USDA Forest Service, Bugwood.org

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did through the tall cogongrass. This led us to observe the possible benefits in treating rampant growth by mashing – namely, fire suppression, soil moisture and organic matter conservation, and the conservation of ecological reserves for wildlife. Mashing cogongrass seems to have potential as a future method of control, and studies are being conducted to verify this hypothesis. Of course the mashing method, or the burning /herbicide treatment, are mainly applicable to solid infestations of cogongrass. Where mixed stands of desirable plants contain some invading cogongrass you can spot treat individual plants or patches with high rates of glyphosate or imazapyr or, as FIPR researchers have been studying, apply broadcast spray treatments of lower rates of imazapyr to get selective control. This is possible because some native plant species such as pines, wiregrass, blazing star, golden aster and several legumes are more tolerant of imazapyr than is cogongrass.

Scientific Struggles and Education Matters

FIPR has found that a dense canopy of trees and shrubs can shade out cogongrass (e.g., live oak, laurel oak, wax myrtle). The trees may help control cogongrass. Some researchers are considering non-native trees that have value for harvesting as an alternative fuel source or as an alternative to cypress for mulch. We must consider the wisdom of replacing one exotic with another. Which is worse – a field of solid cogongrass or a field of eucalyptus trees which may have some desirable plants in the understory? Current evidence suggests the eucalyptus species planned for plantations are not invasive. Native trees can be planted if the public and landowners so desire, but eucalyptus provides a quicker return on investment in a commercial plantation. Other non-native plant species are under consideration as alternative cover to cogongrass.

It is important to point out that researchers and land managers have found ways to kill cogongrass, although treatments are rarely 100% effective. But to truly succeed in controlling cogongrass, a replacement cover must be installed and must grow to out compete the reinfesting invader for a long time. This need is often met by developments that install ornamental grasses, farmers who plant tame pasture grasses such as bahia and bermuda, or restorationists who plant a variety of native trees, shrubs, and herbaceous covers. We are also conducting studies to find the best native plants to put out in the fields of mashed cogongrass. (I use "we" to mean those who know about the love and challenge of conserving and restoring native plant communities). Members of the Sierra Club and the Florida Native Plant Society have contributed some great ideas. The Association of Florida Native Nurseries has also given some great advice and encouraged the use of innovations and new native plant materials as they are found.

Eastern gamagrass (*Tripsacum dactyloides*) was introduced to our fields in the last few years and it seems to be holding its own. Unfortunately, many natives (e.g,. wiregrass) are not vigorous enough to compete well with cogongrass. The native plants that work, like gamagrass and a vigorous cultivar of maidencane (*Panicum hemitomon*), also called 'Citrus' maidencane, switchgrass (*Panicum virgatum*), blue maidencane (*Amphicarpum muhlenbergianum*), and a few others, have been the subject of study for more than a decade by the Natural Resource Conservation Service, the Bureau of Mine Reclamation, and FIPR along with several University related forestry and reclamation programs. (see www.fl.nrcs.usda.gov/programs/flplantmaterials.html).

Additional study is being given to some perhaps overlooked native plants that have the key attributes useful in a restoration project: availability, transplantability, transportability, tenacious regrowth by rhizomes, plants that are structurally equipped to arrest flying cogongrass seeds, persistence in the field, and benefits to wildlife.

Among those candidates that might qualify fit species of genera such as *Solidago, Euthamia, Aster* and many others. Given these attributes, and the efforts on the part of others to develop donor fields, seed sources, be they public or private, commercial or not-for-profit, we can work toward economically harvesting, planting and watching the war of plants for species domination of the Florida landscape, with the hope that one day our natives will triumph.

You might stop by to see these efforts one day, or invite a speaker to update your group on these important environmental matters. This is said to emphasize the need to know, because, what we know, we love, and what we love we protect. Truly, each citizen as a native plant enthusiast can contribute to the defense of our beautiful natural communities, or help restore them by learning, and wanting to care and keep them going...in the field or the backyard.

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More Nitrogen Leached from Landscape Plantings than Lawns

A critique of a University of Florida experiment

By Richard Poole and Christine Brown

Nitrogen (N) is the major component of fertilizer applied to lawns and ornamental plants. Other major components of fertilizer are phosphorus (P) and potassium (K). Nitrogen leaches readily from the soil, especially the sandy soil that comprises much of Florida's lawns. When nitrogen leaves the soil it enters the aquifer, and streams and lakes, where it frequently produces algae blooms and eutrophication. Phosphorus also contributes to the decline of our waterways (Pope and Milligan, 2002).

To maintain lush green lawns desired by most homeowners and required by many homeowner associations, large quantities of water and fertilizer are applied. As a result, harmful fertilizers are added to our water supply.

A University of Florida study by Erickson et. al., 2001, states that more nitrogen is leached from ground covers, shrubs and trees than lawns. Their abstract states: "The results from the newly established landscapes presented here indicated that St. Augustine grass was more efficient at using applied nitrogen and minimizing nitrogen leaching compared with the alternative landscape."

Let's examine the *Materials and Methods* section of the paper. The experiment was conducted at the University of Florida's Fort Lauderdale Research and Education Center. Plants chosen were approximately half Florida native plants and half exotic plants commonly used in Florida landscapes. A comparison was made between plots completely covered with St. Augustine and plots with 71 plants whose roots initially covered about 5% of the test plots. The root zone mix used to grow the plants was a medium fine sand with relatively high infiltration rate. The rate of irrigation used was uniform across all plots for five months. Nitrogen was applied at the rate of approximately 44 pounds per acre per application, a moderate amount for south Florida. Grass received twice as much fertilizer as the landscape plants.

Guidelines for native plant maintenance recommend that an initial dose of dilute fertilizer to get the plants off to a good start is sometimes beneficial, but routine fertilizing of native plants is not recommended (Osorio, 2001). Once established a water-conserving yard may require only moderate amounts of supplemental fertilizer. Over-fertilizing aggravates pest problems, stimulates excessive growth and requires frequent watering. Fertilizers carried by irrigation water or rain can leach into ground water and our waterways (Waterwise, 2003). Other sources suggest requirements for soil, light and temperature but make no suggestions for fertilizer application (Huegel, no date; Traas 1999). Saint John's River Water Management District promotes 'Think Two' – watering twice a week for St. Augustine grass. However, once established, native plants do not require irrigation, and exotic ornamentals will thrive with less than twice weekly irrigation.

In the experiment, initial plots of grass had 100% vegetation coverage, whereas the initial plots of mixed plants had approximately 5% coverage. Much of the fertilizer in the mixed plots was applied to medium fine sand with no vegetation coverage.

More water was applied to the mixed plants by Erickson et.al. than necessary. More fertilizer was applied than needed by the mixed planting and much of the fertilizer was applied to sand with no vegetative cover or roots. Erickson et.al. suggest "it is possible that too much fertilizer was applied to the mixed species landscape plants." Under the conditions of the experiment nitrogen leachate would be expected to be greater for the mixed plants.

The abstract should have read: *Results from the newly established landscapes presented here indicated that St. Augustine grass was more efficient at using applied nitrogen and minimizing nitrogen leaching compared with the alternative landscape when excessive amounts of nitrogen and water are applied to landscape plants and sand.*

To properly evaluate nitrogen leachate of native and landscape plants, fertilizer or no fertilizer should be applied to the plant root zones. Water should be applied less than twice a week.

The experimental plots as designed by Erickson et. al. to test nitrogen leachate from grass and landscape plants favors lawns.

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Florida ranchlands

Areas of conservation value and opportunities for restoration

by Betsey Hermanson Boughton, University of Central Florida

Clouds loom over head, the sky rumbles and cabbage palms rustle loudly. The anticipation of a storm is so strong that I cannot ignore it any longer; I decide to stop working and head indoors. As a field biologist, I've learned to heed the signs of the Florida sky. Nowhere else in Florida but on open rangeland does the sky seem so huge and have so many faces. A storm can produce swirling colors of dark blue, gray, and green while sunsets consist of varied combinations of red and orange interrupted by the dark silhouettes of palms. Under this vast Central Florida sky, cattle graze on a mosaic of habitats which also house many native species. The role of cattle ranches in protecting natural resources and Florida ecosystems is significant but often unrecognized.

Ranchland occupies most of the terrain surrounding Lake Okeechobee, especially north of the Lake (Swain et al. 2007). Ranches in southern Florida are valuable in many ways. They provide jobs and support rural economies. Many native Floridians grew up on or around ranches and associate ranchland with the "real" Florida. Unfortunately many of these ranches are threatened by development. The loss of ranches results not only in the loss of history and a sense of place for many people but it also means that many plant and animal species that make their homes on ranches could vanish or decline. Burrowing Owls, Crested Caracaras, Eastern Meadowlarks, and Bobwhite Quail rely on open ranchland as habitat. Also, one of the secrets of Florida ranches is that they contain extensive natural areas such as prairies, marshes, and hammocks that have not been highly altered from their original state.

Florida ranches consist of a combination of improved pasture (fertilized, bahia grass), unimproved or semi-native pasture (unfertilized, a mixture of native and exotic grasses) and native rangeland. Because many ranches contain substantial native areas, they are extremely important for increasing and maintaining the biodiversity of the Florida landscape (Swain et al. 2007). In Florida and other places in the US, a pivotal conservation strategy is to work with ranchers to keep large parcels of private ranch land from being developed (Maestas et al. 2003). Native and semi-native rangelands (unfertilized and unplowed grasslands or prairies) are also important areas of biodiversity in many European countries, including Sweden, Finland, The Netherlands, Germany, and England, and the decline of semi-natural grasslands is one of the major threats to European flora and fauna (Fuller 1987).

Florida's semi-native ranchlands contain several rare habitat types including wet prairie, dry prairie, calcareous prairies and cabbage palm savannas. Expert botanists, Edwin Bridges and Steve Orzell (Avon Park Air Force Range), study prairies throughout Florida and have found calcareous prairies to have one of the highest incidences of vascular plant species diversity ever recorded in North America, with up to 171 species in 1000 m^2 (Orzell and Bridges 2006). Because of their rarity and extremely impressive biodiversity, disturbed or remnant calcareous prairies should be protected and restored. Unfortunately, there are several strong threats to Florida semi-native rangelands, including suburban development, intense agricultural uses such as sod and vegetable farming and conversion to improved pastures dominated by exotic forage grasses and more intense management practices.

Buck Island Ranch and the Indian Prairie

One prime example of a Florida ranch is Buck Island Ranch, the location of MacArthur Agro-Ecology Research Center (MAERC; a division of Archbold Biological Station). This ranch is composed of 51% improved pasture and 49% semi-native rangeland. Buck

Island Ranch is a large ranch (10,500 acres), and professional cowboys headed by ranch manager Gene Lollis, manage 3,000 head of cattle which include Brahman cross cows bred to Angus or Charolais bulls. Over 2,300 calves are raised annually making Buck Island Ranch among the top 20 producers of cow-calves in Florida. Hunting provides further revenue for the ranch as there are many deer, hogs, alligators and turkeys. Dr. Patrick Bohlen directs ecological research at MAERC. One major focus of the research program is to determine the impact of ranching on water quality and the capacity for ranches to store water and prevent phosphorus runoff from reaching downstream waterways, and ultimately Lake Okeechobee, the headwaters to the Everglades. High phosphorus loading has severely impaired Lake Okeechobee and is a threat to the Everglades restoration efforts. Another focus of the ranch research program is to understand the basic ecology of ranch systems, and to provide information about the ecological value of ranches to the broader scientific community, ranchers and the public. Researchers at MAERC collaborate with the University of Florida IFAS, South Florida Water Management District, the Florida Department of Agriculture and Consumer Services, The Florida Cattlemen's Association, the Florida Department of Environmental Protection, the USDA Natural Resource Conservation Service (NRCS) and Agricultural Research Service, and the World Wildlife Fund, as well as other private ranches in the Lake Okeechobee watershed. Goals include determining how agricultural land can be utilized to minimize phosphorus flow and to maximize wildlife habitat and ecosystem services while remaining economically viable. Buck Island Ranch is situated in an area historically known as the "Indian Prairie" a 250-square mile area in south-central Florida, extending from Lake Istokpoga to Lake Okeechobee (Kushlan 1990). Remnants of the original Indian Prairie can be found in the NRCS Wetland Reserve Program Site on Buck Island Ranch (Bridges and Orzell 2005), within the Fisheating Creek basin, Avon Park Bombing Range, and Kissimmee Prairie Preserve (Tanner et al. 1982). The Indian Prairie region historically consisted of wet palm savannas and wetlands, interspersed with dry prairie islands (Davis 1943, Meshaka 1997). Calcareous prairies, which are rare in south-central Florida and more common in south Florida, exist within the Indian Prairie, and support a unique flora. The calcareous prairie is often dominated by muhly grass, *Muhlenbergia capillaris* var. *filipes* (Photo 1), and love grasses (*Eragrostis* spp.) both of which display striking purple inflorescences in fall (Bridges and Orzell 2005, Orzell and Bridges 2006), and are present in the semi-native pastures of Buck Island Ranch. In a survey conducted on Buck Island Ranch in 2005, in addition to finding wet and calcareous prairie types, Bridges and Orzell found two types of little disturbed, Indian Prairie savanna; including *Sabal palmetto/Spartina bakeri* wet savanna and *Sabal palmetto/Cladium jamaicense* wet savanna. Other species found in the prairies at Buck Island Ranch include *Mecardonia acuminata* var. *peninsularis* (endemic to peninsular FL), *Sacoila lanceolata* var. *lanceolata* (Photo 2), *Polygala grandiflora* var. *angustifolia*, *Aristida palustris, Aristida patula* (endemic), and *Euthamia graminifolia* var. *hirtipes* (the most extensive inland population ever observed by Bridges and Orzell (2005); (Photo 3).

Photo 1: *Muhlenbergia capillaris* var. *filipes*

Photo 2: *Sacoila lanceolata var. lanceolata*

Photo 3: *Euthamia graminifolia* var. *hirtipes*

Light or moderate grazing on semi-native pastures or native range, both of which are used as winter pastures on many ranches, maintains a diverse prairie community, including the more sensitive species (Duever 1986). The strong threat of converting semi-native pastures to improved pastures in order to support more cattle or to convert them into subdivisions threatens the future of these valuable prairie and savanna remnants in Florida. There are only a few protected prairie reserves, including Paynes Prairie near Gainesville and Kissimmee Prairie near Okeechobee, making prairie remnants on ranchlands extremely important as intermediate habitat and buffers providing habitat continuity and connectivity with public prairie preserves.

Continued on page 14

Marshes and Wetlands on Ranchland: Refuges for Native Plants

Marshes and wetlands on Buck Island Ranch serve as refuges for native plants in a drained landscape. There are 628 small isolated wetlands on the property and these wetlands harbor considerable native diversity. In a survey of 40 wetlands on the ranch, 20 improved and 20 semi-native, we found 154 species, of which nine were exotic. Endemic species include a large population of the federally endangered *Hypericum edisonianum* (Photo 4). Another endemic, *Aristida patula*, is found commonly within the semi-native pasture wetlands, and muhly grass, which is nearly endemic with calcareous affinities, is found along the borders of many of the semi-native wetlands. Some commonly found species include: *Amphicarpum muhlenbergianum*, *Cephalanthus occidentalis*, *Cladium jamaicense*, *Fuirena scirpoidea*, *Hypericum fasciculatum*, *Ipomoea sagittata*, *Oxypolis filiformis*, *Polygala cymosa*, *Rhynchospora filifolia*, *R. inundata*, *R. tracyi*, *Sabatia grandiflora*, *Sagittaria latifolia*, and *Utricularia foliosa*.

Photo 4: *Hypericum edisonianum*

Restoration of Natural Communities on Working Ranches

Semi-native pastures are easier targets for restoration than improved pastures and could serve as valuable mitigation land. Semi-native pastures typically have never been fertilized or limed and therefore soils in these pastures and wetlands tend to have much lower phosphorous contents and the soils and detrital layers are less disturbed. Because semi-native pastures haven't been plowed, it is likely that a native seed bank still exists and many native species are still present. For restoration of prairie remnants, a short hydroperiod is required, with approximately four months of shallow flooding (Orzell and Bridges 2006). Fire regime is extremely important for prairie species and a natural spring burning regime is needed to increase the number of plant species found in these areas and also increase flowering of existing species (Main and Barry 2002, Bridges and Orzell 2005). Grazing should be low intensity and areas should be closely monitored for any problems caused by exotic species.

In marshes, restoration of a longer hydroperiod is important for wetland plants that thrive in deeper water conditions, such as *Cladium jamaicense*, *Rhynchospora inundata, Panicum hemitomon*, *Saccharum giganteum*, *Cephalanthus occidentalis*, and *Paspalidium geminatum*. A fluctuating water regime would best mimic the historical hydrology as many species are adapted to a period of both wet and dry periods. For example, maidencane (*Panicum hemitomon*) can die out if there is prolonged flooding and is replaced by emergent vegetation such as pickerelweed (*Pontederia cordata*) or cattail (*Typha latifolia*) (Kushlan 1990). There are also many shallow marsh species at Buck Island Ranch such as spider lily (*Hymenocallis latifolia*) and *Canna flaccida* which would benefit from a fluctuating water regime. Resuming a natural fire regime (early growing season) would also be integral to restoring marshes and wetlands on ranchlands where most fires usually occur in the winter. Fire plays a crucial role in marshes affecting both species composition and nutrient dynamics, and most deep water marshes historically burned every three to five years while shallow marshes burned every one to three years (Kushlan 1990).

In addition to restoring hydroperiod in ranch wetlands, some of the more intensely grazed wetlands may require more work than just simply removing cattle. At Buck Island Ranch, intensely grazed wetlands are dominated by *Juncus effusus* subsp. *solutus*, plant diversity is reduced, and nutrient levels are higher. The effect of *Juncus* on other plant species may be of importance for grazed wetland restoration (see the "Closer Look" sidebar). How wetlands respond to complete removal of grazing is unknown and historical successional trajectories may be altered. For example, in herbaceous sedge meadows in Wisconsin, removal of cattle resulted in a dominance of shrubs (Middleton 2002). A possible solution could be light or moderate grazing that allows for recovery of native species while inhibiting establishment of undesirable shrub species. Management of vegetation through mechanical chopping or through prescribed fire are other possible alternatives. A new experiment at Buck Island Ranch, funded by the USDA, in which 20 entire wetlands (10 improved pasture wetlands and 10 semi-native pasture wetlands) are fenced (established in spring 2007) will determine how complete removal of grazing influences plant species composition and spread of exotic species.

Ranches or Suburbs?

The development of Florida ranches into subdivisions or more intensive agricultural activities threatens a spectacular array of natural communities (Hiscock et al. 2003; Swain et al. 2007). Florida's ranchlands contain areas that have been relatively little disturbed with impressive examples of natural communities; just one example are the prairies and savannas found on Buck Island Ranch. Ranchlands also provide a buffer for more natural conserved areas. Attempts should be made to conserve and restore these precious areas and to create incentives for ranchers to maintain and restore natural communities located on their ranches. Florida ranches provide windows of what Florida looked like in the past and contribute greatly to the current beauty and biodiversity of the Florida landscape.

A CLOSER LOOK:

The role of *Juncus effusus* in grazed wetlands

The edges of improved pasture wetlands are dominated by soft rush, *Juncus effusus* subsp. *solutus*, which creates a large tussock. Cattle avoid *Juncus,* presumably due to the plant's tough spiky culms. At Buck Island Ranch, I am investigating the role of *Juncus* in protecting native wetland plants from being eradicated by cattle in grazed wetlands. It appears that *Juncus* tussocks prevent many species from being eaten and that plants growing within or next to *Juncus* are protected from grazing. My data show that native plants such as maidencane (*Panicum hemitomon)*, regain dominance when cattle are removed (Photo 5).

Other native plants that I have observed growing within the *Juncus* clump include *Justicia ovata* var. *ovata*, *Ipomoea sagittata*, *Centella asiatica*, *Galium tinctorium* and *Diodia virginiana*. This suggests that plant communities in grazed wetlands can be restored because they still contain native diversity. Additionally, once grazing is removed, we have found that *Juncus* declines.

In many grazed ecosystems, unpalatable plants such as *Juncus* are seen as pests and ranch managers have focused on controlling these plants. However numerous studies have shown that unpalatable plants protect substantial native plant populations, beneficial for both agricultural and conservation interests (Callaway et al. 2005, Rebollo et al. 2005). A down-side is that exotic plants also benefit. I have found that *Juncus* seems to provide protection to limpo grass (*Hemarthria altissima*; (FLEPPC 2007, Cat. II); alligatorweed (*Alternanthera philoxeroides*; FLEPPC Cat. II) and torpedo grass (*Panicum repens*; FLEPPC Cat. I). Experimental grazing exclosures built in wetlands with limpo grass, an exotic forage grass from Africa, results in a complete monoculture of this mat-forming exotic. The rancher may prefer to see this exotic species proliferate because of its value as a forage species. Torpedo grass and alligatorweed do not form monocultures in these seasonal wetlands when grazing is removed but long-term data on the response of these species are lacking.

Research on the ecological relationships in managed ecosystems, such as ranchland, is important to elucidate mechanisms that might aid in restoration of these areas as well as control the proliferation of exotic species.

Photo 5: A typical improved pasture wetland on Buck Island Ranch. On the left is a fenced area that has been protected from cattle for four years and is dominated by *Panicum hemitomon* and *Sacciolepis striata*. *Juncus* is declining. Pasture on the right side of the fence shows an area dominated by *Juncus* that has been severely grazed.

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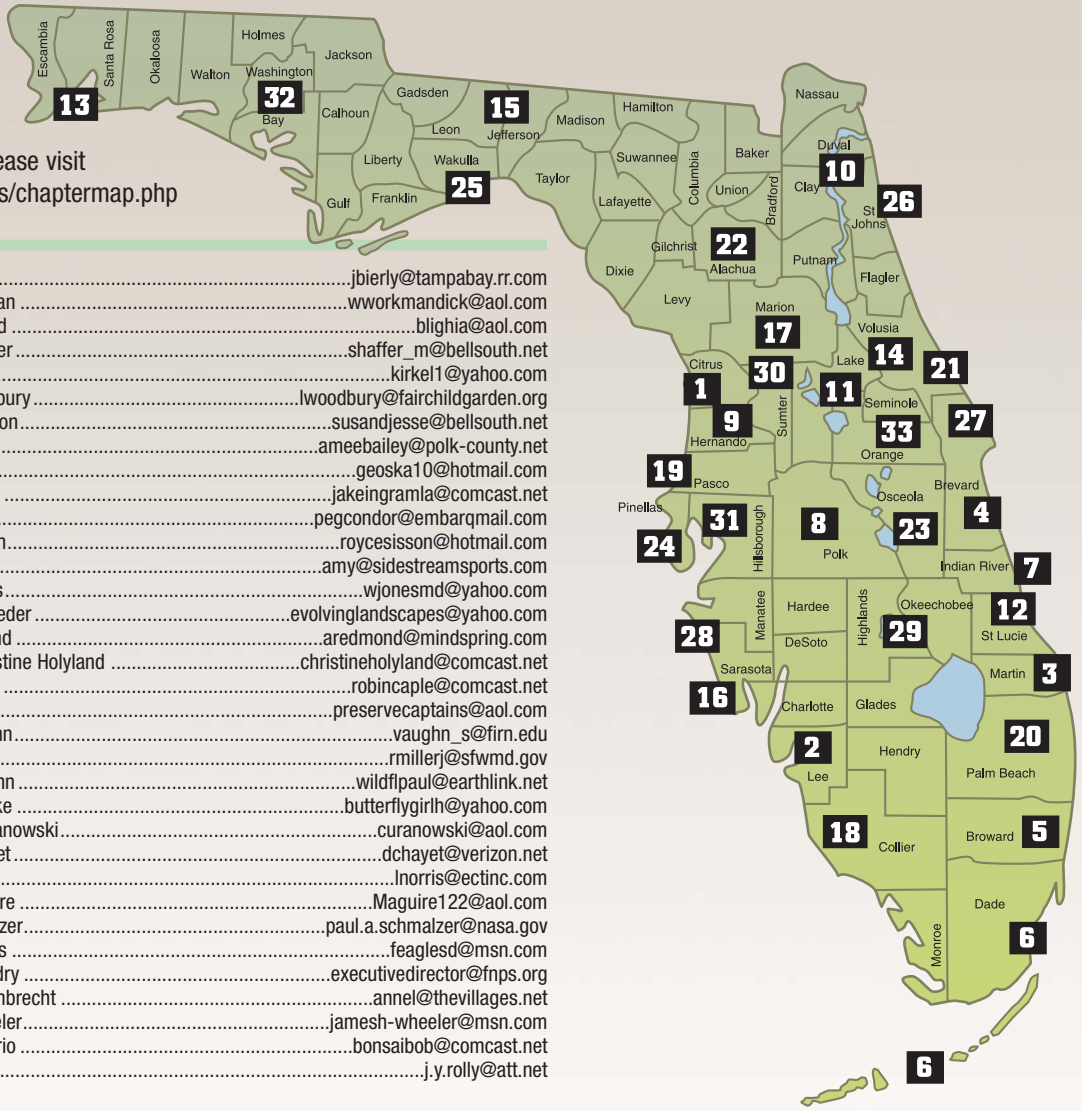

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